

## A

### **A horizon (A-horison)**

See soil horizon.

### **AASHTO classification (AASHTO-klassifikasie)**

The official classification of soil materials and soil aggregate mixtures for highway construction used by the American Association of State Highway Transportation Officials.

### **ABC soil (ABC-grond)**

A soil with a distinctly developed profile, i.e. with A, B, and C horizons.

### **AC soil (AC-grond)**

A soil having a profile containing only A and C horizons with no clearly developed B horizon.

### **abandoned meander (verlate meander)**

A meander that has been abandoned by its stream after the formation of a neck cut-off.

### **abiotic (abioties)**

Refers to non-living, basic components and compounds of the environment.

### **ablation (ablasie)**

Separation and removal of rock material and formation of residual deposits, especially by wind action or the washing away of loose and soluble materials. Some writers prefer to restrict the term to wasting of glaciers by melting and evaporation.

### **abrasion (abrasie)**

The wearing away by friction, the chief agents being glaciers and currents of water or wind laden with sand or other rock debris.

### **abrasion pH (abrasie-pH)**

A term designating the characteristic pH achieved by a suspension of a pulverized mineral in water, and resulting from hydrolysis and dissolution reactions.

### **abrasion platform (abrasieplatform)**

An extensive, nearly horizontal, submerged surface produced by long-continued wave erosion. This landform is still in its original position at or near the wave base, with the marine or lake forces still operating on it, and represents the outward continuation of the wave-cut bench towards a flatter surface.

### **abrasion test (abrasietoets)**

A test made on rock materials to determine their resistance to wear during construction operations or their suitability for riprap. The Los Angeles abrasion test (ASTM No. C131) involves tumbling the dry material in a cylindrical drum with 48 mm diameter steel balls for 500 or 1 000 revolutions. Material that breaks down to smaller than No. 12 sieve size is considered the mass loss. The Deval abrasion test (ASTM No. D289) uses a similar machine, using 10 000 revolutions.

### **absolute age (absolute ouderdom)**

The geological age of a fossil organism, rock or geological feature or event given in units of time. Cf. absolute chronology; geological time scale.

**absolute chronology (absolute chronologie)**

Geochronology in which the time-order is based on absolute age. Usually measured in years by radiometric dating, rather than on superposition and/or fossil content as in relative chronology. Cf. absolute age.

**absolute humidity (absolute humiditeit)**

See humidity.

**absorbance (absorbansie)**

The absorbance of a substance transmitting light is defined by

$$\begin{aligned} A &= \log (1/T) = \log (I_0/I) \text{ where} \\ A &= \text{absorbance} \\ T &= \text{transmittance} \\ I_0 &= \text{flux of incident radiation} \\ I &= \text{flux of radiation after passing through the substance} \end{aligned}$$

Cf. transmittance.

**absorption (absorpsie)**

- (1) The process by which one substance is taken into and included within another substance. Cf. uptake.
- (2) The physical process by which a substance retains radiant energy as some other form of energy.

**absorption, active (absorpsie, aktiewe)**

The uptake of ions and water by the plant root as a result of metabolic processes in the plant, frequently against an activity gradient.

**absorption, passive (absorpsie, passiewe)**

The uptake of ions and water by the plant root as a result of diffusion along an activity gradient.

**accelerated erosion (versnelde erosie)**

See erosion.

**acceleration due to gravity (gravitasieversnelling)**

The acceleration of a freely falling body is called the acceleration due to gravity, or the acceleration of gravity, and is usually denoted by the letter  $g$ . At or near the earth's surface it is approximately  $9,8 \text{ m s}^{-2}$ . Cf. gravitational constant.

**accessory mineral (bykomstige mineraal)**

A discrete mineral occurring in very small amounts in sediments and soils; it is usually a heavy mineral.

**accretion (akkresie)**

A process of accumulation by flowing water, whether of silt, sand, pebbles, etc. The difference between accretion and alluviation is that the latter is due to retardation of flow whereas the former may be due to any cause and in fact includes alluviation.

**accumulation (ions) (akkumulasie (ione))**

The movement of ions against a concentration gradient, generally as a result of active transport. It can also occur passively, e.g. by the establishment of Donnan equilibria or by adsorption.

**acidophyte (asidofiet; suurverdraend)**

Plants that are able to grow under acid soil conditions. Syn. calcifuge.

**acid rain (suurreën)**

Rain (precipitation) whose pH is less than 5,6 (the normal equilibrium value for carbon dioxide and water). The pH is reduced due to the presence of acids (mainly sulphuric and nitric) produced by the combustion of fossil fuels or released by natural events such as volcanic eruptions.

**acid rock (suurgesteente)**

An igneous rock containing more than 66% SiO<sub>2</sub> or 10% free quartz. The term "acid" derives from the concept of silica (SiO<sub>2</sub>) as an acidic oxide. E.g. granite, rhyolite.

**acid soil (suurgrond)**

A general term, which in practice refers to a soil with a low pH and in which plant growth may be restricted because of one or more nutritional disorders caused directly or indirectly by the acid soil condition.

See soil reaction; soil pH.

**acidity, exchangeable (suurheid, uitruilbare)**

The titratable hydrogen that can be replaced from the adsorption complex by a neutral salt solution. Expressed as cmol<sub>c</sub>/kg soil.

**acidity, total (suurheid, totale)**

The total acidity in a soil or clay. Usually it is estimated by a buffered salt determination of cation exchange capacity; by subtracting the exchangeable cations (Ca<sup>++</sup>, Mg<sup>++</sup>, K<sup>+</sup>, Na<sup>+</sup>), the total acidity is obtained. It also is approximated by the sum of salt replaceable acidity plus residual acidity at the selected pH conditions.

**Acrisol (Acrisol)**

See soil classification.

**actinolite (aktinoliet)**

A bright-green or greyish-green monoclinic mineral of the amphibole group: Ca<sub>2</sub>(Mg,Fe)<sub>5</sub>Si<sub>8</sub>O<sub>22</sub>(OH)<sub>2</sub>. It may contain manganese. Actinolite is a variety of asbestos, occurring in long, slender, needle-like crystals and also in fibrous, radiated, or columnar forms in metamorphic rocks (such as schists) and in altered igneous rocks.

**actinomycetes (aktinomisete)**

A non-taxonomic term applied to a group of organisms with characteristics intermediate between bacteria and fungi. Most soil actinomycetes are unicellular microorganisms that produce a slender branched mycelium and sporulate by segmentation of the entire mycelium, or more commonly, by segmentation of special hyphae. Includes many but not all organisms belonging to the order Actinomycetales.

**active transport (aktiewe vervoer)**

The transport of ions, water and other substances within the plant as a result of metabolic processes, frequently against a concentration gradient.

**additive (bymiddel)**

A material added to a fertilizer to improve its chemical or physical condition. An additive to liquid fertilizer might prevent crystals from forming in the liquid at temperatures where crystallization would normally take place.

**adhesion (adhesie)**

Refers to a molecular attraction which holds two dissimilar substances in contact, such as water and soil particles.

**adjusted SAR (aangepaste NAV)**

The sodium adsorption ratio (SAR) adjusted for the presence of bicarbonate ions in the water, according to the equation

$$\text{Adjusted SAR} = \text{SAR} [1 - (8,4 - \text{pH}_c)]$$

where  $\text{pH}_c$  is the calculated pH of the water if equilibrated with  $\text{CaCO}_3$ . Cf. sodium adsorption ratio (SAR).

**adobe (adobe)**

- (1) A brick or building material of sun-dried earth and straw.
- (2) A clay used in making adobe bricks; broadly: alluvial or playa clay in desert or arid regions.
- (3) A structure made of adobe bricks.

**adsorbate (adsorbaat; geadsorbeerde stof)**

Molecules, ions or colloids which are adsorbed onto a surface. Cf. adsorbent; adsorption.

**adsorbed water (geadsorbeerde water)**

Water held in a soil mass by physico-chemical forces and having physical properties substantially different from absorbed water or chemically combined water at the same temperature and pressure. Cf. adsorption.

**adsorbent (adsorbent; adsorbeermiddel)**

The substance or material which adsorbs molecules, ions or colloids onto its surface. Cf. adsorbate; adsorption.

**adsorption (adsorpsie)**

The surface retention of solid, liquid or gas molecules or of ions by a solid or liquid, as opposed to absorption, the penetration of substances into the bulk of the solid or liquid. The solid or liquid which adsorbs is termed the adsorbent; the solid, liquid or gas which is adsorbed as molecules, atoms or ions is referred to as the adsorbate. The general term sorption refers to both adsorption and absorption. Chemisorption refers to irreversible adsorption by both physical and chemical forces.

**adsorption complex (adsorpsiekompleks)**

The group of substances in soil capable of adsorbing other materials. Organic and inorganic colloidal particles form the greater part of the adsorption complex; the non-colloidal particles, such as silt and sand, exhibit adsorption but to a much lesser extent than the colloidal particles.

**aeolian (eolies)**

- (1) Pertaining to the wind; especially said of rocks, soils, and deposits, (such as loess, dune sand, and some volcanic tuffs) whose constituents were transported (blown) and laid down by atmospheric currents, or of landforms produced or eroded by the wind, or of sedimentary structures (such as ripple marks) made by the wind, or of geologic processes (such as erosion and deposition) accomplished by the wind. Etymol. Greek *Aeolus*, god of the winds. Syn. eolian; eolic.
- (2) Said of the active phase of a dune cycle, marked by diminished vegetal control and increased dune growth.

**aeolianite (eolianiet)**

A cemented, calcareous dune sand. A consolidated sedimentary rock which has been deposited by wind.

**aeolian soil material (eoliese grondmateriaal)**

Soil material accumulated through wind action. In South Africa the most extensive aeolian soil materials consist of sandy deposits. In the USA large areas of silty deposits (loess) occur.

**aerate (belug)**

To impregnate with a gas, usually air. Cf. soil aeration.

**aerobic (aërobies)**

- (1) Having molecular oxygen as a part of the environment.
- (2) Growing only in the presence of molecular oxygen (aerobic organisms).
- (3) Occurring only in the presence of molecular oxygen (said of certain chemical or biochemical processes, such as aerobic decomposition).

Cf. anaerobic.

**afforestation (bebossing; bosaanplanting)**

The artificial establishment of a forest or plantation by planting or sowing on land on which such vegetation has not previously, or recently, grown.

**agate (agaat)**

A fibrous, cryptocrystalline variety of silica, being a variegated chalcedony with colour bands, commonly occupying cavities in volcanic and certain other rocks.

**agglomerate (agglomeraat)**

A deposit of unordered, coarse, pyroclastic materials.

**aggradation (aggradasie)**

The process of building up a land surface by deposition; a long-term or geologic trend in sedimentation.

**aggregate (aggregaat)**

- (1) A single mass or cluster of soil particles, such as a ped, crumb, or granule. Cf. soil structure.
- (2) Crushed rock or gravel screened to sizes for use in road surfaces, concrete, or bituminous mixes.

**aggregate stability (aggregaatstabiliteit)**

Usually refers to the stability of soil peds or aggregates to breakdown in water or by the impact of falling water drops. It is measured by various wet-sieving or drop impact methods. Cf. air-water permeability ratio; dispersal index; dispersion ratio; geometric mean diameter; mean weight diameter.

**aggregation, soil (aggregasie, grond-)**

See soil aggregation.

**agric horizon (agriese horison)**

See diagnostic horison.

**agricchemicals (landbouchemikalieë)**

Chemical materials used in agriculture, e.g. fertilizers and pesticides.

**agricultural gypsum (landbougips)**

See gypsum.

**agricultural land (landbougrond)**

Land on farms regularly used for agricultural production; all land devoted to crop or livestock enterprises, for example, farmstead lands, drainage and irrigation ditches, water supply, cropland, and grazing land of every kind.

**agricultural lime (landboukalk)**

See lime (agricultural).

**agricultural pollution (landboubesoedeling)**

Liquid and solid wastes from all types of farming, including runoff containing pesticides and fertilizers; runoff from feedlots; erosion deposits; dust from ploughing; animal manure and carcasses; and crop residues and debris.

**agricultural waste (landbou-afval)**

Residues resulting from the production of plants and animals for food, including animal and plant rests. Cf. waste.

**agriculture (landbou)**

The science and art of utilizing the soil; including the gathering in of the crops and the rearing of livestock; farming (in the widest sense).

**agronomy (agronomie)**

A specialization of agricultural science concerned with the theory and practice of field-crop production and soil management.

**air capacity (lugkapasiteit)**

See air-filled porosity.

**air-dry (lugdroog)**

- (1) The condition of a soil at equilibrium with the water vapour of the surrounding atmosphere. The actual water content will depend upon the relative humidity and the temperature of the surrounding atmosphere.
- (2) To allow a material to attain a water content in equilibrium with the surrounding atmosphere.

**air-entry value (air-entry pressure) (lugintreewaarde; lugintreedruk)**

The critical negative pressure at which outflow of water begins from the largest pore of a soil which had been completely saturated with water. Syn. bubbling pressure.

**air-filled porosity (lugporeusheid)**

The ratio of the volume of air to soil bulk volume at any given time or under a given condition such as a specified soil water content or soil water matric potential.

**air permeability (lugdeurlatendheid; lugpermeabiliteit)**

The ability of soil to conduct air as a result of pressure differences. To calculate the air permeability (or conductivity), Darcy's Law may be used. Cf. soil water: Darcy's Law.

**air pollution (lugbesoedeling)**

The presence of one or more chemicals in high enough concentrations in the air to harm humans, animals, vegetation, water, or soil.

**air-water permeability ratio (lug-waterdeurlatendheid verhouding)**

The ratio of the permeability of soil to air and to water. It is an index of the stability of soil structure. A ratio of 1 indicates a stable porous medium, while a ratio of 20 is often taken as the threshold value for identifying unstable soils.

**albedo (albedo)**

The proportion of incident radiation that is reflected from a surface, for the visible waveband. It also indicates the lightness or darkness of a surface. Cf. reflection coefficient.

**albic E horizon (obsolete) (albiese E-horison (verouderd))**

See diagnostic horizon.

**albic horizon (albiese horison)**

See diagnostic horizon.

**albite (albiet)**

A colourless or milky-white triclinic mineral of the feldspar group:  $\text{NaAlSi}_3\text{O}_8$ . It is a variety of plagioclase with composition ranging from  $\text{Ab}_{100}\text{An}_0$  to  $\text{Ab}_{90}\text{An}_{10}$ . Albite occurs in all groups of rocks, forming a common constituent of granite and of various acid-to-intermediate igneous rocks. Cf. feldspar group.

**alcrete (alkreet)**

Aluminium-rich duricrusts, often in the form of indurated bauxites. Generally the products of the accumulation of aluminium oxides within the zone of weathering. Cf. hardpan.

**Alfisol (Alfisol)**

See soil classification.

**algae (alge)**

Simple plants, without roots and leaves, many of microscopic size, and containing chlorophyll. They are the base of the food chain in aquatic environments and reproduce by forming spores. (Sing. alga.)

**Algonkian (Algonkium)**

A late Precambrian geological period. Cf. geological time scale.

**Alisol (Alisol)**

See soil classification.

**alkali (alkalie)**

Any substance capable of furnishing the hydroxyl ion (OH<sup>-</sup>) to its solution or other substances; a substance having marked basic properties in contrast to acid. The most important alkali metals (Group IA of the Periodic Table) in soil are sodium and potassium. Cf. alkali soil; alkaline soil.

**alkali feldspar (alkaliese veldspaat)**

See feldspar group.

**alkaline soil (alkaliese grond)**

A soil with pH > 7,0. See soil reaction; soil pH.

**alkali soil (brakgrond)**

A more or less obsolete term, now replaced by the term salt-affected soil. Cf. salt-affected soil; saline soil; sodic soil; saline-sodic soil.

**alley cropping (laanverbouwing)**

Planting of crops in strips with rows of trees or shrubs on each side. Cf. strip cropping.

**allitic soil (allitese grond)**

A soil from which silica has been removed, leaving a dominance of aluminium and iron compounds in the clay fraction. Syn. Oxisol; Latosol.

**allochthonous (allochtoon)**

Formed or produced elsewhere than in its present place; not formed *in situ*. Cf. autochthonous.

**allogenic (allogeen)**

Generated elsewhere. Said of constituents that came into existence outside of, and previous to, the rock of which they now form a part. Etymol. Greek *allos*, other. Cf. authigenic.

**allophane (allofaan)**

A co-precipitate of silica and alumina which contains water, exchangeable ions and frequently iron and organic matter as impurities. Amorphous to X-rays, it is the major constituent of the colloidal fraction in certain soils derived from volcanic ejecta and basic igneous rocks, and occurs to some extent in all soils. The composition and properties of allophane are variable, and naturally occurring allophanes of soils are difficult to isolate and study.

**allotropic (allotropies)**

Capable of existing in two or more forms, for example carbon as diamond and graphite.

**alluvial cone (alluviale kegel)**

An alluvial fan with very steep slopes; it is generally higher and narrower than a fan, and is composed of coarser and thicker material believed to have been deposited by



larger streams. The term is sometimes used synonymously with alluvial fan. Syn. cone of dejection; cone of detritus; hemicone; debris cone; cone delta; dry delta; wash.

**alluvial fan (puinwaaier)**

A sloping, fan-shaped mass of sediment deposited by a stream where it merges from upland onto a plain.

**alluvial plain (alluviale vlakte)**

A level or sloping tract or a slightly undulating land surface produced by extensive deposition of alluvium, usually adjacent to a river that periodically overflows its banks; it may be situated on a flood plain, a delta, or an alluvial fan. Syn. wash plain; waste plain; river plain; aggraded valley plain.

**alluvial soil (alluviale grond)**

A soil developing from recently deposited alluvium and exhibiting essentially no horizon development. Cf. alluvium.

**alluvial terrace (alluviale terras)**

A river terrace composed of alluvium and marking a former higher level of stream deposition.

**alluvium (alluvium)**

Unconsolidated materials deposited in close proximity to streams and rivers through the agency of running water.

**Alpine Meadow Soil (obsolete) (Alpe-weidinggrond (verouderd))**

A great soil group of the intrazonal order, comprised of dark soils of grassy meadows at altitudes above the timberline.

**alumina (alumina)**

Aluminium oxide,  $Al_2O_3$ .

**alumina sheet (aluminaplaat)**

A sheet of aluminium hydroxyl octahedrons in the layers of silicate clay minerals. Cf. aluminium hydroxyl octahedron.

**aluminium hydroxyl octahedron (aluminium hidroksieloktaëder)**

One of the basic structural units of silicate clay minerals, consisting of an aluminium atom surrounded by six hydroxyl groups and having an octahedral configuration.

**aluminium toxicity (aluminium toksisiteit)**

Refers to the poor growth of certain plants as a result of high Al concentrations in soil. This phenomenon is the result of a very low soil pH which leads to an increase in the solubility of Al compounds in soil.

**aluminosilicate clay mineral (aluminosilikaat kleimineraal)**

See clay mineral.

**amelioration, soil (grondverbetering)**

See soil amendment.

**amendment, soil (grondverbeteringsmiddel)**

See soil amendment.

**amethyst (amētis)**

A purple or bluish-violet variety of quartz.

**ammonia liquid (vloeibare ammoniak)**

Liquid ammonia which is kept under pressure and applied into the soil with special equipment.

**ammonia solution (ammoniakoplossing)**

Ammonia gas may be dissolved in water, yielding  $\text{NH}_4\text{OH}$ , which is known as ammonia solution; may be used as a fertilizer.

**ammoniated superphosphate (geammonifiseerde superfosfaat)**

Ammoniated superphosphate fertilizers are prepared by reacting anhydrous or aqua ammonia ( $\text{NH}_3$ ) with any of the superphosphates. The free acid is neutralized and a small portion of the monocalcium phosphate is converted to the less soluble dicalcium phosphate, while ammonium salts are formed. Ammoniated (single) superphosphate contains approximately 2,5% N and 8,1% P, while ammoniated double superphosphate contains approximately 5,6% N and 18,3% P.

**ammonia volatilisation (ammoniakvervlugting)**

Loss of ammonia from a soil due to a high concentration in an alkaline soil.

**ammonification (ammonifikasie)**

The biochemical process whereby ammoniacal nitrogen is released from nitrogen-containing organic compounds.

**ammonium fixation (ammoniumvaslegging)**

The sorption of ammonium ions by inorganic or organic colloids of the soil in such a manner that they are unexchangeable by the usual methods of cation exchange.

**ammonium nitrate (ammoniumnitraat)**

Fertilizer  $\text{NH}_4\text{NO}_3$  contains 32 to 33,5% N, has good handling properties but is slightly hygroscopic and may form explosive mixtures with certain organic compounds. Limestone ammonium nitrate (LAN) contains about 20% N and differs from ammonium nitrate only in that the particles are covered with finely ground limestone.

**ammonium phosphate (ammoniumfosfaat)**

Ammonium phosphate fertilizers are produced by reacting ammonia ( $\text{NH}_3$ ) with phosphoric acid or a mixture of phosphoric and sulphuric acids. Monoammonium phosphate (MAP) and diammonium phosphate (DAP) are prepared in this way. The N and P contents depend on the fertilizer grade; pure MAP would contain 12% N and 26% P, and pure DAP 21% N and 23% P.

**ammonium sulphate (ammoniumsulfaat)**

Ammonium sulphate fertilizer ( $(\text{NH}_4)_2\text{SO}_4$ ) is prepared by reaction of  $\text{NH}_3$  with the appropriate quantity of  $\text{H}_2\text{SO}_4$ . It contains approximately 21% N.

**amorphous compound (amorfe verbinding)**

This term is commonly used in soil science for compounds of aluminium, silicon and iron, amorphous to X-rays, highly reactive and believed to be largely responsible for the fixation of compounds of, for example, phosphorus and molybdenum, and for the high buffer capacity of soils in which they occur. Cf. allophane.

**amphibole (amfibool)**

The amphiboles are a group of ferromagnesian silicate minerals with a cross-linked double chain of tetrahedra with a Si:O ratio of 4:11. They are common in plutonic igneous and metamorphic rocks. Some have little or no Ca and Mg, in some Ca>Na and in others Na>Ca. Hornblende, a widespread member, has the general formula:  $(Ca,Na)_3(Mg,Fe^{2+},Al,Ti)_5(Si,Al)_8O_{22}(OH,F)_2$ .

**amphibolite (amfiboliet)**

A metamorphic rock consisting mainly of amphibole and plagioclase, with little or no quartz.

**amygdale (amandel; amandelsteen)**

A gas cavity in extrusive and occasionally intrusive rocks which is filled with secondary minerals such as zeolites, calcite, chalcedony or quartz.

**anaerobic (anaërobies)**

- (1) A condition indicating the absence of molecular oxygen.
- (2) The growth of organisms in the absence of molecular oxygen (such as anaerobic bacteria).
- (3) A process occurring in the absence of molecular oxygen (e.g. a biochemical process). Cf. aerobic; anoxic.

**analytic model (analitiese model)**

See mathematical model.

**anatase (anataas)**

Titanium oxide,  $TiO_2$  (tetragonal); brown to black, trimorphous with rutile.

**andesine (andesien)**

See feldspar group.

**andesite (andesiet)**

A dark-coloured, fine-grained extrusive rock that, when porphyritic, contains phenocrysts composed primarily of zoned acid plagioclase (esp. andesine) in the range of  $An_{35}$  to  $An_{70}$  and one or more of the mafic minerals (e.g. biotite, hornblende, pyroxene), and a groundmass composed generally of the same minerals as the phenocrysts, although the plagioclase may be more acid and quartz is generally present. The extrusive equivalent of diorite. Its name is derived from the Andes mountains, South America.

**andic horizon (andiese horison)**

See diagnostic horizon.

**Andisol (Andisol)**

See soil classification.

**Andosol (Andosol)**

See soil classification.

**angle of repose (rushoek)**

The angle between the horizontal and the maximum slope that a soil (soil landscape) obtains through natural processes.

**angular structure (hoekige structuur)**

See soil structure.

**anhydrite (anhydriet)**

A mineral consisting of an anhydrous calcium sulphate:  $\text{CaSO}_4$ . It represents gypsum without its water of crystallization.

**anion (anioon)**

A negatively charged ion. Those commonly occurring in soil include chloride ( $\text{Cl}^-$ ), molybdate ( $\text{MoO}_4^-$ ), phosphate ( $\text{H}_2\text{PO}_4^-$ ,  $\text{HPO}_4^-$ ,  $\text{PO}_4^{=}$ ), sulphate ( $\text{SO}_4^-$ ), nitrate ( $\text{NO}_3^-$ ), carbonate ( $\text{CO}_3^-$ ), bicarbonate ( $\text{HCO}_3^-$ ) and the hydroxyl ion ( $\text{OH}^-$ ). Cf. cation.

**anion exchange capacity (AEC) (anioonuitruilkapasiteit (AUK))**

Certain clay-size components (both inorganic and organic) in soils possess a positive electrical charge which is balanced by anions so that the system as a whole is electrically neutral (see cation exchange capacity). The anions so held represent a definite quantity known as the anion exchange capacity which may be expressed on a whole soil basis or on a clay basis using the unit  $\text{cmol}/\text{kg}$ . Because many soils have a pH-dependent positive charge (the lower the pH the higher the charge) it is important to choose the pH at which the AEC is measured so as to serve the specific objective and then to quote this pH when presenting the results. Cf. cation exchange capacity.

**anion exclusion (anioonuitsluiting)**

The exclusion or repulsion of anions in close proximity of soil particle surfaces because of their negative charge; also referred to as negative adsorption.

**anisotropic soil (anisotropiese grond)**

See anisotropy.

**anisotropy (anisotropie)**

Anisotropy implies that the spatial variation of the properties of a body is not uniform but varies in a specific direction. Soils are anisotropic, especially with regard to properties such as hydraulic conductivity and micromorphology.

**annelids (annelide; ringwurms)**

Segmented coelomate worms, commonly called ringworms, having a soft elongated body with a muscular body wall, divided into many similar segments. The main classes of Annelida are Polychaeta (ragworms, lugworms), Oligochaeta (e.g. earthworms) and Hiradinea (leeches).

**anorthite (anortiet)**

The calcium-feldspar end-member in the plagioclase series. A whitish grey or reddish triclinic mineral of the plagioclase feldspar group;  $\text{CaAl}_2\text{Si}_2\text{O}_8$ . It is the most basic

member of the plagioclases, its composition ranging from  $Ab_{10}An_{90}$  to  $Ab_0An_{100}$ . Anorthite occurs in basic and ultrabasic igneous rocks (gabbro, norite, anorthosite), sometimes in tuffs, and very rarely in metamorphic rocks. Syn. calcium feldspar. Cf. feldspar group.

**anorthoclase (anortoklaas)**

See feldspar group.

**anoxic (anoksies)**

Devoid of molecular oxygen. Cf. anaerobic.

**antagonism (antagonisme)**

In plant nutrition it refers to the reduction in uptake of a particular ion due to the presence of one or more, usually chemically related, ions. However, in some cases at certain concentration ranges synergism (increased uptake) instead of antagonism may be observed. Cf. competition (ions).

**anthric horizon (antriese horison)**

See diagnostic horizon.

**anthropic (antropies)**

In the context of soil science, this term refers to soil material with properties caused by continued use by man.

**anthropic epipedon (antropiese epipedon)**

See diagnostic horizon.

**anthropomorphic soil (antropomorfe grond)**

An intrazonal soil that has been formed as a direct result of man's activities (e.g. a paddy soil). Cf. diagnostic horizon: plaggen epipedon. Syn. anthropic soil.

**Anthrosol (Antrosol)**

See soil classification.

**antigorite (antigriet)**

A platy or lamellar, brownish-green mineral of the serpentine group:  $Mg_3Si_2O_5(OH)_4$ . Syn. picrolite; baltimorite.

**apatite (apatiet)**

A group of variously coloured hexagonal minerals consisting of calcium phosphate together with fluorine, chlorine, hydroxyl, or carbonate in varying amounts and having the general formula:

$[Ca_3(PO_4)_2]_3.Ca[CO_3,Cl_2,F_2,(OH)_2]$ . Also any mineral of the apatite group, such as fluorapatite, chlorapatite, hydroxylapatite, carbonate-apatite, and francolite; when not specified the term usually refers to fluorapatite. The apatite minerals occur as accessory minerals in almost all igneous rocks, in metamorphic rocks, and in veins and other ore deposits, and most commonly as fine grained and often impure masses as the chief constituent of phosphate rock and of bones and teeth. Cf. rock phosphate.

**apedal (apedaal)**

See soil structure; micromorphology.

**Ap horizon (Ap-horison)**

The surface layer of a soil disturbed by cultivation or pasturing. Cf. topsoil.

**application efficiency (toedieningsdoeltreffendheid)**

The application efficiency of irrigation water is the percentage water delivered to the field which becomes stored in the root zone and is thus available for crop use. Cf. irrigation efficiency; transmission efficiency; distribution efficiency; replenishment efficiency.

**apron (skort)**

A floor or lining to protect a surface from erosion; for example, the pavement (stones, brick or concrete) below chutes, spillways, or at the toes of dams.

**aquic (akwies)**

A soil water regime that is virtually free of dissolved oxygen because a soil zone is saturated by groundwater or water of the capillary fringe. It implies a reducing condition for at least a few days and a soil temperature above 5°C while the soil is saturated.

**aquifer (waterdraer; akwifeer)**

A body of rock or sediments that contains sufficient saturated permeable material to conduct groundwater and to yield economically significant quantities of groundwater to boreholes, wells and springs. Syn. groundwater reservoir; aquafer.

**arable land (bewerkbare land)**

Land so located that production of cultivated crops is economical and practical.

**arable soil (bewerkbare grond)**

Soil that can produce crops requiring tillage without clearing or other physical improvements.

**aragonite (aragoniet)**

CaCO<sub>3</sub>, orthorombic, dimorphous with calcite.

**Archaean (Argeïes)**

In general usage syn. with Pre-Cambrian; refers to the oldest rocks. Cf. geological time scale.

**arenaceous (sandig)**

Containing mainly sand-size fragments. Not to be confused with siliceous.

**Arenosol (Arenosol)**

See soil classification.

**argillaceous (kleihoudend)**

Refers to sedimentary rocks and deposits composed of very fine-grained material, such as clay, shale, etc.

**argic horizon (argiese horison)**

See diagnostic horizon.

**argillaan (argillaan)**

See clay film; micromorphology.

**argillic B horizon (obsolete) (argilliese B-horison (verouderd))**

See diagnostic horizon.

**argillic horizon (argilliese horison)**

See diagnostic horizon.

**Aridisol (Aridisol)**

See soil classification.

**arkose (arkose)**

A coarse-grained sandstone or grit derived from the rapid disintegration of granite or gneiss and characterized by feldspar fragments.

**arthropods (geleedpotiges)**

Small segmented animals with heads, jointed legs and a thickened chitinous cuticle forming an exoskeleton. Examples: crabs, shrimps, insects, spiders, scorpions and mites.

**aspect (aspek)**

A compass direction toward which a land slope faces. The direction is taken downslope and normal to the contours of elevation.

**assimilation (assimilasie)**

- (1) The utilization of inorganic and/or organic substances in all synthesis. Absorption or building up of simple foodstuffs, or products of digestion of food-stuffs, into complex constituents of the organism.
- (2) In water pollution, the ability of a body of water to purify itself of organic pollution.

**association, soil (assosiasie, grond-)**

See soil association.

**attapulgit (attapulgiet)**

See palygorskite.

**Atterberg limits (Atterberggrense)**

Also termed the Atterberg consistence constants, they are a series of water contents and related indices used to characterize soil plasticity.

*liquid limit (LL)* - The water content at which a soil is practically liquid but possesses a certain small shearing strength. It is the water content at which a trapezoidal groove of specified shape cut in moist soil held in a special cup is closed after 25 taps on a hard rubber plate. Syn. upper plastic limit.

*plastic limit (PL)* - The smallest water content at which a soil is plastic. It is obtained by rolling out samples at slowly decreasing water content until that water content is

reached at which a thread 3 mm in diameter just begins to crumble. Syn. lower plastic limit.

*shrinkage limit* (SL) - The smallest water content that can occur in a soil sample which is completely saturated. It is determined by measuring the water content of a sample at the point where, upon continuous drying, there is no further change in bulk volume.

*plasticity index* (PI) - A measure of plastic behaviour and is the range of water content between the liquid and plastic limits ( $PI = LL - PL$ ). Sometimes referred to as the plasticity number.

*flow index* ( $I_f$ ) - The relationship between the change in water content and the corresponding change in the shearing strength. It is determined from a flow curve by using the liquid limit apparatus.

*shrinkage index* ( $I_s$ ) - The numerical difference between the plastic and shrinkage limits ( $I_s = PL - SL$ ).

*toughness index* ( $I_t$ ) - The ratio between the plasticity and flow indices ( $I_t = PI/I_f$ ).

**auger** (boor; grondboor)

A tool for boring into the soil and withdrawing a small sample for field or laboratory observation. The most common soil augers are (i) those with worm-type bits, unenclosed, or (ii) those with worm-type bits enclosed in a hollow cylinder.

**augite** (ougiet)

A common mineral of the clinopyroxene group:

$(Ca,Na)(Mg,Fe^{2+},Al)(Si,Al)_2O_6$ . It may contain titanium and ferric iron. Augite is usually black, greenish black or dark green and commonly occurs as an essential constituent in many basic igneous rocks and in certain metamorphic rocks. Cf. pyroxene.

**autecology** (outekologie)

The study of individual organisms or species within an ecosystem. Cf. synecology.

**authigenic** (outigenies)

Formed or generated in place. Applied to those constituents that came into existence with or after the formation of the rock of which they constitute a part, e.g. the cements of sedimentary rocks. Cf. allogenic.

**autochthonous** (outochtoon)

- (1) Indigenous, native, aboriginal - used especially for fauna and flora. Autochthonous flora refers to that portion of the microflora that subsist on the more resistant soil organic matter and is little affected by the addition of fresh organic materials. Cf. zymogenous flora.
- (2) In the case of soils and rocks, formed or occurring in the place where found; not imported; indigenous to a region.

**automorphic** (outomorf)

As opposed to hydromorphic (excessive water), it refers to soil-forming processes under a more or less well-drained regime.



**autotroph (outotroof)**

An organism capable of utilizing carbon dioxide as a source of carbon and of obtaining energy for the reduction of carbon dioxide, and for other life processes, from the oxidation of inorganic elements or compounds, e.g. sulphur, hydrogen, ammonium, and nitrite salts (chemo-autotrophic) or from light (photo-autotrophic). Cf. heterotroph.

**available plant nutrient (beskikbare plantvoedingstof)**

Any nutrient element or compound in the soil that can be absorbed readily and assimilated by growing plants.

**available water (beskikbare water)**

See soil water: available water.

**available water capacity (AWC) (beskikbare waterhouvermoë (BWV))**

It is that part of the water which can be held by soil and that is readily absorbed by plant roots. In soils with a low soluble salt content it is conventionally taken to be the difference between field capacity and wilting point. However, all such water is not equally available: as the soil water content decreases, its matric potential also decreases and more energy is needed to transport water into the root. Available water capacity is commonly expressed as a percentage of the dry mass of soil or as mm water per metre depth of soil. Cf. soil water: profile available water capacity; soil water: total available water capacity.

**azonal soil (asonale grond)**

Soils without distinct genetic horizons. An earlier soil order.

**Azotobacter (Azotobacter)**

A genus of aerobic, free-living bacteria capable of utilizing gaseous dinitrogen as a source of nitrogen.

## **B**

### **B horizon (B-horison)**

See soil horizon.

### **BC soil (BC-grond)**

A truncated soil with B and C horizons but with little or no A horizon.

### **backfill (terugvulling)**

The material used to refill a ditch or other excavation, or the process of doing so.

### **bacteria (bakterieë)**

Single-cell, microscopic organisms that possess rigid cell walls. They may be aerobic, anaerobic, or facultative; they can cause disease, and are important in the decomposition of organic matter in soil.

### **badland (dongaveld; gramadoelas)**

A land type generally devoid of vegetation and broken by an intricate maze of narrow ravines, sharp crests, and pinnacles resulting from serious erosion of soil and soft geologic materials. Most common in arid or semi-arid regions. A miscellaneous land type.

### **bajada (bajada; bahada)**

The nearly flat surface of alluvium along the foot of a mountain; surface of confluent alluvial fans. Also spelled bahada.

### **ball clay (balklei)**

A highly plastic, sometimes refractory clay, commonly characterized by the presence of organic matter, having unfired colours ranging from light buff to various shades of grey, and used as a bonding constituent of ceramic wares; pipe clay. It has wet and dry strength, a long vitrification range, and high firing shrinkage. Ball clay is so named because of the early English practice of rolling the clay into balls weighing about 13-22 kg and having diameters of about 25 cm.

### **banded ironstone (gestreepte ystersteen)**

A sedimentary rock consisting of alternating iron-rich and iron-poor layers with an average thickness of 5 mm. The iron-rich layers consist of iron oxides such as magnetite and is dark-coloured. The iron-poor layers consist mainly of chert and are lighter in colour. Crocidolite-asbestos is present as metamorphic material between the layers.

### **banding (fertilizer) (bandplaas (misstof))**

The application of fertilizer in a band near the seed, during planting of row crops.

### **bar (obsolete) (bar (verouderd))**

A unit of pressure equal to 1,01325 standard atmosphere or  $10^5$  Pa. The pascal is the SI unit of pressure and is equal to a force of one newton per square metre ( $\text{N/m}^2$ ).

### **barchan dune (barkaanduin)**

A moving dune, crescentic in shape, with horns pointing in the direction of wind movement.

**basalt (basalt)**

A dark to medium-dark coloured, commonly extrusive (locally intrusive, as dikes), mafic igneous rock composed chiefly of calcic plagioclase (usually labradorite) and clinopyroxene in a glassy or fine-grained groundmass; the extrusive equivalent of gabbro. Nepheline, olivine, hypersthene and quartz may be present, but not all simultaneously; Nepheline and olivine can occur together, as can olivine and hypersthene and hypersthene and quartz, with other combinations not occurring. Apatite and magnetite are common accessories.

**base course (kroonlaag)**

In roadbuilding, a layer of specified or selected material of planned thickness constructed on the subgrade or subbase for the purpose of serving one or more functions such as distributing load, providing drainage, minimizing frost action, etc.

**base flow (basisvloei)**

The normal stream flow of a river as maintained by groundwater inflow.

**base level of erosion (erosiebasisvlak)**

The theoretical limit toward which erosion constantly tends to reduce the land. Sea level is the general base level, but in the reduction of the land there may be many temporary base levels which, for the time being, the streams cannot reduce. These temporary base levels may be controlled by the level of a lake or river into which the stream flows or by a particularly resistant stratum of rock that the stream has difficulty in removing.

**base line (basislyn)**

A surveyed line on the Earth's surface or in space, whose exact length and position have been accurately determined with more than usual care, and that serves as the origin for computing the distance and relative positions of remote points and objects or that is used as a reference to which surveys are co-ordinated and correlated.

**base map (basiskaart)**

A map showing certain basic data to which other information may be added; used inter alia in soil surveys.

**basement rock (oergesteente; primitiewe gesteente)**

- (1) A complex of undifferentiated rocks that underlies the oldest identifiable rocks in the area.
- (2) The crust of the earth below sedimentary deposits, extending downward to the Mohorovicic discontinuity. In many places the rocks of the complex are igneous and metamorphic and of Precambrian age, but in some places they are Paleozoic, Mesozoic, or even Cenozoic. Syn. basal complex; fundamental complex; basement complex. Cf. geological time scale.

**base saturation percentage (basisversadigingspersentasie)**

The sum of exchangeable Ca, Mg, Na and K ions expressed as a percentage of the total cation exchange capacity at a specified pH. Cf. S-value.

**base status (basisstatus)**

A qualitative expression of base saturation. Cf. base saturation percentage; dystrophic; mesotrophic; eutrophic; S-value.

**basic rock (basiese gesteente)**

A loosely used term for a quartz-free igneous rock, with more than 45% basic oxides (aluminium, iron, calcium, sodium, magnesium, potassium); e.g. basalt, dolerite, norite and gabbro.

**basic slag (slakmeel)**

Ground slag, rich in phosphorous, produced as a by-product of the steel industry.

**basin (bekken)**

- (1) In hydrology, the area drained by a river.
- (2) In irrigation, a level plot or field, surrounded by dikes, which may be flood-irrigated.

**basin irrigation (kombesproeiing)**

See irrigation methods.

**bauxite (bauxiet; bouksiet)**

An off-white, greyish, brown, yellow, or reddish-brown rock composed of a mixture of various hydrous aluminium oxides and aluminium hydroxides (principally gibbsite, some boehmite), and containing impurities in the form of titanium oxide, iron hydroxides, and quartz.

**bearing capacity (dravermoë)**

The load per unit of area which the soil can safely support without excessive yield.

**bed load (vloervrag)**

The part of the total stream load that is moved along the stream bed, such as the larger or heavier particles (boulders, pebbles, gravel) transported by traction or saltation along the bottom; the part of the load that is not continuously in suspension or solution. Also spelled : bedload. Syn. bottom load; traction load.

**bedrock (vaste gesteente)**

A general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.

**beidellite (beidelliet)**

See smectite.

**bench (bank)**

See terrace.

**benchmark soil (verwysingsgrond)**

A soil for which data have been obtained and are used as reference values for various applications.

**benthic (benties)**

Pertaining to plants, animals and other organisms that inhabit the floors of lakes, seas and oceans.

**bentonite (bentoniet)**

A clay deposit largely composed of montmorillonitic clay minerals, produced by the alteration of volcanic ash *in situ*. Cf. smectite.

**bidentate (bidentaant)**

A ligand in which two atoms are bonded to the central atom of a complex. Cf. complex; monodentate.

**binary exchange (binêre uitruiling)**

Refers to an exchange reaction in which only two ions are involved. Cf. quaternary exchange; ternary exchange.

**binding agent (bindmiddel; kitmiddel)**

A mineral cement that is precipitated in the pore space between grains and that holds them together, or a primarily clay matrix that fills the interstices between grains.

**biodegradable (bioafbreekbaar)**

Refers to a substance of which the physical and chemical structure can be significantly broken down by micro-organisms.

**biogeochemistry (biogeochemie)**

The science concerned with the effects of living things on sub-surface geology; or with the distribution and fixation of chemical elements in the biosphere. It is also the study of the chemistry of organic sediments and of the chemical composition of fossils and fossil fuels.

**biological control (biologiese beheer)**

The control of a pest by its natural or introduced enemies.

**biological crust (biologiese kors)**

See soil crust.

**biological oxygen demand (BOD) (biologiese suurstofbehoefte (BSB))**

A measurement of the amount of organic pollution in water, measured as the amount of oxygen taken up from a sample containing a known amount of oxygen and kept at 20°C for 5 days. A low BOD indicates little pollution, while a high BOD indicates increased activity of heterotrophic microorganisms and thus heavy pollution.

**biomass (biomassa)**

- (1) The amount of living organisms in a particular area, stated in terms of the mass or volume of organisms per unit area or volume of the environment.
- (2) The mass of biologically derived material; it may be subdivided into living biomass and dead biomass.

**biome (bloom)**

A biome is a large, easily recognizable community unit formed by the interaction of regional climates with dominant regional biota and substrates. Its extent, in general, coincides with a distinctive type of soil. For example, the climax vegetation of the grassland biome is grass, although the dominant species of grass may vary in different parts of the biome.

**biosphere (biosfeer)**

- (1) The entire area occupied by living organisms, or favourable for their occupation. It includes parts of the lithosphere, pedosphere, hydrosphere, and atmosphere. Cf. ecosphere.
- (2) All living organisms of the earth and its atmosphere.

**biosequence (soil) (bioreeks (grond))**

A sequence of related soils that differ, one from the other, primarily because of differences in kinds and numbers of organisms as a soil-forming factor.

**biota (biota)**

A general term denoting all living matter.

**biotic (bioties)**

Of or pertaining to life or the mode of living of plants and animals collectively.

**biotic factor (biotiese faktor)**

In ecology, those environmental factors, distinct from physical and chemical factors, which are the result of living organisms and their activities, such as competition and predation.

**biotite (biotiet)**

See mica.

**biotope (biotoop)**

- (1) In ecology, an area of uniform ecology and biological adaption. The habitat, or physical basis, of a uniform community of animals and plants adapted to its environmental conditions under which the existence of a given biocoenosis is possible. It is more or less ephemeral and at any moment it is circumscribed by a boundary that is subject to expansion, contraction, or other shift in position.
- (2) An association of organisms characteristic of a particular geographic area.

**bioturbation (bioturbasie)**

Mixing (turbation) of soil by organisms (biota).

**biotype (biotipe)**

A group of individuals occurring in nature, all with essentially the same genetic constitution. A species usually consists of many biotypes. Cf. habitat.

**bird guano (voëlgvano)**

See guano.

**birnessite (birnessiet)**

A manganese oxide with composition  $MnO_{1,8}$ .

**Black Earth (Swartaarde)**

A term used by some as synonymous with Chernozem, by others (e.g. in Australia) to describe self-mulching black clays. Cf. turf.

**bleicherde (bleicherde; bleekaarde)**

The light-coloured A2 horizon of Podzol soils.

**blocky structure (blokstruktuur)**

See soil structure.

**boehmite (boehmiet)**

A greyish, brownish, or reddish orthorhombic mineral :  $\gamma$ -AlO(OH). It is a major constituent of some bauxites and it represents the gamma phase dimorphous with diaspore. Syn. böhmite.

**bog (moeras)**

See marsh; swamp.

**bog iron ore (moerasystererts)**

Impure ferruginous deposits developed in bogs or swamps by the chemical or biochemical oxidation of iron carried in solution.

**Bog Soil (Moerasgrond; Veengrond)**

A great soil group of the intrazonal order and hydromorphic suborder. Includes muck and peat.

**border-strip irrigation (randstrookbesproeiing)**

See irrigation methods.

**bottomland (laagland)**

See flood plain.

**boulder (rotsblok)**

A large individual fragment of rock, exceeding 200 mm (British Standards Inst.), or 256 mm (U.S. Wentworth Scale) in diameter.

**boulder clay (gletserkeileem)**

Unsorted, unstratified sediment carried or deposited directly by or under a glacier.

**brack (brak)**

Slightly salty, applied to water with a salt content that is intermediate between that of freshwater and seawater. Cf. salt-affected soil.

**brack soil (brakgrond)**

See salt-affected soil.

**breccia (breksie)**

A coarse-grained clastic rock composed of angular rock fragments. It differs from a conglomerate in that the fragments have sharp edges and unworn corners.

**broadcast application (breedwerpige toediening)**

The distribution of a fertilizer (or other chemical) over an entire area.

**brookite (brookiet)**

TiO<sub>2</sub>, orthorhombic, brown or reddish crystals. Trimorphous with rutile, anatase.

**Brown Earth (Bruinaarde)**

Soils with a mull horizon but having no horizon of accumulation of clay or sesquioxides. (Generally used as a synonym for "Brown Forest Soils" and sometimes for similar acid soils.)

**Brown Forest Soil (Bruin Woudgrond)**

A great soil group of the intrazonal order and calcimorphic suborder formed on calcium rich parent materials under deciduous forest and possessing a high base status but lacking a pronounced illuvial horizon. (A much narrower group than the European Brown Forest soil or Braunerde.)

**Brown Podzolic Soil (Bruin Podzoliese Grond)**

A zonal great soil group similar to Podzols but lacking the distinct A2 horizon characteristic of the Podzol group. (Some American soil taxonomists prefer to class this soil as a kind of Podzol and not as a distinct great soil group.)

**Brown Soil (Bruingrond)**

A great soil group of the temperate to cool arid regions, composed of soils with a brown surface and a light-coloured transitional subsurface horizon over an accumulation of calcium carbonate.

**brucite (brusiet)**

A hexagonal mineral :  $Mg(OH)_2$ . It commonly occurs in thin pearly folia and in fibrous form, as in serpentines and impure limestones.

**Brunizem (Brunizem)**

A zonal great soil group consisting of soils formed under temperate to cool-temperature, humid regions under tall grass. Syn. Prairie Soil.

**brushite (brushiet)**

Dicalciumphosphate dihydrate,  $CaHPO_4 \cdot 2H_2O$ .

**bubbling pressure (air-entry pressure) (lugintreedruk)**

See air-entry value.

**buffer (soil) (buffer (grond))**

A substance that acts chemically to resist changes in pH. The buffering action in soil is due mainly to clay and very fine organic matter. Highly weathered tropical clays are less active buffers than most less weathered silicate clays. Thus, with the same pH, more lime is required to neutralize (i) a clayey soil than a sandy soil, (ii) a soil rich in organic matter than one low in organic matter, or (iii) a soil with a high cation exchange capacity than one with a low cation exchange capacity.

**buffer capacity (buffervermoë)**

The ability of soil to resist an induced change in pH. Cf. amorphous compound.

**bulk density (brutodigtheid; matriksdigtheid)**

The mass of dry soil per unit bulk volume. The bulk volume is determined before drying to constant mass at 105°C. Values range roughly from 1000-1800 kg m<sup>-3</sup>, although higher values may be found in compacted soils.



**bulk volume (brutovolume; matriksvolume)**

The volume, including the solids and the pores, of an arbitrary soil mass.

**buried soil (begraafde grond)**

Soil covered by an alluvial, loessal, or other deposit. Cf. paleosol.

**butte (spitskop)**

A prominent, isolated, cliffed, erosional remnant in dry regions, usually bounded by talus slopes; often turret-shaped.

**bypass flow (voorkeurvloei)**

See preferential flow.

## C

**C horizon (C-horison)**

See soil horizon.

**cadastral (kadastraal)**

Delineating or recording property boundaries, sometimes subdivision lines, buildings, and other details. Etymol. French cadastre, an official register of the real property of a political subdivision with details of area, ownership and value, and used in apportioning taxes.

**Cainozoic (Kainosoïkum)**

Syn. Cenozoic. See geological time scale.

**calcan (kalkaan)**

See micromorphology.

**calcarenite (kalkareniet)**

Limestone consisting predominantly of detrital calcite particles of sand size. Consolidated calcareous sand.

**calcareous crust (kalkkors; kalkreet)**

An indurated layer cemented by calcium carbonate. Cf. caliche; hardpan; diagnostic horizon: petrocalcic horizon.

**calcareous soil (kalkgrond; kalkryke grond)**

A soil with sufficient calcium carbonate or calcium-magnesium carbonate to effervesce visibly when treated with cold dilute hydrochloric acid.

**calcic horizon (kalsiese horison)**

See diagnostic horizon.

**calcicole (kalkliefhebbend)**

Any plant that thrives on lime-rich soils. Cf. calciphyte.

**calcification (verkalking)**

- (1) Deposition of calcium salts in living tissue.
- (2) Replacement of organic material by calcium salts (esp.  $\text{CaCO}_3$ ) in fossilization.
- (3) See calcification, soil.

**calcification, soil (verkalking, grond-)**

The process or processes of soil formation in which the surface soil is kept supplied with calcium, or the process of accumulation of calcium in some horizon of the soil profile.

**calcifuge (asidofiet; suurverdraend)**

Any plant that thrives in acid soils. Cf. acidophyte.

**calcination (kalsinering)**

The heating of a substance to its temperature of dissociation, e.g. of limestone to CaO and CO<sub>2</sub> or of gypsum to lose its water of crystallization. Cf. calcined clay.

**calcined clay (gekalsineerde klei)**

Clay minerals, such as montmorillonite and attapulgite, that have been fired at high temperatures to obtain absorbent, stable, granular particles; generally used as amendments in soil modification. Cf. calcination.

**calciphyte (kalsifiet)**

A plant that requires or tolerates rather large amounts of calcium or is associated with soils rich in calcium. Syn. calcicole.

**Calcisol (Kalsisol)**

See soil classification.

**calcite (kalsiet)**

A common rock-forming mineral : CaCO<sub>3</sub>. Calcite is usually white, colourless, or pale shades of grey, yellow, and blue; it has perfect rhombohedral cleavage, a vitreous lustre, a hardness of 3 on Mohs' scale, and it readily effervesces in cold dilute hydrochloric acid. It is the principal constituent of limestone; calcite also occurs in crystalline form in marble, loose and earthy in chalk, spongy in tufa, and stalactitic in cave deposits. It is commonly found as the cementing medium in clastic sedimentary rocks; it is also a minor secondary constituent in many igneous rocks. Calcite crystallizes in a great variety of forms, such as nailhead spar, dogtooth spar, and iceland spar. Cf. dolomite. Syn. calcespar.

**calcium feldspar (kalsiumveldspaat)**

See feldspar group of minerals.

**calcrete (kalkreet)**

See hardpan; calcareous crust.

**caliche (caliche)**

- (1) A soil layer near the surface, more or less cemented by secondary carbonates of calcium and/or magnesium precipitated from the soil solution. It may occur as a soft, thin soil layer, as a hard, thick bed just beneath the solum, or as a surface layer exposed by erosion. Not a geologic deposit. Cf. calcrete; hardpan.
- (2) Alluvium cemented with sodium nitrate, chloride, and/or other soluble salts in the nitrate deposits of Chile and Peru. Cf. hardpan; Chile-salpetre.

**California bearing ratio (CBR) (Kaliforniese dravermoë (KDV))**

A measure of the relative resistance of a soil to penetration under controlled conditions of density and water content. It is the ratio of the load required for the penetration of a standard rod or piston to a specified depth (usually 2,5 mm or 5,0 mm) into a soil sample (or soil *in situ*), to the load required for corresponding penetration of a standard material (crushed-rock base material) whose resistance under standardized conditions is well established. The CBR is expressed as a percentage.

**cambic B horizon (obsolete) (kambiese B-horison (verouderd))**

See diagnostic horizon.

**cambic horizon (kambiese horison)**

See diagnostic horizon.

**Cambisol (Kambisol)**

See soil classification.

**Cambrian (Kambrium)**

See geological time scale.

**canal (kanaal)**

A constructed open channel for transporting water from the source of supply to the point of distribution.

**canyon (canyon; ravyn)**

A deep, steep-sided gorge with a river at the bottom; mainly found in arid or semi-arid areas, where a rapidly eroding river flows.

**capability, land (landvermoë)**

See land capability.

**capillarity (kapillariteit)**

- (1) The degree to which a material or object containing minute openings or passages, when immersed in a liquid, will draw the surface of the liquid above the level of zero hydrostatic pressure. Unless otherwise defined, the liquid is generally assumed to be water.
- (2) The phenomenon by which water is held in interstices above the normal level of zero hydrostatic pressure, due to attraction of the molecules in the walls of an interstice for the molecules of the water as well as the attraction of the molecules of water for one another.

**capillary conductivity (kapillêre geleivermoë)**

See soil water : hydraulic conductivity.

**capillary flow (kapillêre vloei)**

See soil water : unsaturated flow.

**capillary fringe (kapillêre grenssone)**

A zone just above the plane of zero hydrostatic pressure that remains saturated or nearly saturated. The extent can be inferred from the retentivity curve and air-entry pressure. Syn. zone of capillarity; capillary moisture zone; capillary zone.

**capillary potential (kapillêre potensiaal)**

See soil water : matric potential.

**capillary pressure (kapillêre druk)**

See soil water : matric pressure.

**capillary water (obsolete) (kapillêre water (verouderd))**

The water held in the "capillary" or small pores of a soil, usually with a negative pressure of less than -6 kPa.

**capillary zone (kapillêre gebied; -sone)**

The zone in which soil water is held by capillary forces. The interstices may be completely filled (saturation zone) or partly filled (aeration zone). Liquid pressures within this zone are less than atmospheric. Cf. capillary fringe.

**carbon-14 dating (koolstof-14 datering)**

See radiocarbon dating.

**carbonaceous (koolstofhoudend)**

Pertaining to or containing carbon derived from plant and animal residues.

**carbon cycle (koolstofsiklus)**

The sequence of transformations whereby carbon dioxide is fixed in living organisms by photosynthesis or by chemosynthesis, liberated by respiration and by the death and decomposition of the fixing organism, used by heterotrophic species, and ultimately returned to its original state.

**Carboniferous (Karboon)**

See geological time scale.

**carbon-nitrogen ratio (koolstof-stikstofverhouding)**

The ratio of the mass of organic carbon to the mass of total nitrogen (inorganic plus organic forms) in soil or organic matter.

**carrier (draer)**

A component of the cell membrane which can form a complex with ions outside the membrane, the complex being able to traverse the membrane and release the ion, which cannot traverse the membrane while not combined with the carrier, to the inner cell space.

**carrier mechanism (draer-meganisme)**

A mechanism of ion uptake and transport across membranes, impermeable to the ions, and based on the existence of carriers. Cf. carrier.

**carrying capacity (drakrag; draervermoë)**

The maximum number of animals an area can support during a specified period of time. Cf. grazing capacity.

**cast (uitwerpsel)**

In soil biology, something that is cast out or off, such as an earthworm cast or a faecal pellet.

**cataphoresis (kataforese)**

Electrophoresis in which the movement of suspended positive particles in a fluid is toward the cathode.

**catchment (opvanggebied)**

The specified area from which runoff water flows into a stream/streams or basin. Cf. watershed.

**category, soil (kategorie, grond-)**

See soil category.

**catena (katena)**

A sequence of soils of about the same age and derived from similar parent material. These soils occur under similar macroclimatic conditions, but have different characteristics due only to variation in topography and drainage. Cf. soil association.

**cation (katioon)**

A positively charged ion, for example  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{K}^+$ ,  $\text{Na}^+$ ,  $\text{H}^+$ ,  $\text{Al}^{3+}$ ,  $\text{NH}_4^+$ , and  $\text{H}_3\text{O}^+$ . The term exchangeable metal cations ordinarily refers to calcium, magnesium, potassium and sodium. Cf. cation exchange capacity; anion.

**cation exchange (katioonuitruiling)**

The interchange between a cation in solution and another cation adsorbed on the surface of any surface-active material such as clay colloid or organic colloid. Cf. binary exchange; exchange constant; selectivity coefficient.

**cation exchange capacity (CEC) (katioonuitruilkapasiteit (KUK))**

The sum total of exchangeable cations that a soil can adsorb. This soil property is due to the negative electrical charge of the colloidal (both inorganic and organic) fraction of most soils. The negative charge is balanced by adsorbed cations so that the soil system as a whole is electrically neutral. The balancing cations represent a definite quantity referred to as the cation exchange capacity (CEC). The CEC is expressed in  $\text{cmol}_c/\text{kg}$  soil or  $\text{cmol}_c/\text{kg}$  clay (previously in milli-equivalents/100 g soil or clay; sometimes expressed as  $\text{cmol}(+)/\text{kg}$  or  $\text{cmol}(-)/\text{kg}$ ). The CEC is dependent on pH (usually CEC increases with pH) due to the release of protons from functional groups on the surfaces of organic matter, clay minerals and amorphous compounds. Cf. anion exchange capacity; base saturation percentage; S-value; T-value.

**cemented (gesementeer; verkit)**

Indurated; refers to an indurated soil material in which the individual particles are held together by cementing substances such as humus, calcium carbonate, or the oxides of silicon, iron, and aluminium. The material has a hard, brittle consistence which persists even when wet. Cf. nodule; fragipan; hardpan; induration.

**cementing agent (kitmiddel; bindmiddel)**

See binding agent.

**Cenozoic (Senosoïkum)**

See geological time scale.

**centre-pivot irrigation (spilpuntbesproeiing)**

See irrigation methods.

**chalcedony (chalcedoon)**

A cryptocrystalline variety of quartz. Commonly microscopically fibrous, translucent or semitransparent, a uniform tint, and white pale blue, gray brown or black colour. It has a lower density and lower indices of refraction than quartz. Syn. chalcedonite.

**chalk (kryt; mergel)**

A very soft usually white to light grey or buff porous, fine-textured limestone of marine origin. Composed mainly of the calcareous shells of various marine micro-organisms,

but whose matrix consists of fine particles of calcium carbonate, some of which may have been chemically precipitated. Cf. marl.

**chamber (kamer)**

See micromorphology.

**channel (kanaal)**

See micromorphology.

**characteristic curve (waterretensiekromme)**

See soil water: retentivity curve.

**check-basin irrigation (ruitkombesproeiing)**

See irrigation methods.

**chelate (chelaat)**

See chelation.

**chelation (chelaatvorming)**

A chemical process involving the formation of a heterocyclic ring compound which contains at least one metal cation (or hydrogen ion) in the ring. Cf. complex.

**cheluviation (cheluviasie)**

A term derived from the combination of chelation and eluviation; the removal of iron and aluminium as organic complexes (chelates) from the profile by acid percolating water (eluviation).

**Chernozem (Chernozem)**

A zonal great soil group consisting of soils with a thick, nearly black or black, organic matter-rich A horizon rich in exchangeable calcium, underlain by a lighter coloured transitional horizon above a zone of calcium carbonate accumulation; occurs in a cool subhumid climate under a vegetation of tall and midgrass prairie.

**chert (chert)**

A hard, extremely compact, dull to semivitreous cryptocrystalline rock, consisting dominantly of cryptocrystalline silica. See coarse fragments.

**Chestnut Soil (Kastaiingbruingrond)**

A zonal great soil group consisting of soils with a moderately thick, dark-brown A horizon over a lighter coloured horizon that is above a zone of calcium carbonate accumulation.

**Chile saltpetre (Chili-salpeter)**

A fertilizer containing mainly sodium nitrate, from Chilean origin; in earlier years the main nitrogen fertilizer. Cf. caliche.

**china clay (porseleinaarde)**

A commercial term for kaolin obtained from china clay rock after washing and suitable for use in the manufacture of chinaware. Sometimes spelled China clay.

**chisel plough (beitelploeg)**

A tillage implement used to shatter or loosen hard, compact layers, usually in the subsoil, to depths below normal plough depth. Cf. subsoiling; tillage systems.

**chlorite (chloriet)**

A clay mineral with structure similar to the smectites, but having an octahedral brucite or gibbsite layer situated between the 2:1 unit layers. It has negligible swelling properties.

**chlorosis (chlorose)**

A condition in plants resulting from a reduction of chlorophyll synthesis caused by a deficiency of an essential nutrient or other physiological disorder. Leaves of chlorotic plants range from light green through yellow to almost white.

**chroma (chroma)**

The relative purity, strength, or saturation of a colour, directly related to the dominance of the determining wavelength of the light and inversely related to greyness; one of the three variables of colour. Cf. soil colour; hue; value.

**chronosequence (chronoreeks)**

Two or more related soils that differ one from the other, in certain properties, primarily as a result of time as a soil-forming factor.

**class, soil (grondklas)**

See soil classification.

**classification, soil (grondklassifikasie)**

See soil classification.

**clast (klast)**

An individual constituent, grain or fragment of a sediment or sedimentary rock produced by the physical disintegration of a large rock mass.

**clastic (klasties)**

A term applied to rocks or sediments composed principally of fragmental material derived from pre-existing rocks.

**clay (klei)**

- (1) A soil separate consisting of particles < 0,002 mm in equivalent diameter; clay minerals, quartz and primary minerals may be found in this separate.
- (2) A soil texture class. See soil texture.
- (3) In engineering, a fine-grained soil that has a high plasticity index in relation to the liquid limit.

**clay domain (kleidomein)**

A group of clay crystals which are orientated and sufficiently close together for a group to behave in water as a single unit.

**clayey (kleierig)**

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



**clay film (kleifilm)**

A thin coating of well-oriented clay particles on the surface of a soil aggregate, particle, or pore. Syn. clay skin; cutan.

**clay-humus complex (klei-humus kompleks)**

Associations of clay particles and humus or humic compounds, mainly through the mechanisms of polyvalent cation bonding, ligand exchange and London or van der Waals forces. Much of the humus in soil can be associated with clay in this way. The complex usually carries a net negative charge. Cf. exchange complex.

**clay loam (kleileem)**

See soil texture.

**clay mineral (kleimineraal)**

A naturally occurring crystalline compound of aluminium and silicon < 0,002 mm in equivalent diameter. The term is often used in a more general sense in relation to soil and sediments for a wide variety of crystalline and cryptocrystalline, clay-size inorganic materials, *inter alia* kaolinite, mica, the smectites, vermiculite, interstratified clay minerals, chlorite, amorphous compounds (of Fe, Al, Si) and the following crystalline oxides : gibbsite  $\text{Al}(\text{OH})_3$ ; diaspore  $\alpha\text{-AlOOH}$ ; boehmite  $\gamma\text{-AlOOH}$ ; goethite  $\alpha\text{-FeOOH}$ ; lepidocrocite  $\gamma\text{-FeOOH}$ ; hematite  $\alpha\text{-Fe}_2\text{O}_3$ ; maghemite  $\gamma\text{-Fe}_2\text{O}_3$ ; quartz  $\text{SiO}_2$ .

**claypan (kleibank)**

A horizon or layer that is considerably less permeable and more clayey than the material overlying it. Examples are the B horizons of duplex soils.

**clay skin (kleihuid)**

See cutan; clay film.

**clean tillage (skoonbewerking)**

See tillage systems.

**cleavage (splyting)**

The splitting or tendency of minerals to split along crystallographic planes. As applied to rocks, it is the property of splitting into thin parallel sheets which may be highly inclined to the bedding planes, as in slate and shale.

**climax (klimaks)**

A plant community of the most advanced type capable of development under and in dynamic equilibrium with the prevailing environment.

**climosequence (klimaatreeks)**

A sequence of related soils which differ from one another in certain properties primarily as a result of the effect of climate as a soil-forming factor.

**clod (kluit)**

A compact, coherent mass of soil ranging in size from 5 to 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.

**coagulate (koaguleer)**

The coalescence of particles in a suspension resulting in their settling out; often induced by polyvalent ions, or by increasing the salt content.

**coarse fragments (growwe brokstukke)**

Rock or mineral particles > 2,0 mm in diameter. The following names are used for coarse fragments in soils (Soil Survey Staff, 1951):

Fragments*		Descriptive terms applied to fragments that have:		
Shape	Material	Diameters < 75 mm	Diameters 75-250 mm	Diameters > 250 mm
rounded or subrounded	all kinds of rock	gravelly	cobbly	stone**
irregular and angular	(1) chert (2) other than chert	cherty angular gravelly	coarse cherty angular cobbly	stony stony
		Lengths < 150 mm	Lengths 150 - 375 mm	Lengths > 375 mm
thin and flat	(1) limestone sandstone or schist (2) slate (3) shale	channery  slaty shaly	flaggy  flaggy flaggy	stony  stony stony

\* The adjectives describing fragments are also applied to lands and soils when they have significant amounts of such fragments.

\*\* "bouldery" is sometimes used when stones are larger than 600 mm.

**coarse sand (grofsand)**

See soil separates; soil texture.

**coarse sand class (grofsandklas)**

See soil texture.

**coarse sandy loam (grofsandleem)**

See soil texture.

**coarse texture (growwe tekstuur)**

The texture exhibited by sands, loamy sands and sandy loams; a soil containing large quantities of these textural classes. Cf. fine texture; medium texture; soil texture.

**cobble (cobblestone) (keisteen; ronde klip)**

See cobblestone.

**cobblestone (keisteen)**

**Rounded or partially rounded rock or mineral fragments between 75 and 250 mm in diameter. Cf. coarse fragments.**

**coefficient of linear extensibility (cole) (koëffisiënt van lineêre uitsetting)**

The ratio of the difference between the wet (-33 kPa water potential) length and the dry length of a clod, to its dry length.

**coherent soil (saamklewende grond)**

See soil structure.

**cohesion (kohesie)**

The attraction of a substance for itself; the mutual attraction among molecules or particles comprising a substance that allows it to cling together as a continuous mass.

**cohesive soil (kohesiegrond; saamklewende grond)**

Said of a soil that has relatively high shear strength when air-dried, and sticky when wet, e.g. a clayey soil.

**COLE (koëffisiënt van lineêre uitsetting)**

See coefficient of linear extensibility.

**coliform (kolivorm)**

A group of bacteria used as an indicator of sanitary quality in water. The total coliform group is an indicator of sanitary significance, because the organisms are normally present in large numbers in the intestinal tracts of humans and warm-blooded animals.

**collapsible soil (swiggrond)**

A soil with a low shear strength and thus with a tendency to collapse under applied pressure. Also a soil with a high content of swelling clay(s). Cf. smectite; swelling clay.

**Collembola (Kollembole (Collembola))**

The Collembola (soil fleas or springtails) is the most common soil-living insect order. It is one of the wingless insect orders. Some live in the deeper soil layers, but most types are found in the organic matter layer. The latter group have well-developed springtails. The Collembola feed on many various types of organic debris, e.g. dead and decomposing plant and animal material.

**collimating mark (kollimasiemerk)**

See fiducial mark.

**colloid (kolloïed)**

- (1) A substance in a state of fine subdivision with particles from about 0,0005 to 0,000001 mm equivalent diameter; when apparently dissolved in water, it diffuses very slowly or not at all through a semi-permeable membrane and usually has little effect on freezing point, boiling point, or osmotic pressure of the solution.
- (2) The term is used with reference to matter, both inorganic and organic, having very small particle size and a correspondingly high surface area per unit of mass. Many mineral colloids are crystalline. Etymol. Greek *kolla*, glue.

**colluvial soil (kolluviale grond)**

A soil developed on colluvium as parent material. Cf. colluvium.

**colluvium (kolluvium)**

An unconsolidated deposit of rock fragments and soil material accumulated at the base of slopes primarily as a result of gravitational action and to a lesser extent as a result of front action and local runoff. Cf. soil creep.

**colour, soil (kleur, grond-)**

See soil colour.

**columnar structure (suilstruktuur; kolom-)**

See soil structure.

**compaction (verdigting)**

A reduction in soil bulk volume (increase in bulk density and reduction of porosity) resulting from an applied force, such as that due to machinery and animals. Cf. soil compaction.

**compaction test (verdigtingstoets)**

A laboratory compacting procedure whereby a soil at a known water content is placed in a specified manner into a mould of given dimensions, subjected to a compaction effort of controlled magnitude, and the resulting bulk density determined. The procedure is repeated for various water contents sufficient to establish a relation between water content and bulk density.

**competition (ions) (kompetisie (ione))**

Refers to the effect of a particular plant nutrient ion on another with related chemical properties in the process of nutrient uptake by plants, as for example the effect of nitrate on phosphate uptake.

**complementary-ion effect (komplementêre ioon-effek)**

The exchangeability of a particular adsorbed ion is determined, amongst others, by the nature of the other exchangeable ions, i.e. the complementary ions, in the exchanger phase. In general the exchangeability of an ion decreases as the complementary ions are less strongly adsorbed. The same principle plays a role in the availability of exchangeable cations for plant uptake.

**complex (kompleks)**

In chemistry, a complex consists of a central group (such as an ion) in close association with other atoms or molecules. The latter are termed ligands. If two or more functional groups of a single ligand are coordinated to a metal cation in a complex, the complex is termed a chelate. Cf. inner-sphere complex; outer-sphere complex.

**complex, soil (kompleks, grond-)**

See soil complex.

**compost (kompos)**

Organic residues, or a mixture of organic residues and soil, that have been piled, wetted, and allowed to undergo biological decomposition. Mineral fertilizers are sometimes added. Used as a soil ameliorant and fertilizer.

**compressibility (saamdrukbaarheid)**

The ratio of the relative volume decrease to the corresponding increase in pressure of a soil undergoing compression. Compressibility is also the reciprocal of the bulk modulus.

**compression (saamdrukking)**

A system of forces or stresses that tends to decrease the volume of, or compact a soil, or the change of volume produced by such a system of forces.

**compressive strength (saamdruksterkte)**

The maximum compressive stress that can be applied to a soil, under given conditions, before failure occurs.

**compressive stress (drukspanning)**

The ratio of force applied to area, for a soil subjected to compression.

**concordant (konkordant)**

Applied to an igneous intrusion that has been emplaced parallel with the structure (bedding, foliation, etc.) of the invaded country rock. Sills are examples of concordant intrusions.

**concretion (konkresie)**

A nodule made up of concentric accretions. See nodule.

**conductance (konduktansie)**

- (1) The reciprocal of (electrical) resistance.
- (2) Hydraulic conductance is a term sometimes used when referring to hydraulic conductivity. Cf. soil water: hydraulic conductivity.

**conduction (geleiding)**

The transmission of energy through materials or of fluids through pipes or porous media. Cf. conductance; conductivity.

**conductivity (konduktiwiteit; geleivermoë)**

- (1) Also termed specific conductance, it is the conductance of a homogeneous unit cube of material. In general the conductivity is given by  $\lambda = L/RA$ , in which R is the resistance of a conductor of length L and cross-sectional area A. The SI unit of conductivity is S/m.  
(Note : 100 mS/m = 1 millimho/cm.)
- (2) A measure of the ability of a material to conduct electricity, water, gases etc.
- (3) See soil water : hydraulic conductivity.
- (4) See electrical conductivity.

**conformable (konkordant)**

Applied to a sequence of strata deposited in an apparently continuous succession. Not the same as concordant. Cf. concordant.

**conglomerate (konglomeraat)**

A rock composed of rounded, waterworn pebbles, cemented in a matrix of sand, silt, clay, calcium carbonate, silica, iron oxide or mixtures of these. Cf. agglomerate; breccia.

**conservation (bewaring)**

The protection or improvement and use of natural resources according to principles that will assure their highest economic or social benefit, for some specified purpose.

conservation tillage (bewaringsbewerking)

A collective term for systems in which the soil is cultivated in such a way that ridges may form but crop residues and clods remain on the surface of the soil. Cf. tillage systems.

consistence, soil (konsistensie, grond-)

See soil consistence.

consociation (soil map unit) (konsosiasie (grondkaartenheid))

A soil map unit indicating an area that is occupied by a single taxonomic unit only.

consolidation, soil (konsolidasie, grond-)

Gradual or slow reduction in volume and increase in bulk density of a soil mass in response to increased load or compressive stress. Cf. compaction.

consumer (verbruiker)

A heterotrophic organism, mainly of the animal kingdom, that ingests other organisms or particulate organic matter.

consumptive water use (totale waterverbruik)

The water used by plants in transpiration and growth, plus water loss from adjacent soil or from intercepted precipitation in any specified time.

contact exchange (kontakuitruiling)

The process whereby ions on different exchanger surfaces exchange directly through the overlap of the respective diffuse double layers.

contour line (kontoerlyn)

A line connecting points of equal elevation on a map.

control (kontrole)

In research, an untreated or standard treatment of some variable, which is used as a basis for comparison against the results of other treatments.

controlled mosaic (gekontroleerde mosaïek)

See mosaic (photo); mosaic, controlled; mosaic, uncontrolled.

conversion factors (omrekeningsfaktore)

*Concentration*

me/100 g	=	cmol (+ or - charge) kg <sup>-1</sup> or cmol <sub>c</sub> /kg
me/100 g	=	(mg/kg (ppm))/(equivalent mass x 10)
1 me Ca <sup>2+</sup> /100 g	=	200,4 ppm = 5 mmol/kg = 401 kg/ha/150 mm (BD = 1 333 kg/m <sup>3</sup> , or 1,333 g/cm <sup>3</sup> )
1 me Mg <sup>2+</sup> /100 g	=	121,5 ppm = 5 mmol/kg
	=	243 kg/ha per 150 mm depth
1 me Na <sup>+</sup> /100 g	=	230 ppm = 10 mmol/kg
	=	460 kg/ha per 150 mm depth

1 me K <sup>+</sup> /100 g	=	391 ppm = 10 mmol/kg
	=	782 kg/ha per 150 mm depth
1 ppm P	=	2,0 kg/ha per 150 mm depth
1 me Ca <sup>2+</sup> /l	=	20,0 ppm = 0,5 mmol/dm <sup>3</sup> (1 dm <sup>3</sup> = 1l)
1 me Mg <sup>2+</sup> /l	=	12,2 ppm = 0,5 mmol/dm <sup>3</sup>
1 me Na <sup>+</sup> /l	=	23,0 ppm = 1,0 mmol/dm <sup>3</sup>
1 me K <sup>+</sup> /l	=	39,1 ppm = 1,0 mmol/dm <sup>3</sup>
1 me HCO <sub>3</sub> <sup>-</sup> /l	=	61,0 ppm = 1,0 mmol/dm <sup>3</sup>
1 me CO <sub>3</sub> <sup>=</sup> /l	=	30,0 ppm = 0,5 mmol/dm <sup>3</sup>
1 me SO <sub>4</sub> <sup>=</sup> /l	=	48,0 ppm = 0,5 mmol/dm <sup>3</sup>
1 me Cl <sup>-</sup> /l	=	35,4 ppm = 1,0 mmol/dm <sup>3</sup>

*Electrical conductivity*

$$1 \text{ mS/m} = 1 \text{ mmho/m} = 0,01 \text{ mmho/cm} = 10 \text{ }\mu\text{mho/cm}$$

*Pressure*

$$1 \text{ kPa} = 0,01 \text{ bar} = 0,00987 \text{ atm} = 0,145 \text{ lb/in}^2$$

$$= 0,102 \text{ m head of water}$$

*Miscellaneous*

1% organic carbon = 1,72% organic matter (approximately)

Area (ha) per cm<sup>2</sup> on a map = (map scale)<sup>2</sup>/10<sup>8</sup>

1 ha soil 150 mm deep has mass 2 x 10<sup>6</sup> kg at bulk density

1 333 kg/m<sup>3</sup> or 1,333 g/cm<sup>3</sup>.

**co-ordination number (koördinasiegetal)**

The number of ions that can be packed around a central ion, which depends on the ratio of radii of the two ions. In clay minerals the Si<sup>4+</sup> cation occurs in fourfold or tetrahedral co-ordination and Al<sup>3+</sup> usually in sixfold or octahedral co-ordination and sometimes in tetrahedral co-ordination.

**correlation (korrelasie)**

See soil correlation.

**corrugation irrigation (riffelbesproeiing)**

See irrigation methods.

**counter ions (teenione)**

The surface accumulation of ions of opposite charge on the surface of a particle carrying a net positive or negative charge. Also termed gegenions (from German literature).

**covariant properties (kovariërende eienskappe)**

Certain properties vary consistently with one another and hence it is unnecessary to specify all such covariant properties in the definition of a class (e.g. a soil series) - one is sufficient and the others apply automatically; e.g. a horizon with free lime automatically has a pH value above 7 and an exchange complex fully saturated with metal cations.

**coverage (photo) (fotodekking)**

Aerial photographs taken with sufficient overlap to permit stereoscopic examination in the overlap area, usually 60% in line of flight and 30% in adjoining flights.

**cover crop (dekgewas)**

A close-growing crop grown primarily for the purpose of protecting and improving soil between periods of regular crop production, or in orchards and vineyards.

**cradle knoll (hobbel)**

A small knoll formed by earth that is raised and left when a tree is uprooted (a microrelief term).

**creep (kruip)**

See soil creep.

**Cretaceous (Kryt)**

See geological time scale

**critical hydraulic gradient (kritiese hidrouliese gradiënt)**

In a cohesionless soil, that hydraulic gradient at which matric pressure is reduced to zero by the upward flow of water.

**critical slope (kritiese helling)**

- (1) In hydraulics, that slope that will sustain a given discharge at uniform, critical depth in a given channel.
- (2) In soils, see angle of repose.

**crotovine (krotovien; krotovina)**

A former animal burrow in a soil horizon that has been filled with organic matter or material from another horizon, or with material from the same horizon but with an altered structure. Also known as a pedotubule; also spelled krotovina or crotovina.

**crumb (krummel)**

A soft, porous, more or less rounded ped from one to five millimetres in diameter. See soil structure.

**crust (kors)**

See soil crust.

**crust (earth) (aardkors)**

The thin outermost solid layer of the Earth. It varies in thickness from approximately 5 km beneath the oceans to approximately 60 km beneath mountain chains. Cf. mantle; soil.

**cryic (kriogenies)**

See soil temperature.

**Cryosol (Kriosol)**

See soil classification.

**cryptocrystalline (kriptokristallyn)**

Crystalline, but so fine-grained that the individual components cannot be seen with an ordinary microscope.

**crystal (kristal)**



**A homogeneous inorganic substance of definite chemical composition bounded by plane surfaces that form definite angles with each other, thus giving the substance a regular geometrical form. Cf. soil mineral.**

**crystal lattice (kristaltralie)**

**The three-dimensional, regularly repeating atomic arrangement of a crystal, each point of which has identical surroundings. The lattice is built by the regular, parallel translations in space of the unit cell. There are fourteen possible lattice patterns.**

**crystalline rock (kristallyne gesteente)**

**A rock consisting of various minerals that have crystallized in place from magma. Cf. igneous rock.**

**crystallographic axis (kristallografiese as)**

**One of three (four in a hexagonal crystal) imaginary lines in a crystal that pass through its centre; it is used as a reference in describing crystal structure and symmetry. One or all of the crystallographic axes may coincide with axes of symmetry. Syn. crystal axis.**

**crystal structure (kristalstruktuur)**

**The regular, orderly, and repeated arrangement of atoms in a crystal, described by the crystal lattice or space lattice. Syn. crystalline structure.**

**crystal system (kristalsisteam)**

**One of six groups or classifications of a crystal according to the symmetry of its crystal faces, and having characteristic dimensional equivalences in the lattices or axes of reference. The systems are: isometric, hexagonal, tetragonal, orthorhombic, monoclinic, and triclinic. Within the six systems there are a total of 32 crystal classes.**

**cuesta (cuesta)**

**A long low ridge with a steep scarp slope and a gentle back slope, formed by the differential erosion of strata of differing hardness. Etymol. Spanish from Latin *costa*, side; rib.**

**cultivar (kultivar)**

**An assemblage of cultivated plants which is clearly distinguished by its characteristics (morphological, physiological, cytological, chemical, or others) and which when reproduced (sexually or asexually), retains those distinguishing characteristics.**

**cultivate (bework)**

**See till; tillage.**

**cumulative infiltration (kumulatiewe infiltrasie)**

**See soil water : cumulative infiltration.**

**cutan (kutaan)**

**Cutans occur on the surface of peds or individual particles (sand grains, stones). They consist of material which is usually finer than and that has an organisation different to the material that makes up the surface on which they occur. They originate through deposition, diffusion or stress. Syn. clay film; clay skin. Cf. micromorphology.**

**cutoff (afsnyding)**

- (1) A wall, collar, or other structure, such as a trench, filled with relatively impervious material intended to reduce seepage of water through porous strata.
- (2) In river hydraulics, the new and shorter channel formed either naturally or artificially when a stream cuts through the neck of a band, e.g. cutoff drain. Cf. interceptor drain.
- (3) In flood irrigation, cutoff time of the water supply or cutoff position of the advance front.

**cyclosilicate (siklosilikaat)**

A class or structural type of silicate characterised by the linkage of the  $\text{SiO}_4$  tetrahedra in rings, with a ratio of  $\text{Si}:\text{O} = 1:3$ . An example of a cyclosilicate is beryl,  $\text{BeAl}_2(\text{Si}_6\text{O}_{18})$ . Cf. nesosilicate; sorosilicate; inosilicate; phyllosilicate; tectosilicate. Syn. ring silicate.

## D

### **dacite (dasiet)**

A fine-grained extrusive rock with the same general composition as andesite, but having less calcic plagioclase and more quartz. It is sometimes regarded as the extrusive equivalent of granodiorite. Syn. quartz andesite.

### **darcy (darcy)**

See soil water : darcy.

### **Darcy's Law (Darcy se wet)**

See soil water : Darcy's Law.

### **debris (puin)**

The loose material arising from the disintegration of rocks and vegetative material; transportable by streams, ice, or floods.

### **decomposer (ontbinder)**

An organism, usually a bacterium or a fungus, that breaks down dead plants and animals into simple compounds.

### **decomposition (ontbinding)**

The process of resolving into simpler or constituent parts. Inorganic ions are generally among the terminal products. The decomposition of organic materials results from the action of especially micro-organisms; the processes may be aerobic or anaerobic.

### **deep tillage (diepbewerking)**

A soil cultivation operation in which the soil is disturbed to a depth greater than the 180 to 200 mm normally encountered with conventional ploughing. Cf. tillage systems.

### **deficiency disease (gebreksiekte)**

A characteristic plant growth abnormality associated with the deficiency of an essential nutrient. Cf. essential element; plant nutrient.

### **deflation (deflasie)**

The removal of fine particles from soil by wind. Hence, deflation basin.

### **deflocculation (deflokkulasie)**

- (1) Separation of the individual components of compound particles (e.g. soil aggregates) by chemical and/or physical means. Syn. dispersion.
- (2) To disperse the particles of a colloidal system thus producing a stable suspension.
- (3) A high soluble salt content (a high electrolyte concentration) promotes flocculation in soils, whereas a low soluble salt content combined with a high sodium adsorption ratio favours deflocculation. Cf. dispersion; flocculation; sodic soil.

### **deforestation (ontbossing)**

The removal of trees from a forested area without adequate replanting.

### **degradation (degradasie)**

- (1) See soil degradation.

- (2) The process whereby a compound is transformed into simpler compounds, although products more complex than the starting material may be formed.
- (3) The general lowering of the surface of the land by weathering and erosive processes.

**degree of saturation (versadigingsgraad)**

See soil water : degree of saturation.

**dehydration (dehidrasie)**

- (1) Removal or loss of water from a compound.
- (2) Dewatering of fruit, vegetables, etc.
- (3) Withdrawal or removal of water from gels, sediments, rocks, etc.
- (4) Loss of water from animal and human bodies.

**delineation (afbakening)**

The process of drawing or plotting features on a map with lines and symbols.

**delta (delta)**

A buildup deposit of river-borne sediments at the mouth of a river.

**demineralization (ontsouting)**

The removal of inorganic substances from water, organic media and substances, or organisms. Cf. desalination.

**dendrochronology (dendrochronologie)**

Study and matching of tree rings with the aim of dating events in the recent past.

**dendritic (dendrities)**

- (1) Said of a mineral that has crystallized in a branching pattern: pertaining to dendrite. Syn. arborescent.
- (2) The form of the drainage pattern of a stream and its tributaries when it follows a treelike shape, with the main trunk, branches, and twigs corresponding to the main stream, tributaries and subtributaries, respectively, of the stream.

**denitrification (denitrifikasie)**

The chemical or biochemical reduction of nitrate or nitrite to gaseous nitrogen, either as molecular nitrogen ( $N_2$ ) or as an oxide of nitrogen.

**density (digtheid)**

- (1) The ratio of the mass of an object to its volume at a specified temperature, in units  $kg\ m^{-3}$ . Cf. bulk density.
- (2) In biology, the number of organisms per unit of volume or area at a given time.

**density probe (digtheidspeiler; digtheidsonde)**

A probe, usually used in conjunction with the neutron water meter, for the measurement of soil bulk density. Cf. neutron moderation.

**denudation (denudasie)**

- (1) The sum of the processes that results in the wearing away or the progressive lowering of the Earth's surface by various natural agencies that include weathering, erosion, mass wasting, and transportation.
- (2) The removal of vegetation from land by man or as a result of natural processes.

**deposit (afsetting)**

- (1) Material left in a new position by a natural transporting agent such as water, wind, ice or gravity, or by the activity of man. Hence : deposition.
- (2) Material accumulated in various ways, e.g. as surface layers, in cracks, in layers, etc., through chemical and physical processes such as leaching, precipitation, crystallization, etc.

**depositional crust (afsettingskors)**

See soil crust.

**depression (depressie)**

An area that is below or has sunk below its surroundings; a hollow.

**depth (diepte)**

See effective soil depth; soil depth.

**desalination (ontsouting)**

- (1) The removal of salts from saline or sea water.
- (2) The removal of salts from saline soils, usually by leaching.

**desert crust (woestynkors)**

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

**desertification (verwoestyning)**

Conversion of rangeland, rainfed cropland, or irrigated cropland to desertlike land, with a drop in agricultural productivity of 10% or more. It is usually caused by a combination of overgrazing, soil erosion, prolonged drought, and climatic change.

**desert pavement (woestynvloer)**

Gravel accumulated at the soil surface after removal of the finer material by wind action.

**Desert Soil (obsolete) (Woestyngrond (verouderd))**

A zonal great soil group consisting of soil with a very thin, light-coloured surface horizon that may be vesicular and is ordinarily underlain by calcareous material; formed in arid regions under sparse shrub vegetation.

**desert varnish (woestynverniss)**

A glossy sheen or coating (mainly of Fe and Mn oxides) on stones and gravel in arid regions.

**deterministic model (deterministiese model)**

See mathematical model.

**detritus (detritus)**

Material produced by the disintegration and weathering of rocks and that has been moved from its site of origin.

**Devonian (Devoon)**

See geological time scale.

**diabase (diabaas)**

In South Africa this term is used for a dark, grey-green coloured hypabyssal coarse grained rock, usually consisting of plagioclase (mainly labradorite) and augite with pyroxene somewhat altered to greenish uralite, sometimes containing amphibole and small amounts of biotite, quartz and micropegmatite. Diabase is intrusive mainly in the Transvaal Supergroup and is therefore pre-Karoo as far as age is concerned. Cf. dolerite.

**diagenesis (diagenese)**

- (1) The changes which occur in sediments after their initial deposition and during and after lithification. These changes include compaction, replacement, cementation and recrystallization.
- (2) The rearrangement of a mineral to form a new mineral.

**diagnostic horizon (diagnostiese horison)**

A surface (epipedon) or subsurface horizon which is used for the taxonomic classification of soils.

- (1) In the revised edition of "Soil Classification - A Taxonomic System for South Africa" (Soil Classification Working Group, 1991) the diagnostic horizons are described in detail. In the following list a very abbreviated description of each horizon is given:

**Topsoil horizons*****organic O horizon* (organiese O-horison)**

A very dark horizon with more than 10% organic carbon and saturated with water for long periods.

***humic A horizon* (humiese A-horison)**

A dark-coloured horizon with a moderate content of organic carbon, low base status and no signs of wetness.

***vertic A horizon* (vertiese A-horison)**

A dark coloured-horizon with a high clay content and with swell-shrink properties.

***melanic A horizon* (melaniese A-horison)**

A dark-coloured horizon with a high base status.

***orthic A horizon* (ortiese A-horison)**

A surface horizon that does not qualify as organic, humic, vertic or melanic topsoil horizons.

**Subsoil horizons and materials**

***E horizon (E-horison)***

A light-coloured, structureless horizon in which removal of colloidal matter has taken place.

***G horizon (G-horison)***

A horizon with greyish colours, which is saturated for long periods and has a firm consistence and has undergone no removal of colloidal matter.

***red apedal B horizon (rooi apedale B-horison)***

A reddish, structureless and non-calcareous horizon.

***yellow-brown apedal B horizon (geelbruin apedale B-horison)***

A yellowish, structureless and non-calcareous horizon.

***red structured B horizon (rooi gestruktuurde B-horison)***

A reddish horizon with strong structure.

***soft plinthic B horizon (sagte plintiese B-horison)***

A mottled and concretionary (iron and manganese oxides) horizon that is non-indurated and non-calcareous.

***hard plinthic B horizon (harde plintiese B-horison)***

The indurated equivalent of the soft plinthic B horizon.

***prismacutanic B horizon (prismakutaniese B-horison)***

A horizon with an abrupt transition with an overlying A horizon with respect to texture, structure or consistence; the structure is strong prismatic or columnar.

***pedocutanic B horizon (pedokutaniese B-horison)***

A horizon with strong blocky structure and clearly expressed cutans.

***lithocutanic B horizon (litokutaniese B-horison)***

A horizon with distinct affinities with the underlying parent rock into which it merges. It has cutanic character expressed usually as tongues or prominent colour variegations.

***neocutanic B horizon (neokutaniese B-horison)***

A horizon that has developed in recent sediments and unconsolidated material (usually transported), showing little signs of pedogenesis and is non-calcareous.

***neocarbonate B horizon (neokarbonaat B-horison)***

The calcareous equivalent of the neocutanic B horizon.

***podzol B horizon (podzol B-horison)***

A horizon developed from sandy parent materials in which the sand-size mineral grains present a bleached appearance, placic pans occur and an accumulation of amorphous oxides of Fe and Al and humus have taken place.

***regic sand (regiese sand)***

Recent, structureless, greyish, friable sands.

*stratified alluvium* (gestratifiseerde alluvium)

Unconsolidated alluvial or colluvial deposits with stratifications.

*placic pan* (plaksiese pan)

A thin (usually 2-10 mm thick) dark cemented layer associated with podzol B horizons. It is commonly cemented with iron oxides and is slowly permeable or impermeable to water and roots.

*dorbank* (dorbank)

A very hard, reddish, massive layer cemented by silica.

*saprolite* (saproliet)

A horizon of weathering bedrock which still has distinct affinities with the parent rock and underlying specific B horizons.

*soft carbonate horizon* (sagte karbonaathorison)

A horizon which is dominated by continuous, soft, powdery carbonate material.

*hardpan carbonate horizon* (hardebank karbonaathorison)

A horizon consisting of a continuous, very hard, massive layer cemented by carbonates.

*unconsolidated material without signs of wetness* (ongekonsolideerde materiaal sonder tekens van natheid)

Consists of unconsolidated material underlying specific diagnostic B horizons without signs of wetness.

*unconsolidated material with signs of wetness* (ongekonsolideerde materiaal met tekens van natheid)

Consists of greyish unconsolidated material underlying specific diagnostic B horizons with signs of wetness.

*unspecified material with signs of wetness* (ongespesifiseerde materiaal met tekens van natheid)

Consists of unconsolidated material to partly weathered rock underlying specific diagnostic B horizons with signs of wetness.

*hard rock* (harde rots)

A continuous hard layer of parent rock or silcrete.

*man-made soil deposit* (mensgemaakte grondafsetting)

A man-made deposit of soil material, with or without rock fragments.

- (2) In Soil Taxonomy (USA), combinations of specific soil characteristics that are indicative of certain classes of soils define the diagnostic horizons. Those which occur at the soil surface are called epipedons, those below the surface, diagnostic subsurface horizons. (Soil Survey Staff, 1994.)

*agric horizon* (agriese horison)



A horizon formed by the accumulation of silt, clay, and humus moved from an overlying plough layer by percolating water.

*albic horizon* (albiese horison)

An eluviated surface or subsurface horizon, normally light, if not whitish, in colour. Typically, an A2 horizon.

*anthropic epipedon* (antropiese epipedon)

Similar to a mollic epipedon but with a high level of extractable phosphorus due to heavy fertilization.

*argillic horizon* (argilliese horison)

Essentially, a subsurface horizon formed by the illuviation of crystalline clay.

*calcic horizon* (kalsiese horison)

A lime-enriched horizon (not indurated).

*cambic horizon* (kambiese horison)

A subsurface horizon containing illuvial clay, humus, or amorphous sesquioxides, but not in sufficiency to be classed as spodic or argillic.

*duripan* (duribank)

A soil layer cemented by precipitated silica.

*fragipan* (brosbank)

A natural subsurface horizon with high bulk density relative to the solum above, seemingly cemented.

*glossic horizon* (glossiese horison)

A subsurface horizon that consists of eluvial and illuvial parts. It developed from the degradation of an argillic, a kandic or a natric horizon and contains remnants of these.

*gypsic horizon* (gipsiese horison)

A gypsum-enriched layer.

*histic epipedon* (histiese epipedon)

An organic surface horizon too thin to allow classification of the soil as a Histosol.

*kandic horizon* (kandiese horison)

A diagnostic argillic horizon having mostly low activity (1:1) clays, such as kaolinite.

*melanic epipedon* (melaniese epipedon)

A thick black epipedon which contains a high concentration of organic carbon, usually associated with short-range-order minerals or aluminium-humus complexes.

*mollic epipedon* (molliese epipedon)

A surface horizon of mineral soil that is dark-coloured and relatively thick, contains at least 1% organic matter, and has a base saturation (pH 7,0) in excess of 50%.

*natric horizon* (natriese horison)

A subsurface horizon having the characteristics of an argillic horizon, and in addition, a prismatic or columnar structure and an exchangeable sodium percentage greater than 15.

*ochric epipedon* (okriese epipedon)

A surface horizon of mineral soil that lacks one or more of the properties required for classification as a mollic, histic, anthropic, plaggen, or umbric epipedon.

*oxic horizon* (oksiese horison)

A mineral soil horizon characterized by a lack of weatherable minerals, a low cation-exchange capacity, and small amounts of exchangeable bases, but containing 1:1 layer clays or sesquioxides as dominant minerals, with or without quartz and other resistant minerals.

*petrocalcic horizon* (petrokalsiese horison)

A lime-cemented layer.

*petrogypsic horizon* (petrogipsiese horison)

A continuous, strongly cemented, massive gypsic horizon that is cemented by calcium sulphate. It can be chipped with a spade when dry. Dry fragments do not slake in water, and it is impenetrable to roots.

*placic horizon* (plaksiese horison)

An iron-cemented horizon that is slowly permeable or impermeable to water and roots.

*plaggen epipedon* (plaggiese epipedon)

A thick surface horizon of 50 cm or more formed by long-continued heavy manuring.

*salic horizon* (saliiese horison)

A mineral soil horizon of enrichment with secondary salts more soluble in cold water than gypsum. A salic horizon is 15 cm or more in thickness and contains at least 2% salt.

*sombric horizon* (sombriese horison)

A subsurface horizon high in illuvial humus and less than 50% saturated with bases. Restricted to well-drained, tropical and subtropical soils, often those of higher elevations.

*spodic horizon* (spodiiese horison)

A subsurface horizon containing illuvial humus and/or amorphous sesquioxides, and normally, a low degree of saturation with bases.

*sulfuric horizon* (sulfaathorison)

A strongly acidic layer (pH <3,5) produced by the oxidation of sulphur or sulphur compounds to sulphuric acid.

*umbric epipedon* (umbriese epipedon)

A surface horizon darkened by organic matter but either too low in bases or too thin to be classed as a mollic, plaggen, or anthropic epipedon.

(3) In the 1974 FAO-Unesco soil classification system the following diagnostic horizons were described (FAO UNESCO, 1974). They are now obsolete or have been renamed/redefined, but for the sake of convenience are listed below and very briefly described:

*albic E horizon* (albiese E-horison)

A horizon from which clay and free iron oxides have been removed, normally light in colour.

*argillic B horizon* (argilliese B-horison)

A horizon that contains illuviated layer-lattice clays.

*calcic horizon* (kalsiese horison)

A horizon wherein calcium carbonate has accumulated; it may occur in an A, B, or C horizon.

*cambic B horizon* (kambiese B-horison)

An altered horizon containing illuvial clay but lacking properties that meet the requirements of argillic, natric or spodic B horizons.

*gypsic horizon* (gipsiese horison)

A horizon of secondary calcium sulphate (gypsum) enrichment that is more than 15 cm thick.

*histic H horizon* (histiese H-horison)

An organic surface horizon which is more than 20 cm but less than 40 cm thick.

*mollic A horizon* (molliese A-horison)

A dark surface horizon of mineral soil containing at least 1% organic matter and with a base saturation of 50% or more (pH 7,0).

*natric B horizon* (natriese B-horison)

A subsurface horizon with more than 15% exchangeable sodium and a prismatic or columnar structure.

*ochric A horizon* (okriese A-horison)

A horizon that is too light in colour, has too high a chroma, too little organic matter, or is too thin to be mollic or umbric.

*oxic B horizon* (oksiese B-horison)

A subsurface horizon that is not argillic or natric and is characterized by a lack of weatherable minerals and a low cation exchange capacity of the clay fraction.

*spodic B horizon* (spodiese B-horison)

A subsurface horizon that has a coarse texture and/or that contains illuvial humus and/or amorphous sesquioxides.

*sulfuric horizon* (sulfaathorison)

A horizon with a low pH that forms due to the oxidation of substances rich in sulfides.

***umbric A horizon* (umbriese A-horison)**

A surface horizon darkened due to the presence of organic matter and with a base saturation of less than 50%, thus cannot be classed as mollic.

(4) Diagnostic horizons defined in the World Reference Base for Soil Resources (Spaargaren, 1994) are very briefly described below:

***albic horizon* (albiese horison)**

A light coloured horizon from which clay and free iron oxides have been removed. (Latin *albus*, white.)

***andic horizon* (andiese horison)**

A soil layer in which the mineralogy is dominated by short-range-order minerals. They may be dominated by volcanic glass, allophane or similar minerals, or aluminium-organic complexes. (Japanese *ando*, dark soil.)

***argic horizon* (argiese horison)**

A subsurface horizon with a distinctly higher clay content than the overlying horizon. (Latin *argilla*, white clay.)

***anthric horizon* (antriese horison)**

The anthric horizon comprises a variety of surface layers that result from long-continued cultivation. (Greek *anthropos*, human.)

***calcic horizon* (kalsiese horison)**

A horizon in which secondary calcium carbonate has accumulated. (Latin *calx*, lime.)

***cambic horizon* (kambiese horison)**

A subsurface horizon showing evidence of alteration relative to the underlying horizons, but lacking the properties to qualify as an argic, natric, spodic, histic, folic, mollic or umbric horizon. (Latin *cambiare*, to change.)

***duripan* (duribank)**

A subsurface horizon cemented by silica. (Latin *durum*, hard.)

***eluvic horizon* (eluviese horison)**

A horizon at or near the soil surface rich in sand and having lost clay, iron or aluminium or some combination of them. (Latin *eluere*, to wash out.)

***ferralic horizon* (ferraliese horison)**

A subsurface horizon resulting from long and intense weathering. (Latin *ferrum*, iron.)

***ferric horizon* (ferriese horison)**

A horizon with many coarse, red mottles or with discrete, iron-coated nodules. (Latin *ferrum*, iron.)

***folic horizon* (foliese horison)**

A surface horizon, or subsurface horizon occurring at shallow depth, with more than 20% organic carbon and which is saturated by water for less than one month in most years. (Latin *folium*, leaf.)

***fragipan* (brosbank)**

A natural, non-cemented subsurface horizon wherein roots and water can penetrate along interped faces and streaks. (Latin *fragilis*, *frangere*, to break.)

***gypsic horizon* (gipsiese horison)**

A non-cemented horizon containing secondary accumulations of gypsum in various forms. (Latin *gypsum*, gypsum.)

***histic horizon* (histiese horison)**

A surface horizon, or subsurface horizon occurring at shallow depth, consisting of organic soil material having more than 12% organic carbon. (Greek *histos*, tissue.)

***hydrargic horizon sequence* (hidrargiese horison-opeenvolging)**

A horizon sequence that consists of related surface and subsurface horizons resulting from wet-cultivation practices. It comprises a puddled layer, a plough pan and a subsurface illuvial horizon.

***hypercalcic horizon* (hiperkalsiese horison)**

A horizon that consists of continuous concentrations of calcium carbonate that may or may not be cemented.

***hypergypsic horizon* (hipergipsiese horison)**

A hypergypsic horizon is a horizon with 60% or more gypsum. It may be cemented or not and must be at least 10 cm thick to be diagnostic. If cemented, the dry fragments do not slake in water and it cannot be penetrated by roots.

***mollic horizon* (molliese horison)**

A mollic horizon is a well-structured, dark coloured surface layer with a high base saturation and a moderate to high organic matter content.

***natric horizon* (natriese horison)**

A natric horizon is a dense subsurface horizon with a higher clay content than the overlying horizon(s). The increase in clay content between the natric horizon and the overlying horizon must meet the same requirements as an argic horizon. Moreover, it has a high content of exchangeable sodium and/or magnesium.

***nitic horizon* (nitiese horison)**

The nitic horizon is a subsurface horizon with a moderately to strongly developed angular blocky structure with many shiny ped faces, which cannot or can only partially be attributed to clay illuviation. To be diagnostic it must have a minimum thickness of 30 cm.

***ochric horizon* (okriese horison)**

An ochric horizon is a surface horizon lacking fine stratification and which is too light coloured or too thin, or that has an organic carbon content which is too low, to meet the requirements for a mollic or an umbric horizon.

***petroplinthic horizon* (petroplintiese horison)**

A petroplinthic horizon is a continuous layer of indurated material, at least 10 cm thick, in which iron is an important cement and in which organic matter is absent, or present only in traces.

*plinthic horizon* (plintiese horison)

A plinthic horizon is a subsurface horizon that consists for 10% or more of an iron-rich, humus-poor mixture of kaolinitic clay with quartz and other diluents, which changes irreversibly to a hardpan or to irregular aggregates on exposure to repeated wetting and drying with free access to oxygen.

*salic horizon* (saliiese horison)

A salic horizon is a surface or shallow subsurface horizon which contains a secondary enrichment of readily soluble salts, i.e. salts more soluble than gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ).

*spodic horizon* (spodiese horison)

A spodic horizon is a dark-coloured subsurface horizon which contains illuvial amorphous substances composed of organic matter and aluminium, with or without iron.

*sulfidic horizon* (sulfidiese horison)

A sulfidic horizon is a waterlogged subsurface horizon containing sulphur, mostly in the form of sulphides, and only moderate amounts of calcium carbonate.

*sulfuric horizon* (sulfaathorison)

A sulfuric horizon is an extremely acid ( $\text{pH}(\text{H}_2\text{O}) < 3,5$ ) subsurface horizon generally containing yellow jarosite mottles with a hue 2.5 Y or more and a chroma of 6 or more.

*umbric horizon* (umbriese horison)

An umbric horizon is a dark-coloured base-desaturated surface layer rich in organic matter.

*vertic horizon* (vertiese horison)

A vertic horizon is a subsurface horizon that, as a result of shrinking and swelling, has either slickensides, or wedge-shaped or parallelepiped structural aggregates whose longitudinal axis is tilted between  $10^\circ$  and  $60^\circ$  from the horizontal. It contains 30% or more clay throughout.

## diaspore (diaspoor)

$\alpha\text{-AlO.OH}$ , orthorombic.

## diastrophism (diastrofisme)

Deformation of the earth's crust by tectonic processes.

## diatomaceous earth (diatoomaarde)

A geologic deposit of fine, grayish siliceous material composed chiefly or wholly of the remains of diatoms. It may occur as a powder or as a porous, rigid material.

## dickite (dickiet)

A well-crystallized clay mineral of the kaolin group :  $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$ . It is polymorphous with kaolinite and nacrite. Dickite is structurally distinct from other members of the kaolin group, having a more complex order of stacking in the c-axis direction than kaolinite. It usually occurs in hydrothermal veins. Cf. kandite.

## differential erosion (differensiële erosie)

Irregular erosion resulting from differences in resistance of surface materials.

**differential thermal analysis (differensieeltermiese analise)**

Thermal analysis carried out by uniformly heating or cooling a sample material which undergoes chemical and physical changes, while simultaneously heating or cooling in identical fashion a reference material which undergoes no changes. The temperature difference between the sample and the reference material is measured as a function of the temperature of the reference material. Syn. thermography.

**differential water capacity (differensiële waterkapasiteit)**

See soil water : differential water capacity.

**diffuse double layer (diffuse dubbellaag)**

A system, in the context of soils and clays, which consists of a charged (negative) particle surface and a balancing amount of counter ions (positive), of which the concentration is a function of distance in the liquid near the particle surface.

**diffuse source (diffuse bron)**

A source of environmental pollution originating from a large area, e.g. through rain. Cf. point source.

**diffusion (diffusie)**

The spreading or scattering of matter under the influence of an energy gradient, the energy being quantitatively expressed in terms of the chemical potential of the substance concerned, and approximated by concentration, vapour pressure or similar properties.

**diffusivity (diffusiwiteit)**

See soil water : diffusivity.

**dike (dyke) (gang; dyk)**

- (1) In geology, a tabular body of igneous rock that cuts across the structure of adjacent rocks or cuts massive rocks.
- (2) In engineering, an embankment to confine or control water, especially one built along the banks of a river to prevent overflow of lowlands; a levee.

**dilatancy (dilatansie)**

An increase in the bulk volume during deformation, caused by a change from close-packed structure to open-packed structure, accompanied by an increase in the pore volume. The latter is the result of rotation of grains, microfracturing, grain boundary slippage etc.

**dimorphous (dimorf)**

In mineralogy, having the same chemical composition but crystallizing in two crystal systems.

**dioctahedral (dioktaëdries)**

Refers to a layered-mineral structure in which only two of the three available octahedrally co-ordinated positions are occupied by trivalent cations.

**diopside (diopsied)**

See pyroxene group of minerals.

**diorite (dioriet)**

A diorite is a granular, intrusive rock characterized by plagioclase feldspar but lacking quartz and orthoclase in appreciable amounts. Normally dark minerals are present in sufficient amounts to give the rock a dark appearance. If the plagioclase is more calcic in composition than andesine (labradorite to anorthite) the rock is called a gabbro. The name norite is given to a gabbro in which the pyroxene is essentially hypersthene. The term diabase is sometimes used to indicate a fine-grained gabbro characterized by a certain texture. Cf. diabase; dolerite; gabbro; norite.

**direct count (direkte telling)**

In soil microbiology, any one of several methods of estimating the total number of micro-organisms in a given mass of soil by direct microscopic examination.

**discharge (afvoer)**

In hydraulics, the volume rate of flow; the volume of liquid passing a point per unit time, commonly expressed as cubic metres per second.

**discordant (diskordant)**

See conformable.

**disintegration (disintegrasie)**

See physical weathering; weathering.

**disperse (dispergeer)**

- (1) To break up compound particles, such as aggregates, into the individual component particles.
- (2) To distribute or suspend fine particles, such as clay, in or throughout a dispersion medium, such as water. In soils, ease of dispersion is related to soil erodibility.

**disperse(d) phase (gedispergeerde fase)**

See dispersion medium.

**disperse system (disperse sisteem)**

A system in which at least one of the phases is subdivided into small particles which together exhibit a very large surface area. Soil can be described as a disperse three-phase system, the phases being solid, liquid and gas. Cf. dispersion medium.

**dispersing agent (dispergeermiddel)**

A substance promoting dispersion or deflocculation.

**dispersion (dispersie)**

The act of dispersing; to disperse. Cf. disperse. Syn. deflocculation.

**dispersion medium (dispersiemedium)**

That material (solid, liquid, or gas) in which colloidal particles, known as the dispersed phase, is suspended.

**dispersion ratio (dispersieverhouding)**

The ratio (expressed as a percentage) of the total mass of particles less than a specific diameter (for example, 50  $\mu\text{m}$ ) that enter into suspension after shaking a soil sample in pure water, to the total mass of all particles smaller than that diameter (as determined



by complete dispersion). It is sometimes used as a measure of aggregate stability. Cf. disperse.

**dispersivity (dispersiwigteit)**

A characteristic property of a porous medium which influences the coefficient of hydrodynamic dispersion. Cf. hydrodynamic dispersion.

**dissect (verkerf)**

Cut by erosion into hills and valleys. Applicable especially to plains in the process of erosion after uplift.

**distribution coefficient (verdelingskoeffisiënt)**

A parameter used to describe the partitioning of a solute between the liquid and solid phases of a suspension or soil. It is usually defined as

$$K_D = \frac{\text{mass of solute on the solid phase per unit mass of solid phase}}{\text{concentration of solute in solution}}$$

and reported in units of ml/g.

**distribution efficiency (verspreidingsdoeltreffendheid)**

The efficiency with which irrigation water is distributed to the root zone over the irrigated field. Cf. application efficiency; irrigation efficiency; replenishment efficiency; transmission efficiency.

**divide (waterskeiding)**

See watershed.

**dolerite (doleriet)**

A hypabyssal rock consisting of plagioclase (labradorite) and augite, sometimes containing olivine. Texture varies from fine-grained and porphyritic to coarser grained and ophitic. Dolerite is intrusive mainly in the Karoo Supergroup and is therefore post-Karoo as far as age is concerned. Cf. diabase.

**dolomite (dolomiet)**

The mineral  $\text{CaMg}(\text{CO}_3)_2$ ; also the rock which consists mainly of this mineral.

**domain (domein)**

See clay domain.

**donga (donga)**

A term used in South Africa for a gully formed by water erosion. Etymol. Afrikaans *donga*, from Zulu. See erosion.

**donga erosion (donga-erosie)**

See erosion.

**dorbank (dorbank)**

- (1) A hard to extremely hard layer of soil (subsoil) in certain soils of arid regions. It may simply be massive or it may be laminated (coarse or fine), the latter parallel to the soil surface. Does not soften on immersion in water. It may or may not be calcareous, or salty. Its colour is related to the soil in which it occurs. It is related to the duripan of other classification systems. Cf. diagnostic horizon.
- (2) See diagnostic horizon.

**double layer (dubbellaag)**

See diffuse double layer.

**double superphosphate (dubbelsuperfosfaat)**

A phosphate fertilizer consisting of monocalcium orthophosphate and containing not less than 19% P.

**downslope (helling-af)**

Indicating a movement or direction from a higher to a lower hillslope position. Cf. upslope.

**drag (remming)**

The force retarding the flow of water or wind over the surface of an object, such as the land surface.

**drain (to -) (dreineer)**

- (1) To provide open ditches, perforated pipes or other highly permeable structures so that excess water can be removed by surface or internal flow.
- (2) To lose water (from the soil) by percolation.

**drainage (dreinerig)**

- (1) A general term applied to the removal of surface or ground water from a given area either by gravity or by pumping.
- (2) The removal of excess water from land by means of surface or subsurface drains (external drainage). Cf. drain (to-).
- (3) Internal drainage refers to natural drainage or percolation of water through the soil. Cf. drainage system; drainage water.

**drainage basin (opvanggebied)**

See watershed.

**drainage coefficient (dreineerkoëfficiënt)**

The amount of excess water (expressed in water depth or other units) removed or drained from an area in 24 hours.

**drainage requirement (dreineervereiste)**

The performance and capacity specifications for a drainage system, i.e. permissible fluctuations of water table depth with respect to the root zone or soil surface, and the volume of water that the drains must convey in a given time.

**drainage system (dreineerstelsel)**

- (1) A system of channels, conduits and structures for effecting drainage. Cf. drain (to-).

- (2) A network of streams, and bodies of surface water that are tributary to them, both large and small, which convey water to a specific point. Cf. watershed.
- (3) In plumbing, all piping within public or private premises which conveys sewerage, rain water, or other liquid wastes, to a legal point of disposal.

**drainage terrace (dreineerterras)**

See terrace.

**drainage water (dreineerwater)**

- (1) Water which has been collected by a drainage system and discharged into a natural watercourse.
- (2) Water flowing in a drain and which is derived from soil, surface, or storm water.

**drawdown (watersakking; watervlakverlaging)**

- (1) The magnitude of the change in surface elevation of a body of water as a result of the withdrawal of water therefrom.
- (2) The magnitude of the lowering of the water surface in a well, and of the water table or piezometric surface adjacent to the well, resulting from the withdrawal of water from the well by pumping.

**drift (vervoerde materiaal)**

Unconsolidated material deposited by geological processes in one place after having been removed from another.

**drilling mud (boormodder)**

A heavy suspension, usually in water but sometimes in oil, used in rotary drilling, consisting of various substances in a finely divided state (commonly smectite clays and chemical additives such as barite). Introduced continuously down the drill pipe under hydrostatic pressure and out through openings in the drill bit, and back up in the annular space between the pipe and the walls of the hole and to a surface pit where it is purified and reintroduced into the pipe. It is used to lubricate and cool the bit, to carry the cuttings up from the bottom, and to prevent blowouts and cave-ins by plastering and consolidating the walls with a clay lining, thereby making casing unnecessary during drilling and also offsetting pressure of fluid and gas that may exist in the formation. Syn. drilling fluid; drill mud; mud flush; circulation fluid.

**drip irrigation (drupbesproeiing)**

See irrigation methods.

**driving force (dryfkrag)**

See soil water : driving force.

**drop erosion (druppelerosie)**

See erosion: splash erosion.

**drying crust (drogingskors)**

See soil crust.

**dryland farming (droëland boerdery)**

The practice of crop production without irrigation (rain-fed agriculture).

**dry-mass percentage (droëmassa persentasie)**

The ratio of the mass of any constituent (of a soil) to the oven-dry mass of the soil, expressed as a percentage. Cf. oven-dry soil.

**DTA (DTA)**

See differential thermal analysis.

**dune (duin)**

A mound or ridge of sand piled up by wind.

**dune sand (duinsand)**

See aeolian.

**duplex soil (dupleksgrond)**

A soil with a relatively permeable topsoil abruptly overlying a very slowly permeable diagnostic horizon which is not a hardpan.

**duricrust (durikors)**

A hard crust formed at or near the land surface during the processes of weathering of rocks and soil formation, usually in tropical or arid regions. The main types include alcrete, calcrete, ferricrete (laterite) and silcrete.

**duripan (duribank)**

A mineral soil horizon that is cemented by silica, usually opal or microcrystalline forms of silica, to the point that air-dry fragments will not slake in water or HCl. A duripan may also have accessory cement such as iron oxide or calcium carbonate. See diagnostic horizon.

**dust (stof)**

Finely powdered particles ( $>1,0 \mu\text{m}$ ) lying on surfaces or carried about by wind.

**dust mulch (stofdeklaag)**

A loose, finely granular, or powdery condition of the surface of the soil, usually produced by shallow cultivation when the soil is dry.

**dwarfing (verdwerging)**

An abnormal plant growth condition resulting from a plant nutrient deficiency, disease or physical impediment.

**dynamic model (dinamiese model)**

See mathematical model.

**dynamometer (dinamometer)**

An instrument for measuring draught of tillage implements and for measuring resistance of soil to penetration by tillage implements.

**dystrophic (distrofies)**

Refers to soil that has suffered marked leaching, such that the sum of the exchangeable (as opposed to soluble) Ca, Mg, K and Na, expressed in  $\text{cmol/kg}$  clay, is less than 5.

**The figure is calculated from the S-value and the clay content. Such soil is said to have a low base status.**

## **E**

### **E horizon (E-horison)**

See diagnostic horizon.

### **earth (aarde)**

A term for the loose, softer, or fragmental material of the earth's surface, as distinguished from firm or solid rock (bedrock) or a natural soil. Not synonymous with the term soil. Much of it has been transported by wind, ice, water or man. Cf. regolith; soil; solum.

### **earthslide (grondverskuiwing)**

See landslide.

### **ecology (ekologie)**

The science that deals with the interrelations between organisms and between organisms and their environment.

### **ecosphere (ekosfeer)**

The mantle of earth and troposphere inhabited by living organisms.

### **ecosystem (ekosisteem)**

A community of organisms and the environment in which they live, forming an interacting system.

### **ecotone (ekotoon)**

The transition zone separating different biologic communities.

### **ecotope (ekotoop)**

A particular habitat within a region. Used in South Africa for a class of land within which the variation of natural resources is insufficient to influence significantly the agricultural products that can be produced on it, their potential yield (both quantity and quality) and the required production techniques.

### **ecotype (ekotipe)**

- (1) An ecologic variant of a species that has adapted to local environmental conditions.
- (2) A unit, within an ecospecies, that contains individuals capable of interbreeding both with other members of that ecotype and with members of other ecotypes in the same ecospecies but that remains distinctive through selection and isolation. If it is morphologically distinct, it is more or less equivalent to the taxonomic unit subspecies.
- (3) A locally adapted population of a species which has a distinctive limit of tolerance to environmental factors. Cf. biotype.

### **ectotrophic mycorrhiza (ektotrofe mikorriza)**

A mycorrhizal association in which the fungal hyphae form a compact mantle on the surface of the roots. Mycelial strands extend inward between cortical cells and outward from the mantle to the surrounding soil. Cf. endotrophic.

### **edaphic (edafies)**

- (1) Pertaining to the influence of soil on organisms.
- (2) Resulting from or influenced by factors inherent in the soil rather than by climatic factors. Cf. edaphology.

**edaphic factor (edafiese faktor)**

A condition or characteristic of the soil (chemical, physical, or biological) which influences organisms.

**edaphology (edafologie)**

The science that deals with the influence of soil on living organisms, particularly plants, including man's use of land for plant growth.

**effective pore space (effektiewe porieruimte)**

See pore space.

**effective precipitation (effektiewe neerslag)**

That portion of the total precipitation which becomes available for plant growth. It does not include precipitation lost to deep percolation below the root zone or to surface runoff or to interception loss.

**effective soil depth (effektiewe gronddiepte)**

The depth of soil material that plant roots can penetrate readily to obtain water and plant nutrients. The depth to a layer that differs sufficiently from the overlying material in physical or chemical properties to prevent or seriously retard the growth of roots.

**effective stress (effektiewe spanning)**

The stress transmitted through a soil by intergranular pressures. It is the stress that is effective in mobilizing internal friction. In a saturated soil in equilibrium, the effective stress is the difference between the total stress and the neutral stress of the water in the voids; it attains a maximum value at complete consolidation of the soil. Syn. effective pressure; intergranular pressure. Cf. pore water pressure.

**effervescence (bruising)**

The production of gas bubbles, e.g. when hydrochloric acid is added to lime.

**efflorescence (effloressensie)**

A fluffy, crystalline powder on a surface, produced by evaporation.

**effluent (uitvloeisel)**

- (1) Solid, liquid, or gaseous wastes which enter the environment as man-made by-products.
- (2) The discharge or outflow of water from ground or sub-surface storage.

**electrical conductivity (elektriese geleivermoë; konduktiwiteit)**

- (1) A measure of the ability of a material to conduct electric current. It is the reciprocal of resistivity (specific resistance) and is measured in siemens per metre. Also termed specific conductance. Cf. conductance; conductivity.
- (2) In soil studies it is measured in millisiemens/m (1 mmho/cm = 100 mS/m), and is a measure of the concentration of salts in solution. Low salinity irrigation waters have values less than 25 mS/m and high salinity irrigation waters have values greater than 75 mS/m. Water with an electrical conductivity of 1 mS/m contains

about 0,1 mmol/dm<sup>3</sup> cations and 0,1 mmol/dm<sup>3</sup> anions or about 6,4 mg/dm<sup>3</sup> dissolved salts.

**electrical resistance (elektriese weerstand)**

See resistance, electrical.

**electrical resistance block (elektriese weerstandsblokkie)**

A small porous block (size in the order of 30 mm x 30 mm x 10 mm) made of gypsum, nylon, fibreglass or some similar material, containing electrodes and lead wires for the measurement of the electrical resistance of the block which is a function of its water content, and hence the water content of the soil with which it is in equilibrium.

**electrokinetic (zeta) potential (elektrokinetiese (zeta-) potensiaal)**

- (1) The difference in electrical potential between the immobile liquid layer attached to the surface of a charged particle and the bulk liquid phase.
- (2) The work done in bringing a unit charge from infinite distance (bulk solution) to the plane of shear in the diffuse double layer.

**electrolysis (elektrolise)**

Chemical decomposition of certain substances by electric current passing through a substance.

**electro-ultra filtration (elektro-ultrafiltrasie)**

A technique for the analysis of soils for plant-available nutrients.

**elutriation (elutriasië)**

- (1) A method of particle size analysis of a soil or sediment, in which the finer, light particles are separated from the coarser, heavy particles by means of a slowly rising current of air or water of known and controlled velocity, carrying the lighter particles upward and allowing the heavier ones to settle.
- (2) Purification, or removal of material from a mixture or a suspension in water, by washing and decanting, leaving the heavier particles behind.

**eluviation (eluviasie)**

The removal of soil material in suspension or solution from a part of or from the whole of the soil profile. The term leaching is preferred for removal in solution. Cf. illuviation.

**eluvic horizon (eluviese horison)**

See diagnostic horizon.

**empirical model (empiriese model)**

See mathematical model.

**endellite (endelliet)**

A clay mineral :  $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4 \cdot 4\text{H}_2\text{O}$ . It is the more hydrous form of halloysite. Syn. hydrated halloysite; hydrohalloysite; hydrokaolinite.

**endogenous (endogeen)**

Produced from within, e.g. originating from within an organism, or within the soil or earth.



**endotrophic (endotroof)**

Nourished or receiving nourishment from within, as fungi or their hyphae receiving nourishment from plant roots in a mycorrhizal association.

**enstatite (enstatiet)**

See pyroxene group of minerals.

**Entisol (Entisol)**

See soil classification.

**envelope-pressure (onhulsedruk)**

See soil water : envelope-pressure.

**envelope-pressure potential (omhulsedrukpotensiaal)**

See soil water : envelope-pressure potential.

**environmental degradation (omgewingsdegradasie)**

The depletion or destruction of soil or of a potentially renewable resource such as grassland, forest, or wildlife by using it at a faster rate than it is naturally replenished. Cf. soil degradation.

**environmental soil science (omgewingsgrondkunde)**

Essentially soil science but with prominence given to soil as a component of the environment, thus with particular attention to physical, chemical and biological soil degradation, soil reclamation and study of soil pollution and soil remediation. Cf. soil science.

**Eocene (Eoseen)**

See geological time scale.

**eolian (eolies)**

See aeolian.

**eolian soil material (eoliese grondmateriaal)**

See aeolian soil material.

**ephemeral stream (kortstondige stroom (efemeer))**

A stream or portion of a stream that flows only in direct response to precipitation, and receives little or no water from springs or no long continued supply from snow or other sources, and its channel is at all times above the water table.

**epidiorite (epidioriet)**

A metamorphosed gabbro or diabase in which the augite has been altered to fibrous amphibole. Commonly massive, but may have some schistosity.

**epidote (epidoot)**

$\text{Ca}_2(\text{Al,Fe}^{3+})_3(\text{SiO}_4)_3(\text{OH})$ , monoclinic. A common mineral in metamorphic rocks.

**epipedon (epipedon)**

A diagnostic horizon formed at the surface. It may include all or part of a B horizon.  
Cf. diagnostic horizon.

**epiphyte (epifiet)**

A plant, e.g. a moss, that grows on another plant without being parasitic.

**epoch (epog)**

In geology, a unit of geological time within a period during which a series of rocks is formed, e.g. the Pleistocene epoch. Cf. geological time scale.

**equilibrium (ewewig)**

A state of balance, when various forces have created a state or form which will not be altered with passage of time unless controlling factors change.

**equivalent (chemistry) (obsolete) (ekwivalent (chemie) (verouderd))**

In chemistry, the quantity of a substance equivalent to one mole of charge (mol<sub>c</sub>), or capable of yielding one mole of charge or electrons. For example, one mole of Ca<sup>2+</sup> ions is equal to two equivalents of Ca. The milliequivalent (m.e.) has been a widely-used measure of charge in the soils literature.

**equivalent diameter (ekwivalente deursnee)**

The diameter of a hypothetical sphere composed of material having the same density as that of the actual soil particle and of such size that it will settle in a given liquid at the same terminal velocity as the actual soil particle. Hence also : equivalent radius.

**era (era)**

In geology, a major division of geological time, divided into several periods, e.g. the Mesozoic era. Cf. geological time scale.

**erodibility (erodeerbaarheid)**

- (1) The degree or capability of being eroded; susceptibility to erosion.
- (2) The tendency of soil to be detached and carried away; a characteristic influencing the rate of soil erosion.

**erosion (erosie)**

- (1) The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. Syn. denudation.
- (2) Detachment and movement of soil or rock fragments by water, wind, ice, or gravity. The following terms are used to describe different types of water erosion:

*accelerated erosion* - Erosion much more rapid than normal, natural or geological erosion, primarily as a result of the influence of the activities of man or, in some cases, of animals or natural catastrophies that expose bare surfaces, for example, fires.

*donga erosion* - See gully erosion (below).

*geological erosion* - The normal or natural erosion caused by geological processes acting over long geologic periods and resulting in the wearing away of mountains, the building up of floodplains, coastal plains, etc. Syn. natural erosion.

***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 300 mm to 600 mm to more than 20 m.

***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. Syn. geological erosion.

***normal erosion*** - The gradual erosion of land used by man which does not greatly exceed natural erosion.

***rill erosion*** - An erosion process in which numerous small channels a few centimetres deep are formed; occurs mainly on recently cultivated soils. See rill.

***sheet erosion*** - The removal of a fairly uniform layer of soil from the land surface by runoff water. Syn. surface erosion.

***splash erosion*** - The spattering of small soil particles caused by the impact of raindrops on wet soils. The loosened and spattered particles may or may not be subsequently removed by surface runoff.

***raindrop erosion*** - See splash erosion (above).

***tunnel erosion*** (tunnelling) - The removal of soil material through subsurface flow channels or "pipes" developed by seepage water. Also referred to as piping.

#### **erosion class (erosieklas)**

A grouping of erosion conditions based on the degree of erosion or on characteristic patterns (e.g. slight sheet erosion, severe gully erosion, etc.); not applied to normal, natural, or geological erosion.

#### **erosion crust (erosiekors)**

See soil crust.

#### **erosion cycle (erosiesiklus)**

A sequence of stages in the erosion of a land surface (following an initial change in state) to the ultimate stage of stability or equilibrium. Usually the initial change implies uplift, but it might also involve a change in climate.

#### **erosion pavement (erosieplaveisel)**

A surface covering of stone, gravel or coarse soil particles accumulated as the residue left after erosion has removed the finer soil.

#### **escarpment (eskarp)**

A steep face of a ridge of high land; the escarpment of a mountain range is generally on the side nearest the sea.

#### **esker (esker (smeltwaterrug))**

A narrow ridge of gravelly or sandy drift deposited by a stream in association with glacier ice.

#### **ESP (UNP)**

See exchangeable sodium percentage.

**essential element (essensiële element)**

A chemical element required for the normal growth of plants, and without which a plant cannot complete its life cycle.

**eustasy (eustasie)**

World-wide simultaneous change in sea level.

**eutrophication (eutrofikasie)**

The artificial or natural enrichment of a river, dam or lake by an excessive influx of nutrients normally required for the growth of aquatic plants (such as algae).

**eutrophic (eutrofies)**

Refers to soil that has suffered little or no leaching, such that the sum of the exchangeable Ca, Mg, K and Na, expressed in cmol<sub>c</sub>/kg clay, is more than 15. The figure is calculated from the S-value and the clay content. Such a soil is said to have a high base status. The term is normally confined to non-calcareous soils. Cf. base saturation percentage. Etymol. Greek *trophe*, nourishment; *eu*, good.

**evaporation (verdamping)**

The process by which a liquid is changed to a vapour or gas without change in temperature.

**evaporite (evaporiet)**

A nonclastic sedimentary rock composed primarily of minerals produced from a saline solution that became concentrated by evaporation of the solvent; especially a deposit of salt precipitated from a restricted or enclosed body of seawater or from the water of a salt lake. Examples include gypsum, anhydrite, rock salt, chemically precipitated limestone, primary dolomite, and various rare nitrates and borates. The term sometimes includes rocks developed by metamorphism of other evaporites. Syn. evaporate; saline deposit; saline residue.

**evapotranspiration (evapotranspirasie)**

The combined loss of water from a given area and during a specific period of time, by evaporation from the soil surface and by transpiration from plants. Cf. transpiration.

**exchangeable acidity (uitruilbare suurheid)**

See acidity, exchangeable.

**exchangeable cation percentage (uitruilbare kationpersentasie)**

The extent to which the adsorption complex of soil is occupied by a particular cation. It is calculated as follows:

$$\frac{\text{Amount of exchangeable cations in cmol/kg soil}}{\text{Cation exchange capacity in cmol/kg soil}} \times 100$$

**exchangeable sodium percentage (ESP) (uitruilbare natriumpersentasie (UNP))**

The percentage of the cation exchange capacity of the soil (expressed in cmol/kg soil) that is occupied by sodium (expressed in cmol/kg soil). ESP is calculated as follows:

$$\frac{\text{Amount of exchangeable sodium in cmol/kg soil}}{\text{Cation exchange capacity in cmol/kg soil}} \times 100$$

Cf. sodium adsorption ratio.

**exchange capacity (uitruilkapasiteit)**

See anion exchange capacity; cation exchange capacity.

**exchange complex (uitruilkompleks)**

The sum total of all contributors to the exchange properties of soil, e.g. clay mineral particles, amorphous compounds and colloidal organic substances.

**exchange constant (uitruilkonstante)**

The equilibrium constant for a reaction involving ionic exchange between solution and adsorbed phases; usually not a true constant. Cf. selectivity coefficient.

**exfoliation (eksfoliasie (afbladering))**

The breaking or peeling off of concentric rock sheets from bare rock surfaces. It is caused by the action of physical, thermal or chemical forces producing differential stresses within an expanding rock.

**exogenous (eksogeen)**

Having an external origin, e.g. developing or originating outside an organism, or the soil.

**expanding-lattice clay (swelklei)**

A clay mineral whose crystal lattice is expandable according to the amount of water it adsorbs. For example a layer silicate (such as a smectite) in which diffuse negative charges originating in the central octahedral sheets result in less tendency for successive layers to be tightly bound by interlayer cations. This results in the layers being readily pushed apart by water.

**expansive soil (swelgrond)**

See swelling soil.

**external gas pressure (eksterne gasdruk)**

See soil water: pneumatic pressure.

**external gas pressure potential (eksterne gasdrukpotensiaal)**

See soil water: pneumatic potential.

**extrusive rock (ekstrusiewe gesteente)**

**An igneous rock derived from magma ejected at the earth's surface. Cf. igneous rock.**

## F

### **F layer (F-laag)**

A layer of partially decomposed litter with portions of plant structures still recognizable. Occurs below the L layer (011 horizon) on the forest floor in forest soils. It is the fermentation layer or the 012 layer. See L layer; soil horizon.

### **fabric (soil) (maaksel (grond))**

The micromorphology of soil according to the spatial arrangement of its particles and voids. Cf. micromorphology.

### **facies (fasie)**

Part of a rock body as differentiated from other parts by appearance or composition.

### **faecal pellet (fekale korrel)**

The excreta of fauna in pellet form.

### **failure (swigting)**

Fracture or rupture of a rock or other material that has been stressed beyond its ultimate strength, e.g. rock failure.

### **fallow (braak)**

Allowing cultivated land to lie idle (either tilled or untilled) during the whole or greater portion of the growing season.

### **family, soil (grondfamilie)**

See soil family.

### **fan (waaier)**

- (1) A gently sloping, fan-shaped mass of detritus forming a section of a very low cone commonly at a place where there is a notable decrease in gradient; specifically an alluvial fan.
- (2) A fan-shaped mass of congealed lava that formed on a steep slope by the continually changing direction of effusions.

### **fault (verskuiwing)**

A fracture or fracture zone of the earth along which there has been displacement of one side with respect to the other.

### **fauna (fauna)**

The animal life of a region; members of the animal kingdom.

### **feldspar group (veldspaatgroep)**

Most feldspars can be classified as members of the ternary system  $\text{NaAlSi}_3\text{O}_8$  -  $\text{KAlSi}_3\text{O}_8$  -  $\text{CaAl}_2\text{Si}_2\text{O}_8$  (sodium, potassium and calcium feldspar). Members of the series between  $\text{NaAlSi}_3\text{O}_8$  and  $\text{KAlSi}_3\text{O}_8$  are called alkali feldspars. Most natural alkali feldspars contain a mixture of potassium and sodium feldspars. The most common of these are the low albite potassium feldspars microcline (triclinic) and orthoclase (monoclinic, dimorphous with microcline) which are common in granite and gneissic rocks. Sanidine is a variety of orthoclase. Anorthoclase is a triclinic alkali feldspar rich

in albite. Members of the triclinic feldspar series between  $\text{NaAlSi}_3\text{O}_8$  (albite) and  $\text{CaAl}_2\text{Si}_2\text{O}_8$  (anorthite) are called plagioclase feldspars, one of the most common groups of rock-forming minerals. The series can be designated in terms of the mole fraction of the albite component (abbrev. Ab) and anorthite component (abbrev. An) as follows (Ab + An=100): albite (Ab 100-90), oligoclase (Ab 90-70), andesine (Ab 70-50), labradorite (Ab 50-30), bytownite (Ab 30-10), anorthite (Ab 10-0).

#### **feldspathoid (veldspatoïed)**

The feldspathoids are those minerals that form in place of the feldspars in certain rocks rich in alkali and deficient in silica. Leucite, nepheline, sodalite, and lazurite are the feldspathoids of greatest importance.

#### **felsic minerals (felsiese minerale)**

Mainly feldspars, feldspathoids, quartz and muscovite.

#### **felsite (felsiet)**

An igneous rock in which either the whole or the groundmass consists of a cryptocrystalline aggregate of felsic minerals, quartz and potassium feldspar being the most common. When phenocrysts of quartz are present, the rock is termed a quartz porphyry or a quartz felsite.

#### **fen (ven)**

Low land overflowed, or covered wholly or partially with water, but producing reeds, sedges and other aquatic plants. Cf. marsh; swamp.

#### **fermentation (fermentasie)**

A set of metabolic processes by which anaerobic organisms obtain energy by converting sugars to alcohols or acids and  $\text{CO}_2$ .

#### **fermentation layer (fermentasielaag)**

See F-layer.

#### **ferralic horizon (ferraliese horison)**

See diagnostic horizon.

#### **ferrallitic (ferrallities)**

A term originating in Africa describing highly weathered soils characterised by a clay fraction  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molecular ratio of less than 1,3, a friable consistence and a low cation exchange capacity of the clay separate which predominantly consists of kaolinite and/or sesquioxides. Amorphous compounds are often present, as is gibbsite. Primary weatherable minerals are generally absent. The main genetic processes are the loss of silica and bases and the relative accumulation of sesquioxides. See siallitic soil.

#### **Ferralsol (Ferralsol)**

A term originating in Africa for ferrallitic soils with more than 20% clay and with a low silt/clay ratio; it has apedal structure and less than 50% base saturation. See soil classification.

#### **ferran (ferraan)**

See micromorphology.

#### **ferric horizon (ferriese horison)**

See diagnostic horizon.



**ferricrete (ferrikreet)**

See hardpan.

**ferrihydrite (ferrihidriet)**

A poorly crystalline natural ferric oxide for which various formulae have been proposed, e.g.  $\text{Fe}_2\text{O}_3 \cdot 2\text{FeOOH} \cdot 2,6\text{H}_2\text{O}$  and  $5\text{Fe}_2\text{O}_3 \cdot 9\text{H}_2\text{O}$ . It appears as a reddish brown (rusty), voluminous precipitate, rich in absorbed water and often rich in adsorbed inorganic ions and organic matter.

**Ferrisol (Ferrisol)**

A term originating in Africa which refers to Latosols slightly less weathered than Ferralsols. Although, like Ferralsols, they have  $\text{SiO}_2/\text{Al}_2\text{O}_3$  ratios of less than 2, and less than 50% base saturation, Ferrisols have a structured B horizon, a higher silt/clay ratio and some primary weatherable minerals. The concept probably fits many mesotrophic members of the Shortlands form and certain members of the Hutton and Clovelly forms that exhibit some pedality.

**ferromagnesian (ferromagnesies)**

A term applied to silicate minerals containing iron and magnesium and to mafic and igneous rocks containing such minerals.

**ferruginous tropical soil (ysterryke tropiese grond)**

A class name originating in tropical pedology for soils generally similar to fersiallitic soils.

**fersiallitic (fersiallities)**

A term used in tropical pedology for soils less weathered than ferrallitic. The clay fraction  $\text{SiO}_2/\text{Al}_2\text{O}_3$  ratio is higher than that for ferrallitic soils and ranges up to about 2,3. Consistence is firmer (in fine textured soils) and the CEC of the clay separate (which in addition to 1:1 layer clays, contains 2:1 layer clays) is higher than in ferrallitic soils. Some primary weatherable minerals are usually present.

**fertigation (sproeibemesting)**

Application of plant nutrients in irrigation water to accomplish fertilization.

**fertility, soil (grondvrugbaarheid)**

See soil fertility.

**fertilizer burn (misstofbrand)**

See foliar burn.

**fertilization (bemesting)**

The addition of any material, organic or inorganic, to a soil for the purpose of supplementing the soil's reserves of essential plant nutrients.

**fertilizer (misstof)**

Any organic or inorganic material of natural or synthetic origin which supplies one or more of the nutrient elements essential for the growth and reproduction of plants.

**Fertilizer terms:**

*acid-forming fertilizer* - One that is capable of increasing soil acidity.

*bulk fertilizer* - Commercial fertilizer delivered to the purchaser, either in the solid or the liquid state, in a nonpackaged form.

*complete fertilizer* - A fertilizer containing all three primary plant nutrient elements (N, P and K).

*fertilizer analysis* - As applied to fertilizers, designates the actual percentage composition of the product as determined by a laboratory analysis.

*fertilizer grade* - The minimum guarantee of its plant nutrient content expressed as whole numbers in terms of nitrogen (N), phosphorous (P), and potassium (K) and the sum of their respective percentages, e.g. 2:3:2 (22) fertilizer contains  $\frac{2}{7} \times 22\%$  N,  $\frac{3}{7} \times 22\%$  P and  $\frac{2}{7} \times 22\%$  K.

*fertilizer liquid* - Fertilizer wholly or partially in solution that can be handled as a liquid, including clear liquids and liquids containing solids in suspension.

*fertilizer sidedressed* - Application made to the side of crop rows after plant emergence.

*fertilizer suspension* - A fluid fertilizer containing dissolved and undissolved plant nutrients. The undissolved plant nutrients are kept in suspension with a suspending agent, usually a swelling type clay. The suspension must be flowable enough to be mixed, pumped, agitated, and applied to the soil in a homogeneous mixture.

*fertilizer top-dressed* - A surface application of fertilizer to a soil after the crop has been established.

*granular fertilizer* - A fertilizer in which all fine particles are bound into granules of approximately 2 mm diameter by a physical granulation process, sometimes with the aid of a binding agent.

*inorganic fertilizer* - A fertilizer material in which carbon is not an essential component of its basic chemical structure. Urea is often considered an inorganic fertilizer because of its rapid hydrolysis to form ammonium ions in soil.

*mixed fertilizer* - A fertilizer containing two or more of the primary plant nutrient elements. Also referred to as a fertilizer mixture. (Note: All complete fertilizers are mixed fertilizers, but not all mixed fertilizers are complete fertilizers.)

*pop-up fertilizer* - Fertilizer placed in small amounts in direct contact with the seed.

*single (or straight) fertilizer* - A fertilizer containing only one of the primary plant nutrient elements (N, P or K).

**starter fertilizer** - Liquid or solid fertilizer, placed near or in contact with the seed or roots of new transplants, constituting a small proportion of the total fertilizer requirement.

**fertilizer carrier (misstofdraer)**

The actual chemical substance or compound which contains one or more of the plant nutrient elements.

**fertilizer requirement (bemestingsbehoefte)**

The quantity of certain plant nutrient elements needed, in addition to the amount supplied by the soil, to increase plant growth or yield to a designated level.

**fiducial mark (fidusiële merk)**

An index or point used as a basis of reference, e.g. one of usually four index marks connected with a camera lens (as on the metal frame that encloses the negative) and that forms an image on the negative or print such that lines drawn between opposing points intersect at, and thereby define, the central point of the photograph. Syn. collimating mark.

**field capacity (veldkapasiteit)**

See soil water : field capacity.

**fill (vulling)**

Man-made deposits of geological, soil and/or diverse waste materials.

**filter (drainage) (filter (dreinerings))**

A filter or protective envelope of any porous material whose openings are small enough to prevent movement of soil particles into the drain, but which is sufficiently pervious to offer little resistance to seepage.

**fine earth (fyngrond)**

Soil material that contains only particles < 2 mm in equivalent diameter; soil material from which all solid particles > 2 mm in equivalent diameter have been excluded.

**fines (fynmateriaal; fynfraksie)**

- (1) Very small particles, esp. those smaller than the average in a mixture of particles of various sizes, e.g. the silt and clay fraction in glacial drift, or the fine-grained sediment that settles slowly to the bottom of a body of water.
- (2) An engineering term for the clay- and silt-sized soil particles (diameters < 0,074 mm) passing U.S. standard sieve no. 200.

**fine sand (fynsand)**

See soil separates; soil texture.

**fine sand class (fynsandklas)**

See soil texture.

**fine sandy loam (fynsandleem)**

See soil texture.

**fine texture (fyntekstuur)**

The texture exhibited by soils consisting predominantly of the finer, i.e. silt and clay, separates; includes all textural classes except sand, loamy sand and sandy loam. Cf. coarse texture; medium texture; soil texture.

**fingering (vingervorming)**

The irregular advance of wetting or tracer fronts in a porous medium caused by heterogeneities in pore characteristics.

**finite difference method (eindige-verskilmetode)**

A mathematical technique employed in the solution of differential and partial differential equations, for example those describing transient water, salt and heat flow in soil. Basically the method involves replacement of the derivative at any point by the change in the appropriate variable over a small, finite interval. Consequently the solution is reduced to a set of algebraic equations describing a finite number of points.

**fireclay (vuurklei (vuurvaste klei))**

A siliceous clay rich in hydrous aluminium silicates, capable of withstanding high temperatures without deforming (either disintegrating or becoming soft and pasty), and useful for the manufacture of refractory ceramic products (such as crucibles, or firebrick for lining furnaces). It is deficient in iron, calcium, and alkalis, and approaches kaolin in composition, the better grades containing at least 35% alumina when fired. Syn. firestone; refractory clay; saggar.

**firm (consistence) (ferm (konsistensie))**

See soil consistence.

**fixation (vaslegging; fiksering)**

The process or processes in soil in which certain chemical elements essential for plant growth are converted from an available to an unavailable form, for example, phosphate fixation; potassium fixation.

**flaggy (plaveisteenhoudend)**

See coarse fragments.

**flagstone (plaveisteen)**

A relatively thin fragment, 15 to 40 cm long, of sandstone, limestone, slate, shale or rarely, of schist. Cf. coarse fragments.

**flint (vuursteen)**

A dense, black or dark-grey rock with conchoidal fracture composed of chalcedony and opal. Flint was the chief raw material of tools and weapons of the stone ages. Cf. chert.

**flocculation (flokkulasie)**

See deflocculation.

**flooding (vloedbesproeiing)**

See irrigation methods.

**flood irrigation (vloedbesproeiing)**

See irrigation methods.

**flood plain (vloedvlakte)**

The strip of relatively smooth land adjacent to a river channel, which is built of sediments during the present regime of the stream and which is covered with water when the river overflows its banks at flood stages.

**flora (flora)**

The sum total of the kinds of plants in an area at one time; the plant life of a region. Members of the plant kingdom.

**flownet (vloei-net)**

A graphical representation of stream lines and equipotential lines used in the study of water flow phenomena.

**flow, unsaturated (vloei, onversadigde)**

See soil water : unsaturated flow.

**flow velocity (vloeisnelheid)**

See soil water : flow velocity.

**fluorapatite (fluorapatiet)**

(1) A very common mineral of the apatite group:  $[\text{Ca}_3(\text{PO}_4)_2]_3 \cdot \text{CaF}_2$ . It is a common accessory mineral in igneous rocks. Syn. apatite.

(2) An apatite mineral in which fluorine predominates over chlorine and hydroxyl. Cf. apatite.

**fluorite (fluoriet)**

A transparent to translucent mineral:  $\text{CaF}_2$ . It is found in many different colours (often blue or purple) and has a hardness of 4 on Mohs' scale. Fluorite occurs in veins usually as a gangue mineral associated with lead, tin, and zinc ores.

**fluvial (fluviaal)**

Of or pertaining to rivers; growing or living in streams or ponds; produced by river action, as a fluvial plain. Hence: fluvial deposit.

**fluvioglacial (fluvioglasiaal)**

Pertaining to streams flowing from glaciers or to the deposits made by such streams. Cf. glaciofluvial deposit.

**Fluvisol (Fluvisol)**

See soil classification.

**flux (vloed)**

See soil water : flux.

**flux density (vloeddigheid)**

See soil water : flux density.

**foliar analysis (blaarontleding)**

The analysis of certain selected leaves or plant organs to indicate the nutrient status of plants; it is of use in the diagnosis of plant nutrient deficiencies of soils.

**foliar application (blaartoediening)**

Application of soluble fertilizer in the form of spray on the foliage of plants.

**foliar burn (blaarbrand)**

Injury to shoot tissue caused by dehydration due to contact with high concentrations of chemicals, e.g. certain fertilizers and pesticides.

**foliar diagnosis (blaardiagnose)**

A method of diagnosis of plant nutrient deficiencies or excesses by examining selected plant tissue, either by chemical analysis or visual symptoms such as colour and growth characteristics.

**folic horizon (foliese horison)**

See diagnostic horizon.

**food chain (voedselketting)**

A series of plant or animal species in a community, each of which is related to the others as a source of food.

**food cycle (voedselweb)**

All the interconnecting food chains in a community, also called food web.

**foraminifera (foraminifera)**

Unicellular animals mostly of microscopic size that secrete casts composed of calcium carbonate or build them by cementing together sedimentary grains with calcium carbonate.

**form, soil (grondvorm)**

See soil classification.

**fraction, soil (grondfraksie)**

See soil texture; soil separate.

**fragipan (brosbank)**

A loamy or (uncommonly) sandy subsurface horizon, very low in organic matter, with a high bulk density relative to the horizons above it, and slowly permeable to water. It is seemingly cemented when dry and, when moist, peds tend to rupture suddenly under pressure. Dry fragments slake or fracture when placed in water. See diagnostic horizon.

**fragment (brokstuk)**

See coarse fragments; Cf. clastic.

**friable (brokkelrig)**

The ease of crumbling of soils. Cf. soil consistence.

**frost heaving (vrieswelling)**

The uneven lifting or upward movement, and general distortion, of surface soils, rocks, vegetation, and other structures, such as pavements, due to internal frost action resulting from subsurface freezing of water and growth of ice masses (esp. ice lenses), and usually producing a frost mound. Syn. frost heave.

**fuller's earth (vollersaarde)**

A very fine-grained, naturally occurring earthy substance (such as clay or clay-like material) possessing a high adsorptive capacity, consisting largely of hydrated aluminium silicates (chiefly the clay minerals montmorillonite and palygorskite). Used to clean and thicken (full) cloth.

**fulvic acid (fulviensuur)**

Organic substances of indefinite composition which remain in solution when an aqueous alkaline extract of soil is acidified.

**fungi (fungi)**

Nucleated, usually filamentous, spore-bearing organisms devoid of chlorophyll; typically reproductive both sexually and asexually; living as parasites on plants, animals or other fungi, or as saprophytes on plant or animal remains, in aquatic, marine, terrestrial or subaerial habitats. Yeasts, mildews, rusts, mushrooms, and truffles are examples of fungi.

**furrow irrigation (voorbeproeing)**

See irrigation methods.

## G

### G horizon (G-horison)

See diagnostic horizon.

### gabbro (gabbro)

A group of dark-coloured, basic intrusive igneous rocks composed principally of basic plagioclase (commonly labradorite) and clinopyroxene (augite), with or without olivine and orthopyroxene; also, any member of that group. It is the approximate intrusive equivalent of basalt. Apatite and magnetite or ilmenite are common accessory minerals. Gabbro grades into monzonite with increasing alkali-feldspar content.

### gamma-ray attenuation (gammastraalafduuning)

A procedure, based on the fact that scattering and absorption of gamma rays are related to the density of matter in their path, whereby soil bulk density and water content may be determined.

### garnet (granaat)

A mineral group, formula  $A_3B_2(SiO_4)_3$  where  $A = Ca, Mg, Fe^{2+}, Mn^{2+}$  and  $B = Al, Fe^{3+}, Mn^{3+}, Cr$ . Common in metamorphic rocks and found in some granites, acid volcanic rocks and detrital sediments. Fairly resistant to weathering. Cf. accessory mineral.

### gas pressure potential (gasdrukpotensiaal)

See soil water : pneumatic potential.

### gel (jel)

An amorphous, colloidal mass that has not yet hardened.

### genesis (genese)

See soil genesis.

### genetic (geneties)

- (1) Resulting from, or produced by, soil-forming processes, for example, a genetic profile or a genetic horizon.
- (2) Pertaining to the study of genetics.

### geochemical cycle (geochemiese siklus)

The sequence of stages in the migration of elements during geologic changes such as weathering and soil formation. A major cycle, proceeding from magma to igneous rocks to sediment to sedimentary rocks to metamorphic rocks, and possibly through migmatites and back to magma, and a minor or exogenic cycle proceeding from sediment to sedimentary rocks to weathered material and back to sediments again, are distinguished.

### geochemistry (geochemie)

All aspects of geology that involve chemical changes. It includes the study of (i) the relative and absolute abundances of the elements and the atomic species (isotopes) in the earth, and (ii) the distribution and migration of the individual elements in the



various parts of the earth (the atmosphere, hydrosphere, lithosphere, pedosphere, etc.) and in minerals and rocks.

geogenic mottle (geogeniese vlek)

See mottled soil.

geological erosion (geologiese erosie)

See erosion. Cf. denudation.

geological time scale (geologiese tydskaal)

A scale used for dating past events in the earth's history, as indicated in the record of the rocks. The order of occurrence or formation of rocks, radioactive decay of certain elements and several other methods are used to establish chronology. The eras, periods and epochs and their ages are shown in the following diagram.

#### THE GEOLOGICAL TIME SCALE

ERA	PERIOD	EPOCH	TIME SCALE Million Years
CAINOZOIC OR CENOZOIC	QUATERNARY	Holocene or Recent	0,00
			0,01
			1,64
			5,20
			23,30
			35,40
			58,50
			65,00
			145,60
			208,00
			245,00
			290,00
			362,50
	408,50		
	439,00		
	510,00		
	570,00		
		Pleistocene	
	TERTIARY	Pliocene	
		Miocene	

		<b>Oligocene</b>
		<b>Eocene</b>
		<b>Paleocene</b>
<b>MESOZOIC</b>	<b>CRETACEOUS</b>	
	<b>JURASSIC</b>	
	<b>TRIASSIC</b>	
<b>PALEOZOIC</b>	<b>PERMIAN</b>	
	<b>CARBONIFEROUS</b>	
	<b>DEVONIAN</b>	
	<b>SILURIAN</b>	
	<b>ORDOVICIAN</b>	
	<b>CAMBRIAN</b>	
<b>PRE-CAMBRIAN (including PROTEROZOIC and ARCHAEOAN)</b>		

**geometric mean diameter (GMD) (geometrische gemiddelde diameter (GGD))**

A parameter used to quantify aggregate size distribution, usually following a wet-sieving analysis. It is defined as

$$\text{GMD} = \exp \left[ \frac{\sum_{i=1}^n w_i \ln \bar{x}_i}{\sum_{i=1}^n w_i} \right]$$

where  $\bar{x}_i$  = mean diameter of aggregate size class  $i$ .  
 $w_i$  = mass of aggregates in size class  $i$   
 $n$  = number of size classes used

C.f. mean weight diameter.

#### geomorphology (geomorfologie)

The science which deals with the form of the earth, the general configuration of its surface and the changes that take place in the evolution of land forms.

#### gibbsite (gibbsiet)

A mineral with a platy habit that occurs in highly weathered soils and in laterite:  $\text{Al}(\text{OH})_3$ .

#### gilgai (gilgai)

The microrelief of soils sometimes produced by swelling clays during prolonged expansion and contraction due to changes in water content; usually a succession of microbasins and microknolls in nearly level areas, or of microvalleys and microridges parallel to the direction of the slope. A feature common in Vertisols.

#### glacial drift (gletserpuin)

- (1) A general term for drift transported by glaciers or icebars, and deposited directly on land or in the sea. Cf. fluvioglacial. Syn. glacial deposit; glacial debris.
- (2) Rock debris transported by glaciers and deposited directly from the ice or from the melt water. The debris may or may not be heterogeneous.

#### glacial soil (obsolete) (gletsergrond (verouderd))

A soil derived from glacial drift.

#### glacial till (gletserkeileem)

See till.

#### glaciofluvial deposit (fluvioglasiale afsetting)

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. Cf. glacial drift; till.

#### glebule (glebule)

See micromorphology.

**glaucanite (gloukoniet)**

- (1) A dull-green, amorphous, and earthy or granular mineral of the mica group:  $K,Na(Al,Fe^{3+},Mg)_2(Al,Si)_4O_{10}(OH)_2$ . It has often been regarded as the iron-rich analogue of illite. Glaucanite occurs abundantly in greensand, and seems to be forming in the marine environment at the present time; it is the most common sedimentary (diagenetic) iron silicate and is found in marine sedimentary rocks from the Cambrian to the present. Glaucanite is an indicator of very slow sedimentation.
- (2) A name applied to a group of green minerals consisting of hydrous silicates of potassium and iron.

**gley (gley)**

A material that has been or is subject to intense reduction as a result of prolonged saturation with water. Grey, blue and green colours predominate, but stains of ferric and manganese oxides and hydrates (yellow, brown, red and black) may be present and indicate localized areas of better aeration. Grey colours are due to a depletion of iron compounds; blue and green are due to the presence of ferrous compounds. Gleyed sands are friable and clays firm when moist and usually hard to very hard when dry. Cf. hydromorphy.

**gleyic horizon (gleyiese horison)**

See diagnostic horizon: G horizon.

**gleying (vergleying)**

Soil mottling, caused by partial oxidation and reduction of its constituent ferric iron compounds, due to conditions of intermittent water saturation. The process is also called gleization. Also spelled : glei.

**gley soil (gleygrond)**

A soil developed under conditions of poor drainage resulting in reduction of iron and other elements and in grey colours and mottles.

**Gleysol (Gleysol)**

See soil classification.

**glossic horizon (glossiese horison)**

See diagnostic horizon.

**Glossisol (Glossisol)**

See soil classification.

**gneiss (gneis)**

A foliated rock formed by regional metamorphism in which bands or lenticles of granular minerals alternate with bands and lenticles in which minerals having flaky or elongated prismatic habits predominate.

**goethite (goethiet)**

A yellowish, reddish, or brownish-black mineral,  $\gamma\text{-FeO(OH)}$ . It is dimorphous with lepidocrocite,  $\alpha\text{-FeO(OH)}$ . Goethite is one of the most common minerals and is typically formed under oxidized conditions as a weathering product of iron-bearing

minerals. It also forms as a direct inorganic or biogenic precipitate from solutions. Syn. gothite; xanthosiderite.

**Gondwanaland (Gondwanaland)**

The southern continent that preceded the rupture and drifting apart of South America, Africa, peninsular India, Australia and Antarctica during the late Mesozoic.

**gradation (gradasie; vereffening)**

In geology, the bringing of a surface or a stream bed to grade through erosion, transportation and deposition by running water. Cf. aggradation; degradation.

**graded sediment (gradeerde (= vereffende) sediment)**

In geology, a sediment consisting chiefly of grains of the same size range. In engineering, a sediment having an even distribution of particles from coarse to fine.

**grain (korrel)**

A small, hard particle, usually larger than silt or clay size.

**granite (graniet)**

A coarse-grained, light-coloured plutonic rock consisting essentially of quartz and alkali feldspar. Sodic plagioclase is commonly present in small amounts and muscovite, biotite, hornblende and, rarely, pyroxene may be mafic constituents. Etymol. Latin *granum*, grain.

**granite gneiss (granietgneis)**

A coarsely crystalline, banded gneiss derived from a sedimentary or igneous rock with the mineral composition of granite.

**granodiorite (granodioriet)**

A coarse-grained plutonic rock consisting of quartz, oligoclase or andesine, and orthoclase with biotite, hornblende or pyroxene as mafic constituents. It is intermediate between quartz monzonite and quartz diorite and contains at least twice as much plagioclase as orthoclase.

**granophyric (granofiries)**

The texture of a porphyritic igneous rock in which the phenocrysts and groundmass penetrate each other, having crystallized simultaneously.

**grain-size analysis (deeltjegrootte-ontleding)**

See particle size analysis.

**granular fertilizer (korrelkunsmis)**

See fertilizer.

**granular soil (korrelrige grond (granulêre grond))**

See soil structure.

**granular structure (korrelstruktuur; granulêre struktuur)**

See soil structure; soil structure types.

**granule (korrel)**

A natural soil aggregate or ped that is relatively non-porous; consists of an accumulation of primary particles. Cf. soil structure.

**granulometric analysis (korrelgrootte-ontleding)**

Determination of the relative amounts of granules falling in various size classes, usually by wet-sieving and sedimentation analysis of a soil sample which has not been dispersed physically or chemically. Syn. aggregate-size analysis. Cf. aggregate stability.

**grassland (grasland)**

Land covered by herbaceous vegetation dominated by grasses (Graminae).

**grass waterway (graswaterbaan)**

A natural or constructed waterway covered with erosion-resistant grasses and used to carry water and reduce erosion.

**gravel (gruis)**

Consists of rock fragments between 2 mm and about 75 mm in diameter. Cf. soil separate.

**gravelly (gruiserig)**

A term used to describe a soil which contains appreciable or significant amounts of gravel. Cf. coarse fragments.

**gravimetric water content (gravimetrische waterinhoud)**

See soil water : water content.

**gravitational constant (gravitasiekonstante)**

The force ( $F$ ) exerted by the earth on a small mass ( $m$ ) near the earth's surface is given by  $F = GEm/R^2$ , where  $E$  is the mass of the earth,  $G$  the gravitational constant and  $R$  the radius of the earth. The acceleration due to gravity at the earth's surface ( $g$ ) is given by  $g = GE/R^2$ . It can be seen that  $g$  is not an absolute constant, whereas  $G$  is. It is, however, difficult to measure  $G$ ; its value is  $6,672 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$ . Cf. acceleration due to gravity.

**gravitational head (gravitasiehoogte)**

See soil water : gravitational head.

**gravitational potential (gravitasiepotensiaal)**

See soil water : gravitational potential.

**gravitational water (obsolete) (gravitasiewater (verouderd))**

Water which moves into, through, or out of the soil under the influence of gravity.

**gravity (gravitational) acceleration (gravitasieversnelling)**

See acceleration due to gravity.

**grazing capacity (drakrag; weidingspotensiaal)**

The maximum number of stock utilizing a unit land area without inducing damage to vegetation or related resources. Syn. carrying capacity; grazing potential.

**great soil group (hoofgrondgroep; grootgrondgroep)**

One of the categories in the system of soil classification that has been used in the United States for many years. See soil classification.

**green manure (groenbemesting)**

Green plant material, usually a legume, incorporated into the soil for the purpose of providing nutrients to the following crop; or to orchards and vineyards.

**Grey-brown Podzolic Soil (Grysbrown Podzolie Grond)**

A zonal great soil group consisting of soils with a thin, moderately dark A1 horizon and with a greyish-brown A2 horizon underlain by a B horizon containing a high percentage of bases and an appreciable quantity of illuviated silicate clay; formed on relatively young land surfaces, mostly glacial deposits, from material relatively rich in calcium, under deciduous forests in humid temperate regions.

**Grey Desert Soil (Gryswoestynggrond)**

See Sierozem. Cf. Desert soil.

**greywacke (grouwak)**

Any dark sandstone or grit having a matrix of clay minerals. Cf. grit.

**Greyzem (obsolete) (Greyzem (verouderd))**

See soil classification.

**grit (grint)**

- (1) Small hard particles of sand, earth, stone, etc.
- (2) A gritstone is any coarse sandstone that can be used as a grindstone or millstone.

**gritstone (grintsteen)**

See grit.

**ground (grond)**

- (1) The surface or upper part of the Earth.
- (2) Land, particularly a region or area.
- (3) The Afrikaans term also has the meaning of "soil".

**groundwater (ondergrondwater)**

That part of the subsurface water in the zone in which permeable rocks are saturated with water under pressure equal to or greater than atmospheric. This water may extend into overlying soil. Phreatic water. Cf. soil water: water table; phreatic line.

**Ground-water Laterite Soil (Grondwaterlaterietgrond)**

A great soil group of the intrazonal order and hydromorphic suborder, consisting of soils characterized by hardpans or concretionary horizons rich in iron and aluminium (and sometimes manganese) oxides that have formed immediately above the water table.

**groundwater level (ondergrondwatervlak)**

- (1) A synonym for groundwater table. See soil water : water table.
- (2) The surface at which the liquid pressure in the pores of soil or rock is equal to atmospheric pressure.

#### Ground-water Podzol Soil (Grondwaterpodzolgrond)

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 underlain by a whitish-grey leached layer, up to 1 m in thickness, in turn underlain by a brown, or very darkbrown, cemented hardpan layer; formed under various types of forest vegetation in cool to tropical, humid climates under conditions of poor drainage.

#### guano (ghwano (guano))

A fertilizer consisting of dried sea bird faeces and feathers; it is gathered on coastal islands where penguins, cormorants and gannets nest; dried and sold as fertilizer. Guano is rich in N and P.

#### gully (donga) (donga)

See donga; erosion.

#### gully erosion (donga-erosie)

See erosion.

#### gypsan (gipsaan)

See micromorphology.

#### gypsic horizon (gipsiese horison)

See diagnostic horizon.

#### Gypsisol (Gipsisol)

See soil classification.

#### gypsum (gips)

A mineral consisting of hydrous calcium sulphate:  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ . It is the commonest sulphate mineral, and is frequently associated with halite and anhydrite in evaporites. Etymol. Greek *gypsos*, chalk. Syn. gypsite; gyp; plaster stone; plaster of Paris.

#### gypsum requirement (gipsbehoefte)

The quantity of gypsum or its equivalent required to reduce the exchangeable sodium percentage of a given portion of soil to a desired level.



## H

### **H layer (H-laag)**

A layer occurring in mor humus consisting of well-decomposed organic matter of unrecognizable origin. The O<sub>2</sub> horizon. See soil horizon.

### **habitat (habitat)**

The environment in which the life requirements of a plant or animal organism, population, or community are supplied.

### **haematite (hematiet)**

See hematite.

### **haematomelanic acid (hematomelaniensuur)**

See hymatomelanic acid.

### **Half-bog Soil (Moerassige Grond)**

A great soil group, of the intrazonal order and hydromorphic suborder consisting of soil with dark-brown or black peaty material over greyish and rust-mottled mineral soil; formed under conditions of poor drainage under forest, sedge, or grass vegetation in cool to tropical humid climates.

### **halite (haliet)**

NaCl, cubic.

### **halloysite (halloysiet)**

A 1:1 aluminosilicate mineral similar in structure to kaolinite. Due to variations in hydration, halloysite has a variable interlayer spacing: 0,74 nm up to 1,0 nm compared with 0,72 nm for kaolinite. Electron micrographs of well crystallized kaolinite show six-sided flakes, whereas halloysite typically shows tubular crystal shapes.

### **halomorphic soil (halomorfe grond)**

Soils the properties of which are determined wholly or in part by the presence of neutral or alkali salts, or both.

### **halophyte (halofiet)**

A plant that grows naturally in saline soils.

### **hard (consistence) (hard (konsistensie))**

See soil consistence.

### **hardness scale (hardheidskaal)**

A standard of ten minerals by which the hardness of a mineral may be rated, viz. 1. Talc, 2. Gypsum, 3. Calcite, 4. Fluorite, 5. Apatite, 6. Orthoclase, 7. Quartz, 8. Topaz, 9. Corundum, 10. Diamond. Syn. Mohs' scale of hardness.

### **hardpan (hardebank)**

A massive material enriched with and strongly cemented by sesquioxides, chiefly iron oxides (also known as ferricrete, diagnostic hard plinthite, ironpan, ngubane, ouklip,

laterite hardpan), silica (silcrete, durban) or lime (diagnostic hardpan carbonate horizon, calcrete). Ortstein hardpans are cemented by iron oxides and organic matter. Cf. durban; nodule; induration; diagnostic horizon: hardpan carbonate horizon; hard plinthic B horizon.

hardpan carbonate horizon (hardebank karbonaathorison)  
See diagnostic horizon.

hard plinthic B horizon (harde plintiese B-horison)  
See diagnostic horizon.

hard plinthite (harde plintiet)  
See hardpan.

hard rock (harde rots)  
See diagnostic horizon.

head, hydraulic (hoogte, hidrouliese)  
See soil water : hydraulic head.

headwater (hoofwater)  
(1) The source of a stream.  
(2) The water upstream from a structure or point in a stream.

heat budget (hittebalans)  
The accounting of the total amount of heat received and lost by a particular system, such as a lake, a glacier, or the entire earth during a specific period. Syn. heat balance.

heat capacity (hittekapasiteit)  
The amount of heat required to raise the temperature of a unit volume, or mass, of soil by one degree. The units of volumetric heat capacity and of heat capacity on a mass basis, are  $\text{J m}^{-3} \text{ } ^\circ\text{C}^{-1}$  and  $\text{J kg}^{-1} \text{ } ^\circ\text{C}^{-1}$ , respectively.

heat flux density (hittevloeddigheid)  
See thermal flux.

heat of wetting (benattingswarmte)  
The adsorption of water upon clay surfaces is an exothermic process, resulting in the liberation of an amount of heat known as the heat of wetting. It results from a lowering of the free energy of water.

heave (opswel; rys)  
See swelling clay.

heaving soil (swelgrond)  
See swelling soil.

heavy metal (swaarmetaal)  
(1) Any of the transition elements, e.g. manganese, iron, cobalt, nickel, copper, zinc, silver, cadmium, tin, tantalum, platinum, gold, mercury, tellurium, lead, bismuth, etc.  
(2) Those metals with densities, of the pure metal, greater than  $5\,000 \text{ kg/m}^3$ .

**heavy mineral (swaarmineraal)**

A detrital mineral from a sedimentary rock, having a density higher than a standard (usually 2 850 kg/m<sup>3</sup>), and commonly occurring as a minor constituent or accessory mineral of the rock (less than 1% in most sands); e.g. magnetite, ilmenite, zircon, rutile, kyanite, garnet, tourmaline, sphene, apatite, biotite.

**heavy soil (obsolete) (swaar grond (verouderd))**

A soil with a high content of the fine separates, particularly clay, or one with a high drawbar pull and hence difficult to cultivate. Cf. fine texture.

**hectorite (hektoriet)**

See smectite.

**hematite (hematiet)**

A common iron mineral :  $\alpha\text{-Fe}_2\text{O}_3$ . It is dimorphous with maghemite and is the principal red pigment in soils, occurring as coatings on soil mineral particles in iron-rich soils under oxidizing conditions. Hematite occurs in splendent, metallic-looking, steel-grey or iron-black rhombohedral crystals, in reniform masses or fibrous aggregates, or in deep-red or red-brown earthy forms, and it has a distinctive cherry-red to reddish-brown streak and a characteristic brick colour when powdered. It is found in igneous, sedimentary, and metamorphic rocks both as a primary constituent and as an alteration product. Syn. haematite; red hematite; red iron ore; red ochre; rhombohedral iron ore; bloodstone.

**heterotroph (heterotroof)**

An organism capable of deriving carbon and energy for growth and cell synthesis by the utilization of reduced organic compounds. Cf. autotroph.

**hill (heuvel)**

An area where local relief is between 60 m and 600 m, and where slopes of more than 5% predominate.

**histic epipedon (histiese epipedon)**

See diagnostic horizon.

**histic H horizon (obsolete) (histiese H-horison (verouderd))**

See diagnostic horizon.

**histic horizon (histiese horison)**

See diagnostic horizon.

**Histosol (obsolete) (Histosol (verouderd))**

See soil classification.

**hogsback (skerprug)**

A ridge formed by the outcropping edge of tilted strata, hence any ridge with a sharp summit and steeply sloping sides, as an esker.

**hollow-tining (holtandbewaterking)**

A method of turf cultivation in which smallish soil cores are removed by a suitable coring implement, the purpose being to aerate the soil and to increase its porosity. Cf. tining.

**Holocene (Holoseen)**

See geological time scale.

**horizon, soil (grondhorison)**

See soil horizon.

**hornblende (hoornblende)**

The commonest mineral of the amphibole group :

$\text{Ca}_2\text{Na}(\text{Mg}, \text{Fe}^{2+})_4(\text{Al}, \text{Fe}^{3+}, \text{Ti})_3\text{Si}_6\text{O}_{22}(\text{O}, \text{OH})_2$ . It has a variable composition, and may contain potassium and appreciable fluorine. Hornblende is commonly black, dark green, or brown, and occurs in distinct monoclinic crystals or in columnar, fibrous, or granular forms. It is a primary constituent in many acid and intermediate igneous rocks (granite, syenite, diorite, andesite) and less commonly in basic igneous rocks, and it is a common metamorphic mineral in gneiss and schist.

**hornfels (hoornfels)**

A fine-grained, non-schistose metamorphic rock resulting from contact metamorphism of argillaceous rocks. Large crystals, either porphyroblasts or relic phenocrysts, may be present.

**hue (skakering)**

See soil colour.

**humic acid (humussuur)**

A mixture of dark-coloured substances of indefinite composition extracted from soil with dilute alkali and precipitated by acidification to pH 1 to 2.

**Humic Gley Soil (obsolete) (Humiese Gleygrond (verouderd))**

Soil of the intrazonal order and hydromorphic suborder that includes Wiesenboden and related soils, such as Half-Bog Soils, which have a thin muck or peat O2 horizon and an A1 horizon. Developed in wet meadows and in forested swamps.

**humic A horizon (humiese A-horison)**

See diagnostic horizon.

**humidity (humiditeit)**

- (1) Absolute humidity. The density of water vapour, generally expressed in grams per cubic metre.
- (2) Relative humidity. The ratio of the actual amount of water vapour present in the portion of the atmosphere under consideration to the quantity that would be there if it were saturated.

**humification (humifikasie)**

The process whereby the carbon of organic residues is transformed and converted to humic substances through biochemical and/or chemical processes.

**humic acid (humien)**

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

**humus (humus)**

- (1) That more or less stable fraction of the soil organic matter, remaining after the major portion of added plant and animal residues has decomposed; usually amorphous and dark coloured.
- (2) Includes the F and H layers in undisturbed forest soils. See soil organic matter; soil horizon: 01 and 02.

**humus-clay complex (klei-humus kompleks)**

See clay-humus complex.

**humus layer (humuslaag)**

The top portion of the soil which owes its characteristic features to the humus contained in it.

**hydrargic horizon sequence (hidrargiese horison-opeenvolging)**

See diagnostic horizon.

**hydrate (hidraat)**

See hydration.

**hydration (hidrasie)**

The chemical process by which water combines with a substance to form a hydrated compound. Hydration is important in the weathering of rocks and minerals as it changes the solubility of minerals. It is also a means by which colour changes occur in soils; the reddish to yellowish colours in many rocks and soils are due to the hydration of iron minerals.

**hydraulic conductivity (hidrouliese geleivermoë)**

See soil water : hydraulic conductivity.

**hydraulic gradient (hidrouliese gradiënt)**

See soil water : hydraulic gradient.

**hydraulic head (hidrouliese hoogte)**

See soil water : hydraulic head.

**hydraulic potential (hidrouliese potensiaal)**

See soil water : hydraulic potential.

**hydraulic pressure (hidrouliese druk)**

See soil water : hydraulic potential.

**hydraulic radius (hidrouliese straal)**

A characteristic length parameter linked with the hypothetical channels to which the porous medium is presumed to be equivalent. Measured as the ratio of the volume to the surface of the pore space, or the average ratio of cross-sectional area to the corresponding perimeter.

**hydrobiotite (hidrobiotiet)**

- (1) A light-green, trioctahedral, mixed layer clay mineral composed of interstratification of biotite and vermiculite.
- (2) A term applied originally to a biotite-like material high in water content.

**hydrodynamic dispersion (hidrodinamijska disperzija)**

A spreading phenomenon observed in porous media resulting from unequal liquid flow velocities in pores of different sizes, and with distance from the wall within pores. The dispersion phenomenon is observed as a s-shaped concentration versus time breakthrough curve following the introduction of a tracer to the inflow face of a liquid-conducting column.

**hydrogel (hidrojel)**

A gel with water as the liquid component (as opposed to organogels).

**hydrogen bond (vodonikova veza)**

The localized electrostatic attraction between a somewhat acidic hydrogen atom carrying a partial positive charge (as in the bonds O-H, F-H, N-H, etc.) and an electron-rich basic type atom (such as the oxygen in water, alcohols or ethers and the nitrogen in amines). The hydrogen bond is too long (in the order of 0,17 nm) for covalent character to be expected and is due to the charge arrangement in the two molecules concerned.

**hydrogenic soil (hidrogenijska zemlja)**

Soil developed under the influence of water standing within the profile for considerable periods; formed mainly in cold, humic regions.

**hydrograph (hidrograf)**

A graph showing, for a given point on a stream or conduit, the discharge, velocity, available power, or other property of water with respect to time.

**hydrologic cycle (hidrološki ciklus)**

The course taken by water in moving from the oceans to the land via evaporation and precipitation and returning via stream flow. The subsystem of the global energy system that regulates the flow of energy through the heat-exchange property of water.

**hydrology (hidrologija)**

The study of the occurrence, distribution and movement of water over, on and under the land-surface.

**hydrolysis (hidroliza)**

- (1) A chemical reaction between water and a salt with the resulting formation of a hydroxide and a weak acid.
- (2) A process of chemical weathering, a reaction involving water, strictly one in which a salt combines with water to form an acid and a base. E.g. the breakdown of feldspar, whereby colloidal silica is removed in solution and clays are formed.

**hydromica (hidromika)**

A hydrous dioctahedral aluminium silicate clay mineral with a 2:1 lattice structure and containing a considerable amount of potassium that serves as an additional bonding between the crystal units, resulting in particles larger than normal in smectites. It has a

smaller cation exchange capacity than montmorillonite. Sometimes referred to as illite or mica. Cf. smectite; illite.

**hydromorphic (hidromorf)**

See Hydromorphic soil; hydromorphy.

**Hydromorphic Soil (Hidromorfe Grond)**

A suborder of intrazonal soils, consisting of seven great soil groups, all formed under conditions of poor drainage in marshes, swamps, seepage areas, or flats. Cf. soil classification.

**hydromorphy (hidromorfie)**

A process of gleying and mottling resulting from the intermittent or permanent presence of excess water. Hydromorphic soils display evidence of this process.

**hydromulching (deklaagspuiting)**

The technique of spraying slurry of fibre, seed, fertilizer, and chemicals onto roadsides for erosion control.

**hydromuscovite (hidromuskoviet)**

A term applied loosely to any fine-grained, muscovite-like clay mineral commonly but not always high in water content and deficient in potassium. It is probably an illite.

**hydrophilic (hidrofiel)**

Describes a substance, such as a colloid, that has an affinity for water.

**hydrophobic (hidrofoob)**

Describes a substance, for example a fat, that repels water.

**hydrophyte (hidrofiet)**

A plant that thrives on an abundance of water.

**hydroponics (hidroponika)**

The technology whereby plants are grown without soil, i.e. by supplying nutrients by means of nutrient solutions, for the commercial production of food or ornamental plants.

**hydrostatic pressure (hidrostatiese druk)**

See soil water : hydrostatic pressure.

**hydrostatic pressure head (hidrostatiese drukhoogte)**

See soil water : hydrostatic pressure head.

**hydrostatic pressure potential (hidrostatiese drukpotensiaal)**

See soil water : hydrostatic pressure potential.

**hydrous oxides (hidro-oksiede)**

Partially hydroxylated oxides of Fe, Al, Mn and Ti, e.g. FeO(OH), AlO(OH) and MnO(OH). Together with amorphous aluminosilicates they are the most important clay-size minerals in soils. Syn. hydroxyoxide.

**hydroxyapatite (hidroksie-apatiet)**

- (1) A mineral of the apatite group :  $[\text{Ca}_3(\text{PO}_4)_2]_3 \cdot \text{Ca}(\text{OH})_2$ .
- (2) Also an apatite mineral in which hydroxyl predominates over fluorine and chlorine. Syn. hydroxylapatite. Cf. apatite.

**hygrometer (higrometer)**

Any instrument for measuring the humidity of air. The commonest is the wet and dry bulb thermometer or psychrometer. Cf. psychrometer.

**hygroscopic (higroskopies)**

Refers to a substance exhibiting the property of water uptake from the atmosphere.

**hygroscopic water (higroskopiese water)**

Water adsorbed by a dry soil from an atmosphere of high relative humidity, or 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% relative humidity at 25°C.

**hymatomelanic acid (hematomelaniensuur)**

The alcohol-soluble portion of the humic acid fraction of soil organic matter.

**hypabyssal (hipabissaal)**

Igneous rocks (e.g. dolerite) that have risen from the depths as magma but solidified mainly as intrusions such as dykes and sills before reaching the surface.

**hypercalcic horizon (hiperkalsiese horison)**

See diagnostic horizon.

**hypergypsic horizon (hipergipsiese horison)**

See diagnostic horizon.

**hypersthene (hipersteen)**

See pyroxene group of minerals.

**hyperthermic (hipertermies)**

See soil temperature.

**hypha (hife)**

The mycelium of a fungus which is a branching, filamentous structure with apical growth; the tubular cytoplasm contains the nuclei and may be divided by septa. Pl. hyphae. Cf. mycelium.

**hysteresis (histerese)**

See soil water : hysteresis.

**hysteresis loop (histereselus)**

See soil water : hysteresis; scanning curve.



# I

## **igneous rock (stollingsgesteente)**

Rock formed from the cooling and solidification of magma, and that has not been changed appreciably since its formation. Cf. basic rock; acid rock; extrusive rock; intrusive rock.

## **illite (illiet)**

- (1) A general name either for non-expandible mica of detrital or authigenic origin or for the micaceous component of interstratified systems as in illite-smectite.
- (2) The species illite (a constituent of argillaceous sediments) is a diagenetic dioctahedral mica of composition similar to muscovite. It differs from muscovite primarily in having poorer crystallinity, a lower K content and higher water content.

## **illuvial horizon (illuviale horison)**

See illuviation.

## **illuviation (illuviasie)**

The process of deposition of soil material (soluble and/or suspended) removed by percolating water from one horizon to another in the soil; usually from an upper to a lower horizon in the soil profile. Cf. eluviation.

## **ilmenite (ilmeniet)**

A black mineral found in igneous rocks as sedimentary deposits and in veins. It is the chief source of titanium. Composition : iron titanium oxide ( $\text{FeTiO}_3$ ).

## **imbalance (nutrients) (wanbalans (voedingstowwe))**

A ratio between any two or a number of plant nutrients or other elements in soils or plants, resulting in one or more nutrient deficiencies in plants and hence restricted plant growth or yield.

## **immature soil (onvolwasse grond)**

A soil with indistinct or only slightly developed horizons because of the relatively short time it has been subjected to the various soilforming processes. It is a soil that has not reached equilibrium with its environment. Also termed juvenile or young soil.

## **immobilization (immobilisasie)**

The conversion of an element from the inorganic to the organic form in microbial or in plant tissues.

## **imogolite (imogoliet)**

A naturally occurring gel-like hydrous aluminium silicate which has been shown by electronmicroscopy to consist of bundles of fine tubes, each about 2 nm in diameter. It has an approximate composition of  $1,5\text{SiO}_2 \cdot \text{Al}_2\text{O}_3 \cdot 2,5\text{H}_2\text{O}$ . The genesis and properties of imogolite are closely related to those of allophane.

## **impeded drainage (belemmerde dreinerings)**

A condition which hinders the movement of water through soils under the influence of gravity.

## **impermeable (ondeurlatend)**

The condition of a soil or other porous medium when the transmission of a fluid under a hydraulic gradient is zero or extremely slow.

**impervious (ondeurdringbaar)**

Refers to a material that is resistant to penetration by fluids or by roots.

**Inceptisol (Inseptisol)**

See soil classification.

**incise (insny)**

Cut down into, as a river cuts into a plateau.

**indicator plant (indikatorplant)**

Any plant that, by its presence, its frequency, or its vigour indicates any particular property of the site and particularly, but not exclusively, of the soil.

**induration (verharding)**

A brittle, hard consistence caused by cementing substances other than quartz and crystalline alumino-silicates. Common cementing agents are sesquioxides, lime and silica. Typically cementation is not altered by wetting. It may be continuous or discontinuous in a horizon. Cf. hardpan.

**infiltrability (infiltreerbaarheid)**

See soil water : infiltrability.

**infiltration (infiltrasie)**

See soil water : infiltration.

**infiltration rate (infiltrasietempo)**

See soil water : infiltration rate.

**infiltrometer (infiltrasiemeter)**

A device for measuring the rate of entry of fluid into a porous body, e.g. water into soil.

**inner-sphere complex (binnesfeerkompleks)**

A complex in which the ligands and central group are in direct contact. Cf. complex; outer-sphere complex.

**inoculation (enting; inenting)**

As an example, it is the process of introducing nitrogen-fixing bacteria or mycorrhizal fungi into soil or onto seed to enhance plant growth.

**inorganic fertilizer (anorganiese misstof)**

As opposed to organic fertilizer, it is a fertilizer consisting of inorganic substances. (Note: Urea is also regarded as an inorganic fertilizer.)

**inosilicate (inosilikaat)**

A class or structural type of silicate characterized by the linkage of the SiO<sub>4</sub> tetrahedra into linear chains by the sharing of oxygens. In a simple chain, e.g. pyroxenes, two oxygens are shared; in a double chain or band, e.g. amphiboles, half the SiO<sub>4</sub>

tetrahedra share three oxygens and the other half share two. The Si:O ratio of the former type is 1:3 and for the latter it is 4:11. Syn. chain silicate.

**insolation (insolasie)**

The rate at which radiant energy is incident directly from the sun per unit of horizontal area at any place on or above the surface of the earth. Its value depends upon : the solar constant; the distance of the point from the sun; the inclination of the sun's rays to the horizontal plane at the point under consideration and the transparency of the atmosphere.

**interaction (interaksie)**

- (1) Mutual or reciprocal action or influence between organisms, between organisms and environment, or between environmental factors.
- (2) Stimulating or inhibiting effects of plant nutrients on one another.

**interception loss (onderskepverlies)**

That portion of precipitation caught by the foliage, twigs and branches of trees, shrubs and other vegetation, lost therefrom by evaporation, and so prevented from reaching the surface of the soil.

**interceptor drain (onderskepdrein)**

A surface or subsurface drain or a combination of both, designed and installed to intercept flowing water.

**intercropping (menggewasverbouing)**

Growing two or more different crops at the same time on a plot. For example, a grain that depletes soil nitrogen and a legume that adds nitrogen to the soil may be intercropped. Cf. stripcropping.

**interface (tussenvlak)**

The boundary layer separating two phases or substances.

**interfluve (tussenriviergebied)**

The area between two adjacent streams flowing in the same general direction.

**intergrade (tussengraad)**

A soil which cannot be accommodated in a single class and which has some of the diagnostic features of two or more genetically related classes.

**intergranular pressure (tussenkorreldruk)**

See effective stress.

**interlayering (tussengelaagdheid)**

The regular or random arrangement of structural units of clay minerals in a clay, each unit differing from the adjacent unit either in composition or in crystallographic orientation.

**internal drainage (interne dreinerings)**

The flow of water within and through the solum.

**internal friction (interne wrywing)**

The portion of the shearing strength of a soil indicated by the term  $\rho \tan \Theta$  in Coulomb's equation :  $s = c + \rho \tan \Theta$ , where  $s$  = shearing strength,  $c$  = effective cohesion,  $\rho$  = effective stress and  $\Theta$  the angle of internal friction. It is usually considered to be due to the interlocking of the soil grains and the resistance to sliding between the grains.

**inter-row cropping (tussenryverbouwing)**

The practice of cultivating a crop between the rows of another crop, sometimes deliberately leaving space for such cropping.

**interstice (tussenruimte)**

The pore space or voids in soils and rocks.

**interstitial (tussenruimtelik)**

Derived from interstice, a minute crack or space separating solid particles.

**interstratified clay mineral (tussengelaagde kleimineraal)**

In these minerals different types of unit layers alternate in a regular or irregular manner, and may contain two or more different types, e.g. vermiculite with chlorite, mica with smectite and chlorite.

**intrazonal soil (intrazonale grond)**

An obsolete soil classification term referring to a soil with more or less well-developed soil characteristics that reflect the dominating influence of some local factor of topography, parent material, or time, over the normal effect of climate and vegetation.

**intrinsic permeability (intrinsieke permeabiliteit)**

See soil water : intrinsic permeability.

**intrusive rock (intrusiewe gesteente)**

A rock formed from the cooling and solidification of magma deep within the earth, resulting in a coarse-grained texture. Cf. extrusive rock; igneous rock. Syn. plutonic rock.

**ion (ioon)**

An atom or group of atoms that are positively charged (cations) because of the loss of one or more electrons, or that are negatively charged (anions) because of a gain of one or more electrons. Cf. anion; cation.

**ionic substitution (ioonsubstitusie)**

See isomorphous substitution.

**iron pan (ysterbank)**

See hardpan; laterite hardpan.

**irrigation efficiency (besproeiingsdoeltreffendheid)**

The ratio of the water actually consumed by evapotranspiration on a specified area to the amount of water diverted from the source onto the area. Cf. application efficiency; distribution efficiency; transmission efficiency; replenishment efficiency.

**irrigation (besproeiing)**

The artificial application of water to the soil for the benefit of growing crops.

### irrigation methods (besproeiingsmetodes)

An irrigation method is the manner in which water is artificially applied to an area. The methods and manner of applying the water are as follows:

*basin* - The water is applied rapidly to relatively level plots surrounded by levees. The basins are relatively large and range normally from 0,2 to 4,0 ha.

*border-strip* - The water is applied at the upper end of a strip or bed with earth borders to confine water to the strip (synonymous with irrigation-bed method).

*centre-pivot* - Sprinkler irrigation achieved by automatically rotating the sprinkler pipe or boom, which supplies water to the sprinkler heads or nozzles. Water is delivered to the centre or pivot point of the system. A circular or partly circular area is irrigated.

*check-basin* - The water is applied rapidly to relatively level plots surrounded by levees. Normally used in orchards where one to four basins per tree is used.

*corrugation* - The water is applied to small, closely-spaced furrows, frequently in grain and forage crops, to confine the flow of irrigation water to one direction.

*drip* - The water emerges from an emitter at low pressure and at a low flow rate to wet a given spot on the soil surface. Syn. trickle.

*flood* - The water is released from field ditches or low-pressure pipelines and allowed to flood over the land.

*furrow* - The water is applied to row crops in ditches made by tillage implements.

*irrigation-bed* - See border-strip.

*micro-irrigation* - Water is applied in small amounts with the specific aim to keep the matric potential high. The distribution system consists of a permanent pipe network with emitters which can be either drippers, microjets or micro sprinklers.

*sprinkler* - The water is sprinkled over the soil through rotating sprinklers operating under pressure. Several systems are possible, e.g. permanent, semi-permanent, hand-move or mechanized systems. In mechanized sprinkler systems the moving of water emitters (i.e. sprinklers, guns, spray booms) is mechanized to eliminate or decrease labour. Different systems such as centre-pivot, side-roll, linear-move, travel-gun, boom-irrigator and tow-line are used.

*subsurface irrigation* - The water is applied in open ditches or tile lines until the water table is raised sufficiently to wet the soil. Syn. subirrigation.

*trickle* - Syn. drip.

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

### irrigation requirement (besproeiingsbehoefte)

The quantity of water that must be artificially applied for crop production. It includes surface evaporation and other unavoidable water losses.

**isohyet (isohieet)**

A line on a map connecting points of equal rainfall.

**isomorphous series (isomorfe reeks)**

Two or more crystalline substances that display isomorphism. Their physical properties vary along a smooth curve. An example is olivine, usually found in nature as a solid solution of  $Mg_2SiO_4$  and  $Fe_2SiO_4$ , i.e. an isomorphous series between forsterite and fayalite. The exact lattice dimensions and other physical properties vary with change of the Mg:Fe ratio.

**isomorphous substitution (isomorfe substitusie)**

The replacement of one atom by another of similar size (but not necessarily of the same valence) in a crystal structure without disrupting or seriously changing the structure.

**isopleth (isopleet)**

A line connecting points of equal ratio.

**isostasy (isostasie)**

The tendency to maintain an even gravity balance at the earth surface despite denudation and deposition.

**isotherm (isotherm)**

- (1) A line on a map connecting points of equal temperature.
- (2) A curve on a graph showing the relationship between two variables at a constant temperature, e.g. adsorption isotherm, exchange isotherm, etc.

**isotope (isotoop)**

Isotopes of an element have an identical number of protons in their nuclei but differ in the number of their neutrons. Isotopes have the same atomic number, different atomic mass and almost but not quite the same chemical properties.

**isotropic (isotroop)**

- (1) Refers to a medium whose properties are the same in all directions, e.g. in crystal optics, said of a crystal whose physical properties do not vary according to crystallographic directions, e.g. light travels with the same speed in any direction. Cubic crystals and amorphous substances are usually isotropic.
- (2) Isotropic soil : Soil having similar properties in different directions at any given point; the term is normally used in the context of hydraulic properties and micromorphology. Cf. anisotropic soil.

## **J**

### **jarosite (jarosiet)**

A pale-yellow potassium iron sulphate mineral,  $\text{KFe}_3(\text{OH})_6(\text{SO}_4)_2$ .

### **jasper (jaspis)**

A variety of chert or chalcedony containing iron oxide impurities that give it various colours (red, brown, green).

### **jaspilite (jaspiliet)**

A rock consisting of jasper and iron oxides in alternating bands.

### **joint (naat)**

In geology, a fracture or parting which interrupts abruptly the physical continuity of a rock mass.

### **Jurassic (Jura)**

See geological time scale.

## K

### kaolinite (kandiet)

A name for the kaolin group of clay minerals, including kaolinite, nacrite, dickite and halloysite. Cf. kaolinite; nacrite; dickite; halloysite.

### kandic horizon (kandiese horizon)

See diagnostic horizon.

### kaolin (kaolien)

A subgroup name of aluminium silicates with a 1:1 layer structure. Kaolinite is the most common clay mineral in the subgroup. Also, a soft, usually white rock composed largely of kaolinite.

### kaolinite (kaoliniet)

A non-swelling clay mineral with a 1:1 crystal structure; i.e. each layer consists of one silicon-oxygen tetrahedral sheet and one aluminium oxide-hydroxide octahedral sheet. It has a CEC range of 5-10 cmol/kg. It is a member of the kandite group of minerals:  $Al_4(Si_4O_{10})(OH)_8$ .

### karst (karst)

A type of topography that is formed over limestone, dolomite, or gypsum by dissolution and that is characterized by closed depressions or sinkholes, caves, and underground drainage. Etymol. German, from the Slavic *kars*, a bleak, waterless place.

### Kastanozem (Kastanozem)

See soil classification.

### katabatic wind (katabatiese wind)

Downslope convectional flow of air, e.g. as a result of surface cooling at night. Also known as mountain wind.

### kieselguhr (kieselgoer)

See diatomaceous earth.

### kimberlite (kimberliet)

An intrusive igneous rock consisting largely of peridotite and often containing diamonds.

### knickpoint (knakpunt)

A break of slope in the hill-slope profile, or where a new erosion cycle intersects an older cycle. In a river system the knickpoint recedes upstream as erosion proceeds.

### krotovina (krotovien)

See crotovine.

### kurtosis (kurtose)



**A measure of the flatness or peakedness of a distribution curve. Kurtosis of a normal distribution is around 3. As values decrease below 3, the curve becomes flatter. Cf. sorting.**

**kyanite (kianiet)**

**$\text{Al}_2\text{SiO}_5$ , triclinic. Characterized by its bladed crystals, good cleavage and blue colour.**

## **L**

### **L layer (litter) (L-laag)**

The surface layer of the forest floor consisting of freshly fallen and easily recognizable leaves, needles, twigs, stems, bark, and fruits. This layer may be very thin or absent during the growing season. The 01 horizon. See soil horizon.

### **labile (labiel)**

Unstable; liable to displacement or change.

### **labile pool (labiele poel)**

The sum of the amount of an element in the soil solution and the amount thereof readily solubilized or exchanged when the soil is equilibrated with a salt solution.

### **labradorite (labradoriet)**

See feldspar group of minerals.

### **laccolith (lakkoliet)**

A concordant igneous intrusive body that has domed up the overlying rocks.

### **lacustrine deposit (meerafsetting)**

Material deposited in lake water and later exposed either by lowering of the water level or by the elevation of the land.

### **lamella (lamella)**

- (1) A lamella is a wavy, horizontally orientated layer, in a vertical section often branched and which, relative to the surrounding soil, is enriched in one or more of aluminosilicate clays, sesquioxides and organic matter.
- (2) Any thin or plate-like structure, e.g. a layer of cells.

### **laminar flow (laminêre vloei)**

Flow in which there are no cross currents or eddies and where the fluid elements move in approximately parallel directions.

### **land (land)**

- (1) The exposed part of the earth's surface as distinguished from the submerged part.
- (2) The total natural environment of the exposed part of the earth's surface, including atmosphere and climate, soils and vegetation, animals, surface water and geological formations.
- (3) The total natural and cultural environment.

### **land capability (landvermoë)**

This is the extent to which land can meet the needs of one or more uses under defined conditions of management, including climate, on the total suitability for use without damage for crops that require regular tillage, for grazing, for woodland, and for wildlife. A more general term than land suitability and more conservation orientated. Cf. land suitability. Land capability involves consideration of (i) the risks of land damage from erosion and other causes and (ii) the difficulties in land use owing to physical land characteristics, including climate.

**land capability class (landvermoëklas)**

A grouping that contains land with similar capabilities. The classes defined in two classification systems are outlined below:

**(1) The South African Land Capability Classification (Scotney *et al*, 1987):**

*(a) Arable land capability classes*

**Class I:** Land in Class I has few permanent limitations that restricts its use and has very high potential for intensive crop production.

**Class II:** Land in Class II has some permanent limitations that reduce the degree of intensity of crop production but is nevertheless of high potential.

**Class III:** Land in Class III has severe permanent limitations that restrict the choice of alternative uses and the intensity of crop production and is of moderate potential.

**Class IV:** Land in Class IV has very severe permanent limitations that greatly restrict the choice of alternative uses and the potential for crop production.

*(b) Non-arable land capability classes*

**Class V:** Land in Class V is unsuitable for the cultivation of annual crops, but has very slight erosion hazard under natural veld, established pastures, forestry or special crops.

**Class VI:** Land in Class VI has permanent limitations that make it unsuited to cultivation and limit its use to natural grazing, veld re-inforcement, afforestation or wildlife.

**Class VII:** Land in Class VII has very severe permanent limitations that render it unsuitable for cultivation or intensification and restrict its use to natural grazing, afforestation or wildlife.

**Class VIII:** Land in Class VIII has permanent limitations that preclude its use for commercial plant production and restrict its use to wildlife, recreation, water supply or aesthetic needs.

**(2) The US Soil Conservation Service Classification (Soil Conservation Society of America, 1976):**

*(a) Land suitable for cultivation and other uses*

**Class I:** Soils that have few limitations restricting their use.

**Class II:** Soils that have some limitations, reducing the choice of plants or requiring moderate conservation practices.

**Class III: Soils that have severe limitations that reduce the choice of plants or require special conservation practices, or both.**

**Class IV: Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.**

*(b) Land generally not suitable for cultivation (without major treatment)*

**Class V: Soils that have little or no erosion hazard, but that have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.**

**Class VI: Soils that have severe limitations that make them generally unsuited for cultivation and limit their use largely to pasture or range, woodland or wildlife food and cover.**

**Class VII: Soils that have very severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife.**

**Class VIII: Soils and landforms that preclude their use for commercial plant production and restrict their use to recreation, wildlife, water supply, or aesthetic purposes.**

**land capability classification (landvermoëklassifikasie)**  
See land capability class.

**land capability map (landvermoëkaart)**  
A map showing the distribution of land capability units, subclasses and classes.

**land characteristic (landkenmerk)**  
An attribute of land that can be measured or estimated.

**land classification (landklassifikasie; terrein-)**  
The arrangement of land units into classes and categories based on the properties of the land or its suitability for some particular purpose.

**land evaluation (matching) (landevaluering (passing))**  
See matching (land evaluation).

**landform (landvorm)**  
A three-dimensional part of the land surface, formed of soil, sediment, or rock that is distinctive because of its shape, that is significant for land use or to landscape genesis, that repeats in various landscapes, and that also has a fairly consistent position relative to surrounding landforms.

**land limitation (landbeperking)**  
Any land characteristic which adversely affects the potential of land for a specified kind of use.

**land reclamation (landherwinning)**

Making land capable of more intensive use by changing its general character, as by drainage of excessively wet land; irrigation of arid or semi-arid land; or recovery of submerged land from seas, lakes and rivers. Large-scale reclamation projects usually are carried out through collective effort. Simple improvements, such as cleaning of stumps or stones from land, should not be referred to as land reclamation.

**landscape (landskap)**

All the natural features, such as fields, hills, forests, and water that distinguish one part of the earth's surface from another part; usually that portion of land or territory which the eye can comprehend in a single view.

**landslide (grondverskuiwing)**

- (1) A mass of material that has slipped downhill under the influence of gravity, frequently occurring when the material is saturated with water.
- (2) Rapid movement downslope of a mass of soil, rock or debris.

**land suitability (landgeskiktheid)**

The suitability of a given type of land for a specified kind of land use.

**land type (landtipe)**

- (1) A class of land with specified characteristics.
- (2) In South Africa it has been used as a map unit denoting land, mappable at 1:250 000 scale, over which there is a marked uniformity of climate, terrain form and soil pattern.

**land use (landgebruik)**

The use to which land is put.

**land use plan (landgebruikplan)**

The key elements of a comprehensive plan; describes the recommended location and intensity of development for public and private land uses such as residential, commercial, industrial, recreational and agricultural.

**laterite (lateriet)**

See hardpan; lateritic weathering.

**laterite hardpan (lateriet-hardebank)**

Synonymous with ironpan (see hardpan). It is not the result of lateritic weathering but the absolute accumulation of sesquioxides (mainly iron) in the zone of a fluctuating water table.

**lateritic duripan (lateriet-duribank)**

See duripan.

**Lateritic Soil (Lateritiese Grond)**

A suborder of zonal soils formed in warm, temperate, and tropical regions and including the following great soil groups: Yellow Podzolic, Red Podzolic, Yellow-brown Lateritic and Lateritic. Cf. soil classification; Latosol.

**lateritic weathering (lateritiese verwering)**

A term used to describe the process of soil formation which, in freely drained conditions, results in a loss of Ca, Mg, K, Na and silica and a relative accumulation of sesquioxides. It leads to the formation of fersiallitic and ferrallitic soils. Laterite hardpan is not the result of lateritic weathering but of the absolute accumulation of sesquioxides (chiefly iron) in the zone of a fluctuating water table.

#### **Latosol (Latosol)**

- (1) A general term in tropical pedology for soils that have reached a fairly advanced stage of lateritic weathering.
- (2) A suborder of zonal soils including soils formed under forested, tropical, humid conditions and characterized by low silica-sesquioxide ratios of the clay fractions, low cation-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 soil classification; Lateritic Soil; Oxisol; Ferralsol.

#### **lattice (rooster)**

The three-dimensional regular array of atoms in a crystal. Cf. layer; sheet.

#### **lava (lawa)**

- (1) Molten rock that issues from a volcano or a fissure in the earth's surface.
- (2) The same rock when cooled and solidified.

#### **layer (laag)**

A repetitive unit of a layer lattice mineral, consisting of a number of sheets. The atoms within a layer are more strongly bonded to each other than are the atoms of adjoining layers. Cf. lattice; sheet.

#### **layer silicate (fillosilikaat; laagsilikaat)**

Syn. phyllosilicate.

#### **layer silicate mineral (laagsilikaatmineraal)**

A mineral with the sheet silicate structure of the phyllosilicates. Cf. phyllosilicate.

#### **leach (loog)**

The removal of soluble constituents by percolating water. Cf. eluviation; illuviation.

#### **leachate (loogwater)**

The liquid that has percolated through a soil and that contains substances in solution or suspension.

#### **leaching fraction (logingsfraksie)**

The fraction of applied irrigation water passing through the root zone under a given water management regime.

#### **leaching requirement (logingsvereiste)**

The leaching requirement (LR) is the minimum leaching fraction which can be relied upon to control salts to within the tolerance of the particular crop grown, considering the quality of the water used. The leaching requirement equation is given by

$$LR = EC_{iw} / \text{maximum } EC_{dw}$$

where  $EC_{iw}$  refers to the electrical conductivity of the irrigation water, and maximum  $EC_{dw}$  reflects the maximum permissible salinity (electrical conductivity) of the percolating water draining from the root zone, and which results from the removal of water by the particular crop in meeting its water requirement for growth. This approach is strictly speaking applicable only for steady state conditions assuming that no precipitation or dissolution of salts occurs in the profile.

**leaf analysis (blaarontleding)**

The analysis of a specified leaf or leaves of a plant for its content of one or more elements, mostly plant nutrients.

**legend, map (legende, kaart-)**

A list, usually shown as marginal information on a map, giving an explanation of or identifying symbols used in the map.

**lens (lens)**

In geology, a body of rock or unconsolidated sediment, thick in the middle and thinning towards the edges.

**lepidolite (lepidoliet)**

A mineral of the mica group:  $K(Li,Al)_3(Si,Al)_4O_{10}(F,OH)_2$ . It commonly occurs in rose- or lilac-coloured masses made up of small scales, as in pegmatites. Syn. lithium mica; lithia mica; lithionite.

**lepidocrocite (lepidokrosiet)**

A common minor constituent of soil clays in humid temperate regions,  $\gamma$ -FeOOH. It is found in non-calcareous seasonally waterlogged soils in which oxidizing and reducing conditions alternate, frequently as strong orange coloured mottles. In soils of tropical regions maghemite ( $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>) appears to take its place.

**Leptosol (Leptosol)**

See soil classification.

**leucoxene (leukokseen)**

A general term for fine-grained, opaque, whitish alteration products of ilmenite, commonly consisting mostly of rutile and partly of anatase or sphene, and occurring in some igneous rocks. The term has also been applied to designate a variety of sphene.

**levee (oewerwal)**

A natural or artificial embankment along a river or stream.

**lichen (ligeen)**

A composite organism formed from the symbiotic association of certain fungi and a green alga or cyanobacterium, forming a simple thallus, found encrusting rocks, tree trunks, etc., often in extreme environments.

**ligand (ligand)**

See complex.

**light soil (obsolete) (ligte grond (verouderd))**

A coarse-textured soil with a low drawbar pull and, hence, easy to cultivate. Cf. coarse texture; soil texture.

**lignin (lignien)**

Organic substances associated with the cellulose in plant cell walls, especially xylem.

**lignite (ligniet)**

A brownish-black coal; in the alteration of vegetal material it has proceeded further than peat but not so far as sub-bituminous coal.

**limburgite (limburgiet)**

A dark-coloured, porphyritic extrusive igneous rock having olivine and clinopyroxene as phenocryst minerals in an alkali-rich glassy groundmass. The latter may have microlites of clinopyroxene, olivine, and opaque oxides; some nepheline and/or analcime may be present, and feldspars are typically absent. Its name is derived from Limburg, Germany. Syn. magma basalt.

**lime (kalk)**

Calcium oxide, CaO. Loosely used for calcium carbonate and calcium hydroxide.

**lime, agricultural (landbouwkalk)**

A soil amendment consisting principally of calcium carbonate but may include magnesium carbonate and other materials, used to neutralize soil acidity and to supply calcium and magnesium for the growth of plants. Calcium carbonate is often termed agricultural or calcitic lime to distinguish it from dolomitic lime. Dolomitic lime contains at least 15% MgCO<sub>3</sub> while calcitic lime contains less than 15% MgCO<sub>3</sub>. Recognized agricultural lime contains at least 70% CaCO<sub>3</sub> equivalent and its degree of fineness must be such that at least 30% passes through a 250 μm sieve (60 mesh US) and 100% passes through a 1700 μm sieve (10 mesh US).

**lime chlorosis (kalkchlorose)**

A yellowing (chlorosis) of plant leaves due to a deficiency of a micronutrient in a calcareous soil.

**lime concretion (kalkkonkresie)**

An aggregate of precipitated calcium carbonate, or of other material cemented by precipitated calcium carbonate.

**lime pan (kalkbank)**

A hardened layer cemented by calcium carbonate.

**lime potential (kalkpotensiaal)**

The value of  $\text{pH} - \frac{1}{2}\text{p}(\text{Ca} + \text{Mg})$ , or  $-\log_{10}a_{\text{H}}/(a_{\text{Ca}+\text{Mg}})^{1/2}$ . Some soil scientists consider the lime potential to be a more characteristic soil property than pH, since it remains essentially constant under conditions that cause the pH to change.

**lime requirement (kalkbehoefte)**



The mass of agricultural lime of specified physical properties, or other specified liming material, required to raise the pH of a given mass of soil (area and depth) to a desired value under field conditions.

**limestone (kalksteen)**

A sedimentary rock consisting mainly of calcium carbonate, deposited as the calcareous remains of marine animals, or chemically precipitated from the sea; used as a building stone, for the manufacture of cement, lime, agricultural lime, etc.

**limestone ammonium nitrate (LAN) (kalksteenammoniumnitraat (KAN))**

A nitrogenous fertilizer containing approximately 28% N and 20%  $\text{CaCO}_3$  Abbr. LAN. See ammonium nitrate.

**liming (bekalking)**

The application of agricultural lime or a liming material to land, primarily to reduce soil acidity and supply calcium for plant growth. Dolomitic lime supplies both calcium and magnesium for plant growth. Cf. agricultural lime.

**liming material (bekalkingsmateriaal)**

Any material used in agriculture to raise the pH of acid soils to a satisfactory level; it can contain  $\text{Ca(OH)}_2$ ,  $\text{CaCO}_3$ ,  $\text{CaMg(CO}_3)_2$  or other neutralizing substances.

**limnology (limnologie)**

The study of bodies of fresh water with reference to their plant and animal life, physical and chemical properties, geographical features, etc.

**limonite (limoniet)**

A common brown, black, or yellow amorphous secondary mineral that consists of hydrated ferric oxides:  $\text{FeO(OH).nH}_2\text{O} + \text{Fe}_2\text{O}_3.\text{nH}_2\text{O}$ .

**linear extensibility (lineêre uitsetting)**

See coefficient of linear extensibility.

**line of seepage (sypellyn)**

The free-water surface of a zone of seepage. Syn. phreatic line.

**liquid fertilizer (vloeibare misstof)**

See fertilizer.

**liquid limit (vloeigrens)**

See Atterberg limits.

**liquid waste (vloeibare afval)**

A general term denoting pollutants such as soap, chemicals or other substances in liquid form.

**liquid ratio (vloeistofverhouding)**

See soil water : liquid ratio.

**lithocutanic B horizon (litokutaniese B-horison)**

See diagnostic horizon.

**lithologic discontinuity (litologiese diskontinuiteit)**

- (1) A boundary or layer at depth, marked by a significant change in the speed of transmission of seismic waves.
- (2) In soil science, a term used to designate two contrasting soil materials or horizons indicative of different origins. Often used in detailed soil profile descriptions.

**lithology (litologie)**

The study and description of the mineralogical composition and texture of rocks using megascopic procedures. The study of rocks using thin section procedures and chemical analysis is known as petrography.

**lithosequence (litoreeks)**

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.

**Lithosol (obsolete) (Litosol (verouderd))**

See soil classification.

**lithosol (litosol)**

Soils (usually shallow) consisting of freshly and imperfectly weathered rock or rock fragments with no clearly expressed soil morphology. Syn. skeletal soils.

**lithosphere (litosfeer)**

The solid part of the earth, as opposed to the atmosphere and hydrosphere.

**litter layer (afvallaag)**

A layer of dead plant material upon the soil's surface.

**littoral (litoraal)**

- (1) Pertaining to the benthic ocean, environment, or depth zone between high water and low water; also pertaining to the organisms of that environment.
- (2) Pertaining to the depth zone between the shore and a depth of about 200 m.

**Lixisol (Lixisol)**

See soil classification.

**loam (leem)**

A soil textural class. See soil texture.

**loamy (leem-)**

Intermediate in texture and properties between fine and coarse classes with the words "loamy" and "loam" as a part of the class name, such as clay loam, loamy sand, loamy coarse sand, loamy fine sand. See soil texture.

**loess (loes)**

A sediment, commonly non-stratified and unconsolidated, composed dominantly of silt-size particles, ordinarily with accessory clay and sand, usually highly calcareous, deposited primarily by wind.

**loose (los)**

A soil consistence term. See soil consistence.

**low biuret urea (laebiuretureum)**

An urea fertilizer, specially manufactured to contain less than 0,3% biuret for use as a foliar spray and on crops sensitive to biuret toxicity.

**lower plastic limit (uitrolgrens)**

See Atterberg limits.

**lunette (lunette)**

Dunes formed as arcuate mounds on the lee side of deflated basins or depressions, pans, lagoon or river segments. They may be composed either of normal quartz dune sand, or of soil aggregates, and are a feature of arid and semi-arid areas.

**luvic (luvies)**

A term that refers to a soil in which the essential characteristic is the markedly higher clay content in the B horizon relative to the A or E horizons. The clay increase is mainly due to illuviation. Cf. diagnostic horizon.

**luvic B horizon (luviese B-horison)**

See diagnostic horizon.

**Luvisol (Luvisol)**

See soil classification.

**luxury uptake (luukse opname)**

The absorption by plants of nutrients in excess of their need for growth. Luxury concentrations during early growth may be utilized in later growth.

**lysimeter (lisimeter)**

A device employed under field conditions and preferably utilizing a block of undisturbed soil, for measuring percolation and losses of nutrients and other salts through leaching, under controlled conditions, from a column of soil; or for measuring gains (precipitation and condensation) and losses (evapotranspiration) of water by a column of soil.

## M

### macronutrient (makrovoedingstof)

A chemical element necessary in relatively large amounts (usually more than 500 mg kg<sup>-1</sup> in the plant) for the growth of plants. These elements are C, H, O, Ca, Mg, K, S, N and P.

### macroorganism (makroörganisme)

Those organisms retained on a U.S. standard sieve no. 30 (openings of 0,589 mm); those organisms visible to the unaided eye. See microorganisms.

### macropore flow (makroporievloei)

The flow of water and chemicals through the macropores of a soil, as distinguished from the total and micropore flow. Cf. preferential flow.

### made land (opgevlude land)

Areas filled with earth; or with earth and trash mixed, usually by or under the control of man. Syn. fill.

### mafic (mafies)

Pertaining to or composed dominantly of magnesian rock-forming silicates. Contrast with felsic. In general, synonymous with "dark minerals".

### maghemite (maghemiet)

A strongly magnetic mineral of the magnetite series in the spinel group:  $\gamma\text{-Fe}_2\text{O}_3$ . It is dimorphous with hematite. Syn. oxymagnetite.

### magma (magma)

The hot material, partly or wholly liquid, from which igneous rocks form. Where magma erupts to the surface, it is commonly known as lava. At the surface cooling is rapid and fine-grained rocks are formed (extrusive rocks). Where magma is unable to reach the surface, it cools more slowly and a coarse-textured (intrusive) rock results. Most magmas are silicate melts with associated crystals and gas. Cf. lava; intrusive rock; extrusive rock; igneous rock.

### magnesite (magnesiet)

A white to greyish, yellow or brown mineral,  $\text{MgCO}_3$ . It is isomorphous with siderite. Magnesite is generally found as earthy masses of irregular veins resulting from the alteration of limestones and dolomite rocks by magmatic solutions or of rocks rich in magnesium silicates (such as olivines). It is an ore of magnesium and is used chiefly in making refractories and magnesia.

### magnetite (magnetiet)

A black, isometric, strongly magnetic, opaque mineral of the spinel group:  $(\text{Fe,Mg})\text{Fe}_2\text{O}_4$ . It often contains variable amounts of titanium oxide, and it constitutes an important ore of iron. Magnetite commonly occurs in octahedrons and is also granular or massive; it is a very common and widely distributed accessory mineral in rocks of all kinds, in orebodies as a magmatic segregation, in lenses enclosed in schists and gneisses, in igneous rocks as a primary mineral or as a secondary alteration product, in placer deposits, and as a constituent or heavy mineral in sands. Syn. magnetic iron ore; octahedral iron ore.

**mangan (mangaan)**

See micromorphology.

**man-made soil deposit (mensgemaakte grondafsetting)**

See diagnostic horizon.

**mantle (mantel)**

The zone lying between the Earth's crust and core, approximately 2300 km thick. Cf. crust (earth).

**manure (mis)**

- (1) The excreta of animals, with or without the admixture of bedding or litter, in varying stages of decomposition, e.g. stable manure, barnyard manure, kraal manure, etc.
- (2) Any fertilizer; to apply fertilizing materials to soil. Cf. fertilizer.

**map, soil (grondkaart)**

See soil map.

**map unit (of a soil map) (kaartenheid (van 'n grondkaart))**

See soil map unit; soil association; soil complex; soil consociation.

**marble (marmer)**

A metamorphosed form of limestone or dolomite in which the grains are recrystallized.

**margalitic (margalities)**

Refers to A horizons with strongly developed structure that are dark coloured with a high base status, Ca and Mg being the predominant exchangeable cations.

**marl (mergel)**

A general term for calcareous clay or calcareous loam. A calcareous clay or intimate mixture of clay and particles of calcite or dolomite, usually fragments of shells. In the USA the term marl is chiefly applied to incoherent calcareous sands, but elsewhere compact impure limestones are also called marls.

**marsh (moeras)**

A periodically wet or continually flooded area where the surface is not deeply submerged; covered dominantly with sedges, cattails, rushes, or other hydrophytic plants. Subclasses included are freshwater and saltwater marshes. A tidal marsh is a low, flat area traversed by interlacing channels and tidal sloughs and periodically inundated by high tides; vegetation usually consists of salt-tolerant plants. Cf. swamp.

**mass flow (ions) (massavloei (ione))**

- (1) The process by which ions are transported in the soil with flowing water as a result of water potential differences (gradients).
- (2) The process through which soluble plant nutrients are transported into and within the conducting tissues of a plant as a result of liquid pressure gradients.

**massive (massief)**

See soil structure.

**matching (land evaluation) (passing (landevaluering))**

Comparison of the requirements and tolerances of a land utilization type with the characteristics and qualities of each type of land in order to determine the suitability of each type of land for each envisaged kind of land use; the most crucial process in land evaluation.

**mathematical model (wiskundige model)**

A mathematical model is a formal expression of the relationships between defined variables that enables predictive statements to be derived from the relationships. It may be as simple as a single equation relating one variable to another, or it may involve the interaction of many equations having several mutually dependent variables. Cf. simulation model. Several types of mathematical models are distinguished (not necessarily mutually exclusive):

*analytic models* - Those for which explicit formulae are derived, or are based on equations that are derived primarily from theoretical considerations. They include those for which analytic solutions of differential equations may be obtained, and regression models.

*deterministic models* - Models for which the predicted values may be computed exactly; the output(s) is (are) determined completely in terms of the input(s).

*mechanistic models* - A subclass of deterministic models (sometimes used synonymously therewith). They are integrative and more concerned with mechanism; they contribute to understanding and are sometimes called explanatory.

*empirical models* - Obtained by using statistical methods to fit one of several possible equation types to experimental data. Regression equations are typical. Such models do not depend upon a theoretical understanding of the system being described.

*stochastic models* - In these models statistics play a part; some of the processes vary according to some probability distribution and correspondingly, the predicted values will vary.

*dynamic models* - They predict how a system unfolds with the passage of time; the time course of events.

**matric potential (matrikspotensiaal)**

See soil water : matric potential.

**matric pressure (matriksdruk)**

See soil water : matric pressure.

**matric pressure head (matriksdrukhoogte)**

See soil water : matric pressure head.

**matric suction (matrikssuiging)**

See soil water : matric suction.

**matrix (matriks)**

- (1) The soil framework consisting of the spatially arranged solid particles which enclose the soil air, soil water and biological component.
- (2) Natural material in which larger particles are embedded.

**mature soil (volwasse grond)**

A soil which has had sufficient time to develop fully in its present environment.

**mean diameter (gemiddelde diameter)**

See geometric mean diameter; mean weight diameter.

**meander (meander)**

One of a series of loop-like bends in the course of a stream, developed when the stream is flowing at grade, through lateral shifting of its course toward the convex sides of the original curves.

**meander land (meanderland)**

Unsurveyed land along a lake shore or stream border that has developed by the receding of the shore line or of the stream since the last cadastral survey of the area. A miscellaneous land type.

**mean weight diameter (MWD) (gemiddelde-massa diameter (GMD))**

A parameter used to quantify aggregate size distribution, usually based on a wet-sieving analysis. It is defined as

$$\text{MWD} = \frac{\sum_{i=1}^n \bar{x}_i w_i}{n}$$

where  $\bar{x}_i$  = mean diameter of aggregate size class  $i$ .  
 $w_i$  = fraction of total sample mass occurring in size class  $i$ .  
 $n$  = number of size classes used

Cf. geometric mean diameter.

**mechanical analysis (obsolete) (meganiese ontleding (verouderd))**

See particle-size analysis; particle-size distribution.

**mechanistic model (meganistiese model)**

See mathematical model.

**medium sand (mediumsand)**

See soil separates; soil texture.

**medium sand class (mediumsandklas)**

See soil texture.

**medium texture (mediumtekstuur)**

Intermediate between fine- and coarse-textured soils, containing moderate amounts of sand, silt, and clay. Includes the following textural classes: very fine sandy loam, loam, silt loam and silt. See soil texture. Cf. coarse texture; fine texture.

**meerschaum (meerskuim)**

Massive sepiolite. Etymol. German *meerschaum*, sea froth. Cf. sepiolite.

**melanic A horizon (melaniese A-horison)**

See diagnostic horizon.

**melanic epipedon (melaniese epipedon)**

See diagnostic horizon.

**melanisation (melanisering)**

Darkening of the soil horizons by the incorporation of humus into the mineral soil.

**mellow consistence (murfkonsistensie)**

See soil consistence.

**mellow soil (murfgrond)**

A very soft, very friable, porous soil without any tendency toward hardness or harshness. See soil consistence.

**mesa (tafelkop)**

A rather flat-topped, steep-sided hill or mountain that is usually composed of nearly horizontal strata of bedrock.

**mesh (maas)**

One of the openings or spaces in a screen. The value of the mesh is usually given as the number of openings per linear inch. This gives no recognition to the diameter of the wire, so that the mesh number does not always have a definite relation to the size of the hole.

**mesic (mesies)**

See soil temperature.

**mesofauna (mesofauna)**

The mesofauna include all soil animals with body size from 0,2 mm to 4 mm. In numbers they are the major group of the soil fauna and include the Enchytraeidae, larger nematodes and micro-arthropods like mites, false scorpions, springtails and small spiders.

**mesophyte (mesofiet)**

A plant that grows under medium or normal conditions of atmospheric water supply as distinguished from one which grows under dry or desert conditions (xerophytes) or very wet conditions (hydrophytes).

**mesotrophic (mesotrofies)**



Refers to soil that has suffered moderate leaching, such that the sum of the exchangeable Ca, Mg, K and Na, is 5-15 cmol/kg clay. This figure is calculated from the S-value and the clay content. Such soil is said to have a medium base status. Etymol. Greek *trophe*, nourishment; *mesos*, middle. Cf. base saturation percentage.

**Mesozoic (Mesosoïkum)**

See geological time scale.

**metahalloysite (metahalloysiet)**

A name used in Europe for the less hydrous form of halloysite. It is synonymous with halloysite of U.S. authors. The term has also been used to designate the nonhydrated form of halloysite. Cf. endellite; halloysite.

**metamorphic rock (metamorfe gesteente)**

A 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. For example, quartzite originating from sandstone.

**mho (obsolete) (mho (verouderd))**

A unit of electrical conductance; the reciprocal of ohm. See conductance; electrical conductivity.

**mica group (mikagroep)**

Phyllosilicate minerals, generally monoclinic, with perfect basal cleavage. Dioctahedral muscovite  $K_2A_{14}(Si_6Al_2)O_{20}(OH)_4$  and trioctahedral biotite  $K_2(Mg,Fe^{2+})_6[(Al,Fe^{3+})_2Si_6]O_{20}(OH)_4$  are pedologically the most important members. Other members of the group are paragonite, glauconite, margarite, phlogopite, sinnwaldite, lepidolite, clintonite and xanthophyllite. Cf. vermiculite; interstratified clay mineral; smectite.

**micelle (misel)**

- (1) The orderly arrangement of molecules, as in cellulose microfibrils in plant cell walls, or phospholipids in aqueous solution.
- (2) A spherical structure with polar groups on the inside and hydrophilic groups on the outside. Clay particles were sometimes referred to as micelles.

**microclimate (mikroklimaat)**

- (1) The climatic conditions of a small area resulting from the modification of the general climatic conditions by local differences in elevation or exposure.
- (2) The sequence of atmospheric changes within a very small region.

**microcline (mikroklien)**

See feldspar group of minerals.

**microfauna (mikrofauna)**

All animals smaller than 0,1 mm, including Protozoa, small unsegmented worms (Turbellaria, Rotifera, Nematoda) and Tardigrada. Most of them are hydrobionts living in the soil water.

**microflora (mikroflora)**

That part of the plant population which consists of individuals too small to be clearly distinguished without the use of a microscope. Includes actinomycetes, algae, bacteria and fungi.

**micro-irrigation (mikrobesproeiing)**

See irrigation methods.

**micromorphology (mikromorfologie)**

The study of soil microstructure, especially with the petrographic microscope. Many features have been recognized and described using this technique; some of the most important are listed below:

*apedal* - Applied to soil materials without peds.

*argillan* - A cutan composed dominantly of clay minerals.

*calcan* - A cutan composed of carbonates.

*chambers* - Vesicles or vughs connected by a channel or channels.

*channel* - A tubular-shaped void.

*cutan* - A modification of the texture, structure, or fabric at natural surfaces in soil materials due to concentration of particular soil constituents or in situ modification of the plasma.

*ferran* - A cutan composed of a concentration of iron oxides.

*glæbule* - A three-dimensional pedogenic feature within the s-matrix of soil material that is approximately prolate to equant in shape.

*gypsan* - A cutan composed of gypsum.

*mangan* - A cutan containing enough manganese (Mn) to effervesce upon application of H<sub>2</sub>O<sub>2</sub>.

*nodules* - Glaebules with an undifferentiated fabric; in this context undifferentiated fabric includes recognizable rock and soil fabrics.

*organan* - A cutan composed of a concentration of organic matter.

*pedal* - Applied to soil materials, most of which consist of peds.

*plasma* - That part of the soil material that is capable of being or has been moved, reorganized, and/or concentrated by the processes of soil formation. It includes all the material, mineral or organic, of colloidal size and relatively soluble material that is not contained in the skeleton grains.

*sesquan* - A cutan composed of a concentration of sesquioxides.

*skeleton grains* - Individual grains that are relatively stable and not readily translocated, concentrated or reorganized by soil-forming processes; they include mineral grains and resistant siliceous and organic bodies larger than colloidal size.

*vugh* - A relatively large void, usually irregular and not normally interconnected with other voids of comparable size.

**micronutrient (mikrovoedingstof)**

A chemical element necessary in small amounts for the growth of plants: B, Cl, Cu, Fe, Mn, Mo and Zn are normally regarded as micronutrients. Cf. essential element.

**microorganism (mikroorganisme)**

A member of a heterogeneous assemblage of simple organisms, consisting of the protozoa, algae, fungi, slime molds, and bacteria. They are either unicellular or, if multicellular, their tissues are relatively undifferentiated.

**microrelief (mikroreliëf)**

Small-scale, local differences in topography, including mounds, hollows, or pits a few metres or less in diameter and with elevation differences of up to 2 m. Cf. gilgai.

**midden (puinhoop)**

Accumulation of refuse around a dwelling place.

**migmatite (migmatiet)**

A composite rock produced by injection of granitic magma into schist.

**milli-equivalent per cent (milliëkwivalente-persent)**

See cation exchange capacity; conversion factors.

**millipedes (duisendpote)**

A group of the macrofauna characterized by elongated bodies and a large number of feet. They feed mainly on decomposing organic matter and fungal hyphae. They occur mainly in forest soils and do not damage crops significantly. Syn. diplopoda.

**mineral (mineraal)**

- (1) An inorganic substance with specific chemical composition; mixtures of mineral particles comprise rocks. Nearly all minerals are crystalline. Some are simple in composition, consisting of a single element (e.g. diamond, carbon) most of two (e.g. pyrites of iron and sulphur, FeS<sub>2</sub>). Minerals have various properties: a characteristic crystal form, hardness, specific gravity, colour, lustre and transparency, streak, cleavage, fracture, striations. Over 2 000 minerals are known, though only a few are important as rock constituents. Cf. soil mineral.
- (2) In general terms a substance obtained by mining: coal, oil, or a metallic ore.

**mineral fertilizer (anorganiese misstof)**

See fertilizer (inorganic).

**mineralization (mineralisasie)**

- (1) The transformation of an element from an organic to an inorganic state as a result of microbial action. Examples are the mineralization of N, P and S.

- (2) Sometimes refers to the enrichment of water by inorganic salts, although the term salinization is preferred. Cf. eutrophication; salinization.

**mineralogical analysis (mineralogiese ontleding)**

The identification and measurement of the kinds or amounts of minerals present in a sample.

**mineral soil (mineraalgrond)**

A soil consisting predominantly of inorganic particles which mainly determines its properties. It usually contains less than 20% organic matter but may sometimes have an organic surface layer up to 30 cm thick. Cf. organic soil.

**minimum tillage (minimumbewerking)**

A collective term for soil cultivation systems in which the number of tillage operations during the preplant period is reduced to a minimum. Syn. reduced tillage. Cf. tillage systems.

**Miocene (Mioseen)**

See geological time scale.

**miscellaneous land type (diverse landtype)**

A map unit for areas of land that either have little or no natural soil, or in respect of which soil identification has not been made. It can include badland, made land, meander land, mine dumps, mine wash, oil wasteland, river wash, rough broken land, rubble land, scoria land, slickens, stony land, swamp, tidal flats, urban land, volcanic-ash land and waste land.

**miscible displacement (mengbare verplasing)**

A process whereby one solution displaces another from a porous body, the two solutions being miscible and mixing occurring freely in the zone of contact between the two solutions.

**mite (myt)**

The mites or Acari constitute one of the eleven orders of the class Arachnida. Generally known as mites, it includes the ticks. They vary in size from 0,1 mm to 15 mm. The body has no clear division between the cephalothorax and abdomen, with little or no segmentation. The adult has four pairs of legs. They occur in large numbers and can numerically constitute up to 80% of the soil fauna population.

**mixed fertilizer (gemengde misstof)**

See fertilizer.

**mixed layer mineral (menglaagmineraal)**

See interstratified clay mineral.

**modal soil profile (modale grondprofiel)**

The most representative example of a specific soil type.

**model (model)**

See mathematical model.

**modulus of elasticity (elastisiteitsmodulus)**

The ratio of stress to strain for a material under given loading conditions; numerically equal to the slope of the tangent or the secant of a stress-strain curve. The use of the term modulus of elasticity is recommended for materials that deform in accordance with Hooke's Law; the term modulus of deformation for materials that deform otherwise.

**modulus of rupture (breukmodulus)**

A measure of the maximum tensile stress that the matrix of a standard soil sample can withstand before failure occurs; measured in kPa. It is a soil property often determined by way of a standardized procedure in studying soil crusting strength.

**Mohs' scale (Mohs se skaal)**

See hardness scale.

**moisture content (waterinhoud)**

See soil water . (Note : All terms with the prefix "moisture" and relating to soil water are dealt with under the entry "soil water").

**moisture equivalent (obsolete) (vogekwivalent (verouderd))**

See soil water: moisture equivalent.

**moisture-holding capacity (waterhouvermoë)**

See soil water : field capacity; saturation water content.

**moisture percentage (obsolete) (vogpersentasie (verouderd); waterinhoud)**

See soil water : water content.

**moisture potential (obsolete) (vogpotensiaal (verouderd); waterpotensiaal)**

See soil water : water potential; total potential.

**moisture profile (waterinhoud profiel)**

See soil water : water content profile.

**moisture-retention curve (grondwaterkenkromme; grondwaterretensie kromme)**

See soil water : water retentivity curve.

**moisture stress (obsolete) (vogspanning (verouderd); matriksdruk)**

See soil water : matric pressure.

**mole drain (moldrein)**

An uncased cylindrical channel created with a torpedo-like implement at a suitable depth below the soil surface and sloping sufficiently to provide for an adequate flow of drainage water.

**mole plough (molploeg)**

A special plough equipped with a sharp blade to which is attached a pointed torpedo-like metal cylindrical plug, used for establishing mole drains.

**mollic A horizon (obsolete) (molliese A-horison (verouderd))**

See diagnostic horizon.

**mollic epipedon (molliese epipedon)**

See diagnostic horizon.

**mollic horizon (molliese horison)**

See diagnostic horizon.

**Mollisol (Mollisol)**

See soil classification.

**molybdenite (molibdeniet)**

$\text{MoS}_2$ , hexagonal; a greenish-gray mineral.

**monoammonium phosphate (MAP) (monoammoniumfosfaat (MAP))**

A fertilizer consisting mainly of  $\text{NH}_4\text{H}_2\text{PO}_4$ . It contains approximately 22% P and 11% N.

**monoculture (monokultuur)**

The continuous cultivation of a single crop, usually on a large area of land.

**monodentate (monodentaat)**

A ligand in which only one atom is bonded to the central atom of a complex. Cf. bidentate; complex.

**monolith (monoliet)**

See soil monolith.

**montmorillonite (montmorilloniet)**

See smectite.

**montmorillonite-saponite group (montmorilloniet-saponiet groep)**

See smectite.

**monzonite (monzoniet)**

A granular plutonic rock containing roughly equal amounts of orthoclase and plagioclase and thus intermediate between syenite and diorite. Hornblende and/or diopside, quartz and biotite are common constituents. Apatite, sphene, zircon and opaque oxides are accessories.

**mor (mor)**

A type of forest humus in which the H layer is present and in which there is practically no mixing of surface or organic matter with mineral soil; that is, the transition from the H layer to the A1 horizon is abrupt.

**moraine (moreen; gletserpuinhoop)**

An accumulation of drift with an initial topographic expression of its own, built within a glaciated region chiefly by the direct action of glacial ice. Examples are ground, lateral, recessional and terminal moraines.

**morphology (morfologie)**

Pertaining to the form and structure of things such as the soil.

**mosaic (photo) (mosaïek; fotomosaïek)**

An assemblage of overlapping aerial photographs whose edges have been matched to form a continuous photographic representation of an area. Cf. mosaic, controlled.

**mosaic, controlled (mosaïek, gekontroleerde)**

An aerial mosaic in which the photographs have been adjusted, oriented, and scaled to horizontal ground control in order to improve the accuracy of representation with respect to distances and distortions. It is usually assembled from rectified photographs that have been corrected for tilt and for variations in flight altitude. An uncontrolled mosaic has not undergone any rectification.

**mosaic, uncontrolled (mosaïek, ongekontroleerde)**

See mosaic, controlled.

**mottle (vlek)**

A spot or blotch of different colour or shades of colour interspersed with the dominant colour of the soil matrix. Cf. mottled soil; soil colour.

**mottled soil (gevlekte grond)**

Soil irregularly marked with spots of colour. A common cause of mottling is impeded drainage, although there are other causes, such as soil development from an uneven weathered rock. The weathering of different kinds of minerals may cause mottling (geogenic mottles). Cf. mottle; soil colour.

**mottling (vlekking)**

See mottle; mottled soil; soil colour.

**muck (meermolm)**

Highly decomposed organic material in which the original plant parts are not recognizable. Contains more mineral matter and is usually darker than peat.

**muck soil (meermolmgrond)**

- (1) An organic soil in which the organic matter is decomposed beyond recognition.
- (2) A soil containing 20 to 50% organic matter.

**mudstone (moddersteen)**

- (1) An indurated mud having the texture and composition, but lacking the fine lamination or fissility, of shale; a blocky or massive, finegrained sedimentary rock in which the proportions of clay and silt are approximately the same; a non-fissile mud shale.
- (2) A general term that includes clay, silt, claystone, siltstone, shale, and argillite, and that should be used only when the amounts of clay and silt are known or specified or cannot be precisely identified or when a deposit consists of an indefinite mixture of clay, silt, and sand particles, the proportions varying from place to place, so that a more precise term is not possible, or when it is desirable to characterize the whole family of finer-grained sedimentary rocks (as distinguished from sandstones, conglomerates, and limestones). Syn. mud rock.

**mulch (deklaag; grondkombers)**

Any material such as straw, sawdust, leaves, plastic film, or loose soil that is spread on the surface of the soil to protect the soil and the plant roots from the effects of raindrops, soil crusting, evaporation and freezing.

**mulching material (dekmateriaal)**

Any material used to establish a mulch, such as straw, leaves, plastic, etc.

**mulch tillage (deklaagbewerking)**

See tillage systems.

**mull (mild humus) (mull (milde humus))**

A type of humus, usually developed in forests, that is incorporated with underlying mineral matter. Cf. mor.

**Munsell colour system (Munsell kleursysteem)**

See soil colour.

**muriate of potash (muraat van potas)**

See potassium chloride fertilizer.

**muscovite (muskoviet)**

See mica.

**mycelium (miselium)**

A mass of thread-like filaments, branched or composing a network, that constitutes the vegetative structure of a fungus. Cf. hypha.

**mycorrhiza (mikorisa)**

A symbiotic association of root and/or rhizome with a fungus.



## N

### **nacrite (nakriet)**

A well-crystallized clay mineral of the kaolin group :  $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_2$ . It is polymorphous with kaolinite and dickite. Nacrite is structurally distinct from other members of the kaolin group, being the most closely stacked in the c-axis direction.

### **natric horizon (natriese horison)**

See diagnostic horizon.

### **natric B horizon (obsolete) (natriese B-horison (verouderd))**

See diagnostic horizon.

### **natric soil (natriese grond)**

See sodic soil.

### **natural classification (natuurlike klassifikasie)**

A type of classification in which observed properties or objects are classified; Cf. soil classification; numerical classification; technical classification.

### **natural erosion (natuurlike erosie)**

See erosion.

### **natural resource (natuurlike hulpbron)**

See resource.

### **necrosis (nekrose)**

Death associated with discolouration and dehydration of plant organs such as leaves.

### **negative adsorption (negatiewe adsorpsie)**

The increase in the concentration of anions in the equilibrium solution following the addition of a dilute, neutral salt solution to clay with little or no adsorbing capacity for anions at the prevailing pH.

### **negative pressure (negatiewe druk)**

See soil water : matric potential.

### **nematode (nematode)**

A term applied to members of the phylum Nematoda, being a group of unsegmented worms commonly parasitic on plants and animals, and occurring widely in soils.

### **neocarbonate B horizon (neokarbonaat B-horison)**

See diagnostic horizon.

### **neocutanic B horizon (neokutaniese B-horison)**

See diagnostic horizon.

### **nepheline (nefelien)**

$(\text{Na,K})\text{AlSi}_3\text{O}_8$ , hexagonal. See feldspathoids.

**nepheline syenite (nefeliensiëniet)**

A medium grained plutonic rock composed essentially of alkali feldspar, nepheline, and sometimes an alkalic ferro-magnesian constituent.

**nesosilicate (nesosilikaat)**

A class or structural type of silicate characterized by the linkage of the  $\text{SiO}_4$  tetrahedra by ionic bonding only, rather than by sharing of oxygens. An example of a nesosilicate is olivine,  $(\text{Mg,Fe})_2\text{SiO}_4$ . Cf. sorosilicate; cyclosilicate; inosilicate; phyllosilicate; tectosilicate.

**neutral soil (neutrale grond)**

See soil pH.

**neutral stress (neutrale spanning)**

See pore water pressure.

**neutron moderation (neutronvertraging)**

Loss of energy of neutrons through collision with atomic nuclei. Neutron moderation constitutes the basis for the determination of soil water content with a neutron water meter.

**neutron water meter (neutronwatermeter)**

An instrument utilizing the principle of neutron moderation for the non-destructive, *in situ* measurement of the water content of soil. A suitable calibration procedure is usually required.

**ngubane (ngubane)**

See hardpan.

**nitic horizon (nitiese horison)**

See diagnostic horizon.

**Nitisol (Nitisol)**

See soil classification.

**Nitosol (obsolete) (Nitosol (verouderd))**

See soil classification.

**nitrification (nitrifikasie)**

The biological oxidation of ammonium nitrogen to nitrite and nitrate nitrogen, or a biologically induced increase in the oxidation state of nitrogen.

**nitrogen assimilation (stikstofassimilasie)**

The incorporation of nitrogen compounds into cell substances by living organisms.

**nitrogen cycle (stikstofsiklus)**

The sequence of biochemical changes undergone by nitrogen, wherein it is utilized by a living organism, liberated upon the death and decomposition of the organism and converted to inorganic forms.

**nitrogen fixation (stikstofbinding)**

The conversion of elemental nitrogen ( $N_2$ ) to organic combinations or to forms readily usable in biological processes.

**nitrogenous fertilizer (stikstofmisstof)**

Any inorganic fertilizer utilized for its nitrogen content. Cf. fertilizer.

**nitrogen loss (stikstofverlies)**

- (1) Losses, particularly of nitrate, by leaching from sandy soil with a low exchange capacity.
- (2) Non-biological volatilization of gaseous ammonia ( $NH_3$ ).
- (3) Biological volatilization of  $N_2$ ,  $N_2O$  and  $NO$  as a result of denitrification.

**nodule (nodule)**

Bodies of various shapes, sizes and colour that have been hardened to a greater or lesser extent by chemical compounds such as lime, sesquioxides, animal excreta and silica. These may be described in terms of:

*kind* - durinodes, gypsum, insect casts, ortstein, iron-manganese, lime, lime-silica, plinthite, salts;

*abundance* - few: less than 20% by volume percentage; common: 20-50%; many: more than 50%;

*hardness* - soft; hard (meaning barely crushable between thumb and forefinger); indurated and

*size* - threadlike; fine; medium (2-5 mm); coarse. Cf. micromorphology

**nodule bacteria (knoppiesbakterieë)**

See rhizobia.

**non-renewable resource (nie-hernubare hulpbron)**

See resource.

**nontronite (nontroniet)**

See smectite.

**norite (noriet)**

A coarse-grained plutonic rock containing basic plagioclase (labradorite) as the chief component and differing from gabbro by the presence of orthopyroxene (and hypersthene) as the dominant mafic mineral.

**normal erosion (normale erosie)**

See erosion.

**no-tillage (geenbewerking)**

See tillage systems.

**numerical classification (numeriese klassifikasie)**

The use of statistical techniques in order to classify soils. Cf. soil classification, natural classification; technical classification.

**nutrient (voedingstof; nutriënt)**

**An element which is absorbed and is necessary for the completion of the life cycle of organisms. Cf. plant nutrient.**

**nutrient balance (voedingstofbalans)**

**See plant nutrient balance.**

**nutrient cycle (voedingstofsiklus)**

**The cycle whereby plant nutrients are taken up from the soil and incorporated into plants, returned to the soil with dead plant matter and through mineralization is again converted to inorganic forms or released.**

## O

### **O horizon (O-horison)**

See soil horizon.

### **oblique air photo (skuinslugfoto)**

An aerial photograph taken with the camera axis intentionally inclined between the horizontal and the vertical (camera pointing down at an angle). It combines the ground view with the pattern obtained from a height. Cf. vertical air photo. Syn. oblique photograph.

### **occlude (insluit)**

The entrapment of an element or ion within the matrix of a crystallized or precipitated compound, e.g. the occlusion of phosphate (occluded P) in amorphous soil components. Cf. amorphous compound.

### **ochric A horizon (obsolete) (okriese A-horison (verouderd))**

See diagnostic horizon.

### **ochric epipedon (okriese epipedon)**

See diagnostic horizon.

### **ochric horizon (okriese horison)**

See diagnostic horizon.

### **octahedral sheet (oktahedrale plaat)**

One of the sheets of layer-lattice minerals. In this sheet Al or Mg atoms are co-ordinated with six oxygen atoms or OH groups, which are located around the Al or Mg atom with their centres on the six corners of a regular octahedron. The oxygen atoms and hydroxyl groups lie in two parallel planes with Al or Mg atoms between these planes. Syn. alumina sheet; magnesia sheet; gibbsite sheet; brucite sheet.

### **ohm (ohm)**

The unit of electrical resistance, equal to the resistance of a circuit in which an electrical potential difference of one volt maintains a current of one ampere.

### **Oligocene (Oligoseen)**

See geological time scale.

### **oligoclase (oligoblaas)**

See feldspar group of minerals.

### **olivine (olivien)**

(1) An olive-green, greyish-green or brown orthorhombic mineral:  $(\text{Mg,Fe})_2\text{SiO}_4$ . It comprises the isomorphous solid-solution series forsterite-fayalite. Olivine is a common rock-forming mineral of basic, ultrabasic and low-silica igneous rocks (gabbro, basalt, peridotite, dunite); it crystallizes early from a magma, weathers readily at the earth's surface, and metamorphoses to serpentine.

- (2) A name applied to a group of minerals forming the isomorphous system  $(\text{Mg,Fe,Mn,Ca})_2\text{SiO}_4$  including forsterite, fayalite, tephroite and a hypothetical calcium orthosilicate. Also, any member of this system.

**oolite (oöliet)**

A rock, usually a limestone, composed mainly of ooliths.

**oolith (oölietkorrels)**

A spherical to ellipsoidal body, usually 0,25 to 2,00 mm in diameter, with concentric or radial structure or both. It is usually calcareous but may be siliceous, haematitic or of other composition.

**opal (opaal)**

A mineral (or mineral gel) :  $\text{SiO}_2 \cdot n\text{H}_2\text{O}$ . It is an amorphous (colloidal) form of silica containing a varying proportion of water (as much as 20% but usually 3-9%) and occurring in nearly all colours. Opal is transparent to nearly opaque, and typically exhibits a definite and often marked iridescent play of colour. It differs from quartz in being isotropic, having a lower refractive index and being softer and less dense. Opal usually occurs massive and frequently pseudomorphous after other minerals and is deposited at low temperatures from silica-bearing water. Syn. opaline. Cf. phytolith.

**order, soil (orde, grond-)**

A category in soil classification schemes. See soil classification.

**Ordovician (Ordovisium)**

See geological time scale.

**organan (organaan)**

See micromorphology.

**organic O horizon (organiese O-horison)**

See soil horizon.

**organic fertilizer (organiese misstof)**

See fertilizer.

**organic matter, soil (organiese materiaal, grond-)**

The organic fraction of soil ranging from undecayed plant and animal tissues through ephemeral products of decomposition to fairly stable amorphous brown to black material, known as humus, which bears no trace of the anatomical structure from which it was derived. Usually determined on soils which have been sieved through a 2,0 mm sieve.

**organic soil (organiese grond)**

A soil which forms under hydromorphic conditions and contains more than 15% organic matter throughout the solum. In general, organic soils are very compressible and have poor load-sustaining properties.

**orthic A horizon (ortiese A-horison)**

See diagnostic horizon.

**orthoclase (ortoklaas)**

One of the most common minerals occurring in rocks,  $KAlSi_3O_8$ . Found especially in granites and syenites, in arkose and certain sandstones and conglomerates, and in gneisses. It has two prominent cleavages at right angles to each other and is grey, white or flesh-red. Also referred to as a potash feldspar.

**orthoquartzite (ortokwartsiet)**

A clastic sedimentary rock composed of silica-cemented quartz sand.

**ortstein (ortstein)**

See hardpan; nodule.

**osmosis (osmose)**

The transport of solvent through a semipermeable membrane separating solutions in which the chemical potentials of the solvent are unequal; the solvent moves to the solution with the higher solute concentration.

**osmotic head (osmotiese hoogte)**

See soil water : osmotic head.

**osmotic potential (osmotiese potensiaal)**

See soil water : osmotic potential.

**osmotic pressure (osmotiese druk)**

See soil water : osmotic pressure.

**osmotic suction (osmotiese suiging)**

See soil water : osmotic stress.

**ouklip (ouklip)**

See hardpan.

**outcrop (dagsoom)**

That part of a geologic formation or structure that appears at the surface of the earth.

**outer-sphere complex (buitesfeerkompleks)**

A complex in which one or more water molecules is interposed between the central group and a ligand. Cf. complex; inner-sphere complex.

**outwash (fluvioglasiale puin)**

Material deposited by glacial meltwater issuing from ice.

**oven-dry soil (oonddroë grond)**

Soil which has been dried at 105°C until it reaches constant mass.

**overburden (bolaag)**

- (1) Material recently deposited by a transportation mode, that occurs immediately superjacent to the surface horizon of a contemporaneous soil.
- (2) A term used to designate disturbed or undisturbed material of any nature, consolidated or unconsolidated, that overlies a deposit of useful materials, ores, lignites, or coals, especially those deposits mined from the surface by open cuts.

**overburden potential (bolaagpotensiaal)**

See soil water : envelope-pressure potential.

**overliming injury (oorbekalkingskade)**

The addition of lime until the pH of the soil is above the range required for optimum growth of a particular plant species on the soil in question. Under such conditions many crops that ordinarily respond to lime are adversely affected, especially during the first season following the application.

**oxbow lake (hoefystermeer)**

A crescent-shaped lake formed in an abandoned river bend by a meander cut-off.

**oxic B horizon (obsolete) (oksiese B-horison (verouderd))**

See diagnostic horizon.

**oxic horizon (oksiese horison)**

See diagnostic horizon.

**oxidation (oksidasie)**

- (1) A chemical reaction that increases the oxygen content of a compound.
- (2) A chemical reaction in which a compound or radical loses electrons, that is in which the positive valence is increased, for example  $\text{Fe}^{2+} \text{-----} \rightarrow \text{Fe}^{3+} + \text{e}^-$ .

**Oxisol (Oksisol)**

See soil classification.



## P

### paleocene (Paleoseen)

See geological time scale.

### paleontology (paleontologie)

The study of life in past geological time, based on fossil remains, both animal and vegetable.

### paleosol (paleosol)

A soil formed during the geological past and subsequently buried. When the overlying, younger material is removed by erosive stripping, it becomes exposed on the landscape surface. Age may be determined by carbon dating and pollen grain analysis. Syn. buried soil; fossil soil.

### Paleozoic (Paleosoikum)

See geological time scale.

### pallid A horizon (obsolete) (pallidiese A-horison (verouderd))

See diagnostic horizon: ochric epipedon.

### palygorskite (paligorskiet)

A chain-lattice clay mineral:  $(\text{Mg,Al})_2\text{Si}_4\text{O}_{10}(\text{OH})\cdot 4\text{H}_2\text{O}$ . The term has also been used as a group name for lightweight, tough, matted, fibrous clay minerals showing a considerable amount of substitution of magnesium for aluminium and characterized by distinctive rod-like shapes under the electron microscope. Syn. attapulgite.

### palynology (stuifmeelstudie)

The study of living and fossil pollen grains and plant spores, including their dispersal and applications in stratigraphy and paleoecology.

### pan (pan)

A closed depression that can occur in great profusion in arid and semi-arid areas such as in the Karoo or Kalahari. Pans may result from such processes as solution and animal activity (buffalo or hog wallows), but the prime cause of their development is deflational activity on surfaces composed of susceptible materials (e.g. shales, fine sandstones and sands, lake beds, etc.). A pan may contain fresh or saline water.

### pan, soil (bank, grond-)

A layer, crust or horizon within the solum with a high bulk density or very high in clay content and usually impeding the movement of water and air and the growth of plant roots. Cf. hardpan.

### parent material (moedermateriaal)

The unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of soils is developed by pedogenic processes. One may speak of the parent material of a horizon, or of a number of horizons which constitute a profile, or even of stratified alluvium which, although almost identical to its parent material, has often undergone changes in organic matter content and base status.

**parent rock (moedergesteente)**

The rock mass from which a soil's parent material is derived.

**particle, soil (deeltjie, grond-)**

See soil particle.

**particle density (deeltjiedigtheid)**

The mass per unit volume of the soil particles. Usually expressed as kg/m<sup>3</sup>.

**particle size (deeltjiegrootte)**

The general dimensions (such as average diameter or volume) of soil particles, based on the premise that the particles are spheres or that the measurements made can be expressed as diameters of equivalent spheres. It is commonly measured by sieving, by sedimentation analysis or by micrometric methods. Syn. grain size.

**particle size analysis (deeltjiegrootte-ontleding)**

Determination of the various amounts of the different separates in a soil sample, usually by sedimentation, sieving, micrometry or a combination of these methods.

**particle size distribution (deeltjiegrootteverspreiding (-verdeling))**

The percentage, usually by mass and sometimes by number of particles in each size fraction into which a dispersed sample of a soil, sediment or rock has been separated, such as the percentage of sand retained on each sieve in a given size range. It is the result of a particle size analysis. Syn. size distribution; size-frequency distribution.

**parts per million (ppm) (dele per miljoen (dpm))**

Mass units of any given component per 1 million mass units of material; or in the case of solutions, the mass units of solute per million volume units of solution. Obsolete, now replaced by mg kg<sup>-1</sup>, mg dm<sup>-3</sup> or g m<sup>-3</sup>.

**patina (patina)**

- (1) The smooth weathered surface of prehistoric artifacts, or similar surfaces on early Holocene and older rocks.
- (2) An incrustation, usually green, on the surface of bronze objects, old coins, etc.; also, the artificial copying thereof.

**pavement crust (plaveiselkors)**

See soil crust.

**peat (veen; moerasturf)**

A dark brown or black residuum produced by the partial decomposition and disintegration of mosses, sedges, trees and other plants that grow in wet places.

**pebble (rolsteen)**

A rock or mineral fragment in the soil, somewhat rounded, having a diameter in the range of 2 to 75 mm. Cf. gravel.

**ped (ped)**

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

**pedal (pedaal)**

Refers to soil materials most of which consists of peds. Cf. soil structure. Cf. micromorphology.

**pedalfer (obsolete) (pedalfer (verouderd))**

An old, general term for a leached soil in which there is a concentration of sesquioxides. It is the characteristic type of soil in a humid region. Cf. pedocal.

**pediment (pediment)**

The footslope component of an erosional slope; geomorphologically an erosional surface that lies at the foot of a receded slope, with underlying rocks or sediments that also underlie the upland, which is barren of, or mantled with sediment, and which normally has a concave upward profile.

**pediplain (pedivlakte)**

A plain formed by the coalescing of pediments. Cf. pediment.

**pedisediment (pedisediment)**

A colluvial deposit on plains of low relief (pediments) of soil material from upslope as a result of surface wash or rapid forms of mass movement such as slumpage or flowage.

**pedocal (obsolete) (pedokal (verouderd))**

An old, general term for a soil in which there is an accumulation or concentration of carbonates, usually calcium carbonate. It is the characteristic type of soil in an arid or semiarid region. Cf. pedalfer.

**pedocutanic B horizon (pedokutaniese B-horison)**

See diagnostic horizon.

**pedofabric (pedomaaksel)**

See fabric. Cf. micromorphology.

**pedogenesis (pedogenese)**

See soil genesis.

**pedogenic material (pedogenetiese materiaal)**

A product of soil genesis. Cf. soil genesis.

**pedogeomorphology (pedogeomorfologie)**

The field of study which emphasizes the spatial coincidence of soils and landforms and which reflects the interaction between pedological and geomorphological processes.

**pedology (pedologie)**

That branch of soil science dealing with soils as a natural phenomenon, including their morphological, physical, chemical, mineralogical and biological constitution, genesis, classification and geographical distribution.

**pedon (pedon)**

The smallest three-dimensional portion of the soil mantle needed to describe and sample soil in order to represent the nature and arrangement of its horizons. Rock or material that is too deep to be of interest to agricultural soil users mark the lower limit of the pedon. Depending on the variability within the soil, the area of a pedon ranges

from about 1 to 10 m<sup>2</sup>. In a way it resembles the unit cell of a crystal because it repeats itself laterally. The term "a soil" refers to those contiguous similar pedons that are bounded on all sides by "not soil" or by pedons of unlike character. This group of contiguous, similar pedons is called a polypedon and is the soil individual for the purpose of classification (Soil Survey Staff, 1994).

**pedorelic (pedorelik)**

A soil feature that is derived from a pre-existing soil horizon.

**pedosphere (pedosfeer)**

That shell or layer of the earth in which soil-forming processes occur.

**pedoturbation (pedoturbasie)**

Biological and physical (freeze-thaw and wet-dry cycles) churning and cycling of soil materials, thereby homogenizing the solum in varying degrees. Several kinds are recognized: floral, faunal, congelli-, argilli-, aero-, aqua-, crystal- and seismido-turbation.

**pegmatite (pegmatiet)**

An exceptionally coarse-grained (most grains 10 mm or more in diameter) igneous rock, with interlocking crystals, usually found as irregular dikes, lenses or veins, esp. at the margins of batholiths. Although pegmatites having gross compositions similar to other rock types are known, their composition is generally that of granite; the composition may be simple or complex and may include rare minerals rich in such elements as lithium, boron, fluorine, niobium, tantalum, uranium, and rare earths. Pegmatites represent the last and most hydrous portion of a magma to crystallize and hence contain high concentrations of minerals present only in trace amounts in granitic rocks. Syn. giant granite.

**peneplain (skiervlakte)**

- (1) A relatively flat, featureless plain which has resulted from the erosion of former overlying formations first by streams cutting a series of channels and then the ridges which lay between such channels eroding until the resulting surface is almost flat.
- (2) A once high, rugged area which has been reduced by erosion to a low, gently rolling surface resembling a plain.

**penetrability (penetreerbaarheid)**

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

**penetrometer resistance (penetrometerweerstand)**

The resistance offered by a soil against the penetration of a standard probe; usually measured in kPa.

**percentage base saturation (persentasie basisversadiging)**

The ratio of S-value to cation exchange capacity, expressed as a percentage. The S-value is the sum of exchangeable Ca, Mg, Na and K, usually expressed in cmol/kg.

**perched water table (verhewe watervlak)**

The surface of a local zone of saturation held above the main body of groundwater by an impermeable layer or stratum, usually clay, and separated from the main body of groundwater by an unsaturated zone.

**percolation (perkolasië)**

A qualitative term applicable to the downward movement of water through soil. Especially, the downward flow of water in saturated or nearly saturated soil at hydraulic gradients of one or less. Cf. soil water: hydraulic conductivity.

**pergelic (vriesend)**

See soil temperature.

**peridot (peridoot)**

A gem variety of olivine.

**peridotite (peridotiet)**

A general term for a coarse-grained plutonic rock consisting chiefly of olivine, with or without other mafic minerals such as amphiboles and pyroxenes, and little or no feldspars.

**periglacial (periglasiaal)**

Indicative of all cold-climate processes, whether or not they occur in the immediate vicinity of glaciers.

**period (periode)**

In geology, a unit of geological time during which a system of rocks is formed, e.g. the Jurassic period. Cf. geological time scale.

**permafrost (ysgrond)**

- (1) Permanently frozen material underlying the solum.
- (2) A perennially frozen soil horizon.

**permanent negative charge (permanente negatiewe lading)**

The negative charges of clay particles inherent in the crystal lattice of the particle due to isomorphous substitution and thus not affected by changes in pH or by ion exchange reactions.

**permanent wilting percentage (permanente verwelkpersentasie)**

The gravimetric water content of a soil at a point where indicator plants growing in that soil wilt and fail to recover turgidity when placed in a humid chamber. Syn. permanent wilting point. Cf. wilting point.

**permeability (deurlatendheid; permeabiliteit)**

A qualitative term that refers to the ease with which gases, plant roots or, more usually, liquids penetrate or pass through soil. See soil water: hydraulic conductivity; infiltration; intrinsic permeability.

**Permian (Perm)**

See geological time scale.

**petrocalcic horizon (petrokalsiese horison)**

See diagnostic horizon.

**petrography (petrografie)**

The systematic description and interpretation of rock textures and mineralogy in thin section and as hand specimens.

**petrogypsic horizon (petrogipsiese horison)**

See diagnostic horizon.

**petrology (petrologie)**

The study of rocks in general, including their occurrence, field relations, structure, origins and history (petrogenesis), and their mineralogy and textures (petrography).

**petroplinthic horizon (petroplintiese horison)**

See diagnostic horizon.

**pF (obsolete) (pF (verouderd))**

The logarithm of the soil matric potential expressed in units of cm water. Originally defined by R.K. Schofield as the logarithm of Buckingham's potential expressed as the height, in cm, of an equivalent water column.

**pH (pH)**

The pH of a solution is the negative logarithm to the base ten of the hydrogen ion activity in the solution:

$$\text{pH} = -\log_{10}a_{\text{H}}$$

where  $a_{\text{H}}$  = hydrogen ion activity. Cf. soil pH.

**pH, soil (pH, grond-)**

See soil pH.

**pH-dependent charge (pH-afhanklike lading)**

That portion of the total charge of soil particles which is affected by, and varies with, changes in pH.

**Phaeozem (Phaeozem)**

See soil classification.

**Phanerozoic (Fanerosoïkum)**

Paleozoic, Mesozoic and Cenozoic. Eon of evident life. Cf. geological time scale.

**phase (soil) (fase (grond))**

A subdivision of a unit of classification (e.g. a series or family) made in order to distinguish properties (e.g. depth) important to the use and management of land.

**phenocryst (fenokrist)**

A porphyritic crystal.

**phlogopite (flogopiet)**

See mica group of minerals.

**phonolite (fonoliet)**

The fine-grained extrusive equivalent of nepheline syenite.

**phosphorite (fosforiet)**

A sedimentary rock composed principally of phosphate minerals.

**phosphate fertilizer (fosfaatmisstof)**

Any fertilizer capable of supplying phosphorus when applied to the soil, e.g. superphosphate; double superphosphate (triple superphosphate, in USA usage); ammoniated superphosphate; mono-ammonium phosphate (MAP); calmafos. Cf. fertilizer.

**phosphate fixation (fosfaatvaslegging)**

See fixation.

**photomap (fotokaart)**

A mosaic map made from aerial photographs with physical and cultural features shown as on a planimetric map.

**phreatic line (freatiese lyn)**

The upper boundary of the water table in soils or of seepage water in earth dams, levees, and dikes. It is the line at which soil water pressure is equal to atmospheric pressure and lies between the capillary zone and the saturation zone. Hence phreatic surface. Cf. line of seepage.

**phyllite (filliet)**

An argillaceous rock formed by regional metamorphism and intermediate in metamorphic grade between slate and mica schist.

**phyllosilicate (fillosilikaat)**

A class or structural type of silicate characterized by the sharing of three of the four oxygens in each tetrahedron with neighbouring tetrahedra, to form sheets; the Si:O ratio is 2:5. An example is the micas. Cf. nesosilicate.

**physical properties of soil (fisiese grondeienskappe)**

Characteristics of soil which can be measured by physical means and expressed in physical terms, such as colour, density, porosity, hydraulic conductivity, structure, texture and depth.

**physical weathering (fisiese verwering)**

The breakdown of rock and mineral particles into smaller particles by physical forces such as frost action. Cf. weathering.

**phytolith (fitoliet)**

Rock formed by plant activity or composed chiefly of plant remains, e.g. coal, lignite and some reef limestones. The stony part of a living plant that secretes mineral matter, for example silica.

**piedmont (piedmont)**

Lying or formed at the base of a mountain.

**piezometer (piësometer)**

A standpipe or tube connected to a point in a liquid system at which the fluid pressure is to be measured.

**piezometric surface (piësometriese vlak)**

The surface to which the water in a given aquifer will rise.

**pigeonite (pigeoniet)**

See pyroxene group of minerals.

**pile (heipaal)**

A long, relatively slender structural foundation element (plate, post, plank, beam board, etc.), usually made of timber, steel, or reinforced or prestressed concrete, that is driven or jettted into the ground or cast in place and that is used to support vertical or lateral loads, to form a wall to exclude water or soft material or to resist their pressure, to compact the surrounding ground, or rarely to restrain the structure from uplift forces.

**pipng (pyperosie; tonnelerosie)**

See erosion. Syn. tunnel erosion.

**piston flow (suiervloei)**

An idealized type of liquid transport in a porous medium such that all elements of the liquid flow in the same direction and with the same velocity. Cf. hydrodynamic dispersion.

**placic horizon (plaksiese horison)**

See diagnostic horizon.

**placic pan (plaksiese horison)**

See diagnostic horizon.

**plain (vlakke)**

An extensive area characterized by a local relief of less than 60 m and slopes of generally less than 5%.

**plaggen epipedon (plaggiiese epipedon)**

See diagnostic horizon.

**plagioclase (plagioklaas)**

See feldspar group.

**Planosol (Planosol)**

See soil classification.

**plant nutrient (plantvoedingstof)**

The elements or groups of elements taken in by a plant which are essential to its growth and used in elaboration of its food and tissues. Cf. essential element; macronutrient; micronutrient.

**plant nutrient balance (plantvoedingstofbalans)**

A ratio among concentrations of nutrients essential for plant growth which permits maximum growth rate and yield. An imbalance results when one or more nutrients are present in either deficient or excessive amounts.



**plant nutrient stress (plantvoedingstofstremming)**

A condition when an inadequate nutrient supply restricts plant growth.

**plant nutrient uptake (plantvoedingstofopname)**

See absorption, active; absorption, passive.

**plant nutrition (plantvoeding)**

That branch of science dealing with the uptake and translocation of nutrients by plants from soil and other media, and the interactions, interrelationships and transformations of nutrients and other substances as related to growth and yield of plants.

**plasma (plasma)**

See micromorphology.

**plastic flow (plastiese vloeï)**

- (1) In structural geology, synonymous with plastic deformation.
- (2) Non-Newtonian fluid flow, i.e. the flow of fluid which does not have a constant viscosity in accordance with Newton's law.

**plasticity (plastisiteit)**

The property of a soil which allows it to be deformed rapidly without cracking or crumbling and then maintain that deformed shape after the deforming force has been released.

**plasticity constants (plastisiteitskonstantes)**

A set of values indicative of soil plasticity. See Atterberg limits.

**plasticity index (plastisiteitsindeks)**

See Atterberg limits.

**plasticity number (plastisiteitsgetal)**

See Atterberg limits.

**plastic limit (plastisiteitsgrens)**

See Atterberg limits.

**plastic soil (plastiese grond)**

A soil capable of being molded or deformed continuously and permanently by relatively moderate pressure. Cf. soil consistence.

**plateau (plato)**

A broad plain that drops to lower elevations on at least three sides.

**platy structure (plaatstruktuur)**

See soil structure.

**playa (playa)**

A shallow basin in a desert region, intermittently filled with water which evaporates in a short time.

**Pleistocene (Pleistoseen)**

See geological time scale.

**plinthic horizon (plintiese horison)**

See diagnostic horizon.

**plinthite (plintiet)**

In a soil, a material consisting of a mixture of clay and quartz with other diluents, that is rich in sesquioxides and poor in humus and is highly weathered. It occurs as red mottles in a platy, polygonal, or reticulate pattern. Repeated wetting and drying changes plinthite to ironstone hardpan or irregular aggregates. See diagnostic horizon.

**Pliocene (Plioseen)**

See geological time scale.

**plough layer (ploeglaag)**

The layer ordinarily disturbed by tillage. Syn. Ap horizon.

**ploughsole (ploegblad (-bank; -sool))**

A subsurface 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. Syn. ploughpan; traffic pan; pressure pan; induced pan.

**plutonic (plutonies)**

A general term applied to that class of igneous rocks which have crystallised at great depth and have therefore assumed, as a rule, granitoid (coarse) texture. Syn. intrusive rock.

**pluvial period (pluviale tydperk)**

A period of hundreds or thousands of years of heavy rainfall.

**pneumatic potential (gasdrukpotensiaal)**

See soil water : pneumatic potential.

**Podzol (Podzol)**

A great soil group of the zonal order consisting of soils formed in cool-temperate to temperate, humid climates, under coniferous or mixed coniferous and deciduous forest, and characterized particularly by a highly-leached, whitish-grey (Podzol) A2 horizon.

**podzol B horizon (podzol B-horison)**

See diagnostic horizon.

**podzolization (podzolisasie)**

The mobilization in and removal from an A and/or E horizon of organic matter and/or sesquioxides. That part of the eluvial horizon which is darkened by organic matter has bleached sand-size grains. The illuvial horizon has increased amounts of sesquioxides and/or organic matter as a result of removal from the upper soil. The process takes place typically in quartzose parent materials under a coniferous, coniferous-deciduous, macchia or heath vegetal cover.

**Podzoluvisol (obsolete) (Podzoluvisol (verouderd))**

See soil classification.

**point source (pollution) (puntbron (besoedeling))**

Pollution originating in a small area, e.g. from a waste dump, an industrial site, a contaminated well, a spillage of chemicals, etc. Cf. diffuse source.

**polder (polder; drooggelegde land)**

An area of low-lying land which has been reclaimed from the sea, and is surrounded by earth banks (dykes) in order to keep out sea and river water, as in the Netherlands.

**polyelectrolyte (poliëlektroliet)**

A polymer containing dissociable ions. Cf. polymer.

**polymer (polimeer)**

A high molecular weight substance of either synthetic or natural origin; it is formed by linkage of smaller units (monomers) through the process of polymerization.

**polymorphic (polimorf)**

See allotropic.

**polypedon (polipedon)**

See pedon.

**poorly drained soil (swak gedreineerde grond)**

A soil that remains wet or waterlogged for long periods and as a result develops a mottled pattern of grey and brown/yellow colours; it usually has a gley horizon.

**poorly graded soil (swak gegradeerde grond)**

A soil material consisting mainly of particles nearly the same size; well sorted, usually by wind. Because there is little difference in size of the particles in poorly graded soil material, density usually can be increased only slightly by compaction.

**pore pressure (poriedruk)**

See pore water pressure.

**pore size (poriegrootte)**

The equivalent diameter of a soil pore determined by micrometry or indirect methods such as mercury injection or water retention.

**pore space (porieruimte)**

The total space not occupied by soil particles in a bulk volume of soil, expressed as a fraction or percentage of the bulk volume. The interconnected part of the pore system through which fluids can move freely is called the effective pore space. Cf. air-filled porosity.

**pore water (poriewater)**

Water occurring within the pore space of soil or rock.

**pore water pressure (poriewaterdruk)**

That part of the total stress in a mass of soil or rock that acts in the liquid contained within the pores. Cf. effective stress. Syn. neutral stress.

**porosity (soil) (poreusheid (grond); porositeit)**

The percentage volume of the soil occupied by pores and pore space.

**porphyritic (porfirities)**

A textural term for those igneous rocks in which larger crystals (phenocrysts) are set in a finer groundmass.

**potash (obsolete) (potas (verouderd))**

- (1) A term used to refer to potassium or potassium fertilizers and usually designated as  $K_2O$ .
- (2) Potash is actually  $K_2CO_3$ ; the name derives from a manufacturing process thereof.

**potassium chloride fertilizer (kaliumchloriedkunsmiss)**

A potassium fertilizer containing 50% K (KCl). Syn. muriate of potash.

**potassium feldspar (kaliumveldspaat)**

See feldspar group of minerals.

**potassium fertilizer (kaliummisstof)**

Any fertilizer that is used to supply a soil with plant available K. Cf. fertilizer.

**potassium fixation (kaliumvaslegging)**

See fixation.

**potassium nitrate fertilizer (kaliumnitraatkunsmiss)**

A fertilizer, little used at present, containing 38% K and 13% N ( $KNO_3$ ).

**potassium sulphate fertilizer (kaliumsulfaatkunsmiss (-misstof))**

A potassium fertilizer, containing 40-42% K ( $K_2SO_4$ ).

**pot clay (potter's clay) (potklei)**

A dense, impermeable, sticky clay usually occurring in the subsoil of low-lying areas. Often used for making clay objects.

**potential evapotranspiration (potensiële evapotranspirasie)**

Water loss from soil supporting an actively growing low level crop of large extent, completely covering the ground and not suffering water stress, through evaporation and transpiration. Very largely controlled by physical meteorological factors.

**potential (soil water) (potensiaal (grondwater))**

See soil water : total potential.

**potential gradient (potensiaalgradiënt)**

See soil water : hydraulic gradient.

**Prairie Soil (Prairiegrond)**

A zonal great soil group consisting of soils formed under temperate to cool-temperate, humid regions under tall grass vegetation.

**Precambrian (Voor-Kambrium)**

See geological time scale.

**precipitation (neerslag)**

In hydrology, the discharge of water in liquid or solid state, out of the atmosphere, upon land or water.

**preferential flow (voorkeurvloei)**

The process whereby water and chemical movement through a porous medium follow favoured routes, thus bypassing other parts of the medium. The favoured routes are cracks, channels and macropores. Syn. bypass flow.

**pressure head (drukhoogte)**

See soil water : pressure head.

**pressure membrane (apparatus) (drukmembraan (-toestel))**

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. Used in a pressure membrane apparatus to determine soil water retention values.

**pressure plate (apparatus) (drukplaat (-toestel))**

A porous ceramic plate, permeable to water and permeable to air only when some critical air-entry pressure value is exceeded, through which water can escape from a soil sample in response to a pressure gradient. Used in a pressure plate apparatus to determine soil water retention values.

**pressure potential (drukpotensiaal)**

See soil water : pressure potential.

**primary mineral (primêre mineraal)**

A mineral that has not been altered chemically since deposition and crystallization from molten lava. Cf. secondary mineral.

**primary mineral (primêre mineraal)**

A mineral that has remained unchanged from the time it was formed out of molten rock.

**prismacutanic B horizon (prismakutaniese B-horison)**

See diagnostic horizon.

**prismatic soil structure (prismatiese grondstruktuur)**

See soil structure.

**prismlike (prismavormig)**

See soil structure.

**probe (peiler)**

A device that can be inserted into a material in order to measure some property thereof, e.g. temperature probe, hardness probe, neutron (water) probe, etc.

**producer (produseerder)**

In ecology, an organism that can use radiant energy, carbon dioxide and inorganic nutrients to synthesize organic substances. Cf. consumer.

**productivity, soil (produktiwiteit, grond-)**

The capacity of a soil, in its normal environment, for producing a specified plant or sequence of plants under a specified system of management.

**profile available water capacity (PAWC) (profiel-beskikbare waterkapasiteit (PBWK))**

For a specified cultivar and growth stage, soil, and evaporative demand, PAWC is the amount of water held in the effective root zone between field capacity and the water content at which water should be applied if optimum yield is to be attained. Cf. available water capacity; soil capacity.

**profile, soil (profiel, grond-)**

See soil profile.

**Proterozoic (Proterosoikum)**

See geological time scale.

**psammite (psammiet)**

A metamorphosed sandstone, arkose, or quartzite, extremely rich in quartz. Etymol. Greek *psammos*, sand.

**psammophyte (psammofiet)**

Plants which prefer or tolerate sand, particularly fine to medium sand, as a habitat.

**pseudomorph (pseudomorf)**

A mineral that has an uncharacteristic crystalline form as a result of assuming the shape of another mineral that it has replaced.

**psychrometer (psigrometer)**

A hygrometer consisting of a similar pair of thermometers, the bulb of one of which is kept wet, and therefore cooled by evaporation. The difference in temperature between the two thermometers is a measure of the relative humidity of the air. Cf. hygrometer.

**puddle (slemp)**

To work a soil in the plastic condition until its pore space is much reduced. Cf. puddled soil.

**puddled soil (toegeslane grond)**

A dense, massive soil artificially compacted when wet and having no regular structure. The condition commonly results from the tillage of a clayey soil when it is wet.

**pure sand (suiwersand)**

A texture class. See soil texture.

**pyrite (piriet)**

An iron sulphide:  $\text{FeS}_2$ . A yellow mineral with metallic lustre, mined chiefly for its sulphur content. Sometimes called "fool's gold".

**pyroclastic (piroklasties)**

A term applied to clastic rock material formed by volcanic explosion or aerial expulsion from a volcanic vent.

**pyrolusite (pirolusiet)**

Manganese dioxide,  $\text{MnO}_2$ . Usually occurs in radiating fibers or columns with metallic lustre.

**pyrophyllite (pirofilliet)**

**An aluminosilicate mineral:  $\text{Al}_4(\text{Si}_8\text{O}_{20})(\text{OH})_4$ . Like the micas it has a layered structure in which a sheet of octahedrally co-ordinated Al ions is sandwiched between two sheets of linked  $\text{SiO}_4$  -tetrahedra.**

**pyroxene (pirokseen)**

**A mineral group in which members are closely analogous chemically to the members of the amphibole group. Augite ( $\text{Ca}(\text{Mg,Fe,Al})(\text{Al,Si})_2\text{O}_6$ ) is the most common pyroxene and an important rock-forming mineral. It is dark-coloured and found mainly in dark-coloured igneous rocks.**

## Q

### quartz (kwarts)

Crystalline silica ( $\text{SiO}_2$ ). It is an important rock-forming mineral and next to feldspar the commonest mineral, occurring either in colourless and transparent hexagonal crystals (sometimes coloured yellow, brown, purple, red, green, blue or black by impurities) or in crystalline or cryptocrystalline masses. Commonly the dominant constituent in the sand fraction of soils, often with red or yellow coatings of iron oxides.

### quartzite (kwartsiet)

- (1) As its name indicates, a quartzite is a rock composed essentially of quartz. It has been derived from a sandstone by intense metamorphism. It is a common and widely distributed rock in which solution and redeposition of silica have yielded a compact rock of interlocking quartz grains; it is hard, resistant to weathering and impermeable. It is distinguished from a sandstone by noting the fracture, which in a quartzite passes through the grains but in a sandstone passes around them.
- (2) A quartzose sandstone cemented by silica which has grown in optical continuity around each fragment.

### quartz diorite (tonalite) (kwartsdioriet; tonaliet)

Plutonic rock with the composition of diorite but with appreciable quartz. A small amount of orthoclase may be present; as this increases, the rock passes to granodiorite.

### quartz porphyry (kwartsporfier)

An extrusive or hypabyssal rock containing phenocrysts of quartz and alkali feldspar, usually orthoclase, with or without mica, in a microcrystalline or cryptocrystalline groundmass. If the phenocrysts are abundant, the rock becomes a granite porphyry.

### Quaternary (Kwaternêr)

See geological time scale.

### quaternary exchange (kwaternêre uitruiling)

Refers to an exchange reaction in which four ions are involved. Cf. binary exchange; ternary exchange.

### quick (condition) (weltoestand)

A condition (e.g. in some sands and clays) in which the bearing capacity of the material is markedly reduced by upward flowing water. Cf. quicksand.

### quicksand (welsand)

Sand that is unstable because of an upward pressure gradient of water in the sand. Usually a thick mass of loose sand and mud saturated with water, which may swallow a heavy object such as an animal. Cf. quick (condition).



## R

### **R horizon (R-horizon)**

See soil horizon.

### **radiocarbon dating (radiokoolstofdatering)**

The determination of the age of a material by measuring the proportion of the isotope  $C^{14}$  (radiocarbon) in the carbon it contains. The method is suitable for the determination of ages up to about 50 000 years.

### **rain shadow (reënskaduwee)**

The area on the leeward side of a mountain range where the precipitation is less than on the rain-bearing, windward side.

### **Ranker (obsolete) (Ranker (verouderd))**

See soil classification.

### **reaction, soil (reaksie, grond-)**

See soil reaction.

### **Recent (Resent)**

See geological time scale.

### **recession (terugtrekking)**

The retreat of the sea, thereby exposing formerly submerged areas. Syn. regression.

### **reclamation (herwinning)**

The process of recovering disturbed and/or deteriorated land to its former uses or other productive uses.

### **reconnaissance survey (verkenningsoopname)**

A reconnaissance inspection or survey of an area to gain general information useful for future planning and management. Cf. soil survey.

### **recycling (hersirkulering)**

A resource recovery method involving the collection and treatment of a waste product for use as a raw material for other purposes, e.g. composting of household wastes.

### **red apedal B horizon (rooi apedale B-horison)**

See diagnostic horizon.

### **Red Desert Soil (Rooi Woestynggrond)**

A zonal great soil group consisting of soil formed under warm-temperate to hot, dry regions under desert type vegetation, mostly shrubs.

### **red earth (rooi aarde)**

Highly leached, red clayey soil of the humid tropics, usually with very deep profiles that are low in silica and high in sesquioxides. Syn. Krasnozem.

### **redox potential (redokspotensiaal)**

Reactions involving the transfer of electrons from donor to acceptor, i.e. oxidation-reduction reactions. Aqueous solutions contain only minute amounts of free electrons, but it is nevertheless possible to define a relative electron activity  $pe = -\log(e^-)$ . The quantity  $pe^0$  indicates the relative electron activity when reacting species other than the electrons are at unit activity. The redox potential ( $E_h$ ) is defined as:

$$E_h = E_h^0 + (RT/nF) \ln[(Ox)/(Red)], \text{ with } E_h^0 - pe^0 \times 60 \text{ mV.}$$

**red structured B horizon (rooi gestruktuurde B-horison)**

See diagnostic horizon.

**reduced tillage (verminderde bewerking)**

See tillage systems.

**reduction (reduksie)**

- (1) The reaction of hydrogen with another substance.
- (2) A chemical reaction in which an element gains an electron, that is the positive valence is reduced, e.g.  $Fe^{3+} + e^- \longrightarrow Fe^{2+}$ .
- (3) In geomorphology : the lowering of a land surface by erosion.

**Red-yellow Podzolic Soil (Rooi-geel Podzoliese Grond)**

A combination of the zonal great soil groups, Red Podzolic and Yellow Podzolic, consisting of soils formed under warm-temperate to tropical, humid climates, under deciduous or coniferous forest vegetation and usually, except for a few members of the Yellow Podzolic group, under conditions of good drainage.

**reflection coefficient (weerkaatsingskoeffisiënt)**

- (1) The average reflectivity over a specific waveband.
- (2) The fraction of radiation intensity reflected by a surface.

**reflectivity (weerkaatsingsvermoë)**

The reflectivity of a surface is the fraction of incident solar radiation reflected at a specific wavelength.

**regic sand (regiese sand)**

See diagnostic horizon.

**regolith (regoliet)**

The unconsolidated mantle of weathered rock and soil material on the earth's surface; loose earth materials above solid rock. (Approximately equivalent to the term "soil" as used by many engineers.)

**Regosol (Regosol)**

Any soil of the azonal order without definite genetic horizons and developing from or on deep, unconsolidated, soft mineral deposits such as sands, loess, or glacial drift. See soil classification.

**regression (regressie)**

See recession.

**Regur (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 Plateau of India. The South African equivalent is the black turf soils or soils of the Arcadia and Rensburg forms (Vertisols).

**relative humidity (relatiewe humiditeit)**

See humidity.

**relief (reliëf)**

The variation in or physical outline of a landscape, shown on maps by the use of contours, spot heights, hypsometric tinting and hillshading. Relief is also used synonymously with relative relief. Positive relief indicates land rising above the general level, i.e. hills. Relief should not be confused with topography. Cf. topography.

**remote sensing (afstandwaarneming)**

Identifying and observing objects from a distance, commonly from aircraft or satellites.

**Rendzina (obsolete) (Rendzina (verouderd))**

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 semi-arid climates. See soil classification.

**renewable resource (hernubare hulpbron)**

See resource.

**replenishment efficiency (aanvullingsdoeltreffendheid)**

The replenishment efficiency of irrigation is the ratio of the amount of water which enters the root zone to the amount of water required to enter the root zone, expressed as a percentage. Cf. application efficiency; distribution efficiency; irrigation efficiency; transmission efficiency.

**residual effect (fertilizer) (nawerking (kunsmis))**

When the effect of a fertilizer application is evident over more than one season, e.g. on crop yield.

**residual material (residuele materiaal)**

Unconsolidated and partly weathered mineral material accumulated by the *in situ* disintegration of consolidated rock.

**residual soil (residuele grond)**

A soil formed from, or resting on, consolidated rock of the same kind as that from which it was formed, and in the same location. Cf. residual material; sedentary soil.

**resilience (herstelvermoë)**

See soil resilience.

**resistance, electrical (weerstand, elektriese)**

(1) That property of any electrically conductive material that causes a portion of the energy of an electric current flowing in a circuit to be converted into heat. This rate of energy conversion is also  $VI$  where  $V$  is the electrical potential difference and  $I$  the current. By Ohm's law  $R = V/I$ , for a metal conductor.

- (2) Soil electrical resistance is measured (and expressed in ohms) on a saturated paste in a US Bureau of Soils resistance cell (cell constant  $0,25 \text{ cm}^{-1}$ ). It is a rough but easily measured guide to the quantity of soluble salts in the soil.

**resource (hulpbron)**

Anything in the environment that is of use to man.

*natural resources* - Part of the environment that can be used commercially (e.g. soil, forests, coal deposits).

*non-renewable resources* - Substances or materials which have been built up or evolved in a geological time-span and cannot be replaced except over a similar time-scale. Examples are copper, coal, oil, etc. We also consider soil to be a non-renewable resource.

*renewable resources* - Resources that derive from solar energy such as rain, wind, trees, grass, fish, wild-life.

**retentivity profile (retensieprofiel)**

A graph showing the retaining capacity of a soil as a function of depth. The retaining capacity may be for water, for water at any given potential, for cations, or for any other substances held by the soil.

**rhizobia (risobia)**

The bacteria capable of living in symbiotic relationship with higher plants, usually legumes, in nodules on the roots. They receive energy from the plant and are capable of using atmospheric nitrogen; hence the term symbiotic nitrogen-fixing bacteria. From the genus name *Rhizobium*.

**rhizosphere (risosfeer)**

The zone of soil immediately adjacent to plant roots in which the kinds, numbers, or activities of microorganisms differ from that of the bulk soil.

**rhyolite (rioliet)**

The extrusive equivalent of granite with quartz and alkali feldspar in a glassy groundmass.

**rill (groef)**

A small, intermittent water course with steep sides; usually only a few centimetres deep and, hence, no obstacle to tillage operations. See erosion.

**rill erosion (groeferosie)**

See erosion.

**riparian (oewer-)**

Pertaining to the banks of a river; as in riparian rights.

**Riss (Riss)**

The third Pleistocene glaciation.

**riverwash (rivierpuin)**

Alluvial material, usually coarse-textured, exposed in streambeds at low water and subject to shifting during normal high water. A miscellaneous land type.

**roaring sand (brulsand)**

Sand, found on a desert dune, that during movement, sets up a low roaring sound that sometimes can be heard for a considerable distance.

**rockland (rotsland)**

Areas containing frequent rock outcrops and shallow soils. Rock outcrops usually occupy 25 to 90% of the area. A miscellaneous land type.

**rock phosphate (rotsfosfaat)**

A finely ground phosphate-containing rock which may be used as a phosphate fertilizer. Also referred to as raw rock phosphate, its chemical formula is conventionally given as  $\text{Ca}_3(\text{PO}_4)_2$ , although it is more likely to approach fluorapatite or hydroxyapatite, with the formula  $[\text{Ca}_3(\text{PO}_4)_2]_3 \cdot \text{Ca}(\text{F},\text{OH})_2$ . Due to its insolubility it is usually used only on acid soils or with organic matter.

**rock salt (rotssout)**

Crystalline, fibrous or even granular aggregates of NaCl (halite).

**root zone (wortelsone)**

The part of the soil that is penetrated or can be penetrated by plant roots.

**rubble land (klipperige land)**

Land areas with 90% or more of the surface covered with stones and boulders. A miscellaneous land type.

**rubification (rubifikasie)**

A process in which iron is released from primary minerals by means of weathering and in the oxidized state the iron causes a reddening of the soil mass. This process is sometimes visible in soils that have been irrigated for some time.

**runoff (afloop)**

That portion of the precipitation on an area which is discharged from the area through stream channels. That which is lost without entering the soil is called *surface runoff* and that which enters the soil before reaching the stream is called *ground water runoff* or *seepage flow* from ground water. (In soil science "runoff" usually refers to the water lost by surface flow; in geology and hydrology "runoff" usually includes both surface and subsurface flow.)

**rutile (rutiel)**

A black, yellowish, or reddish-brown mineral, found in igneous rocks, metamorphosed limestones, and quartz veins. It is a source of titanium; its composition is  $\text{TiO}_2$  and it has a tetragonal crystal structure.

## S

### salic horizon (saliëse horison)

See diagnostic horizon.

### saline-sodic soil (sout-natriumgrond)

A soil containing both sufficient exchangeable sodium and soluble salts to adversely affect the growth of most crop plants. The exchangeable sodium percentage is >15, the conductivity of the saturation extract >400 mS/m (at 25°C), and the pH is usually 8,5 or less in the water saturated soil. Cf. soluble salts; sodic soil; sodium adsorption ratio.

### saline soil (soutgrond)

A soil containing sufficient soluble salts to adversely affect the growth of most crop plants. Specifically, a soil providing a saturation extract having an electrical conductivity >400 mS/m at 25°C and a sodium adsorption ratio <13. Cf. salt-affected soil.

### salinization (versouting; salinisasie)

The process whereby soluble salts accumulate in soil or water. Cf. mineralization.

### salt-affected soil (soutgeaffekteerde grond)

A soil having an excess of soluble salts, or an excess of exchangeable sodium, or both, such that the growth of most crop plants are adversely affected. Cf. saline soil; sodic soil; saline-sodic soil.

### saltation (saltasie)

A mode of sediment transport in which the particles are moved progressively forward in a series of short intermittent leaps, jumps, hops or bounces from a surface; e.g. sand particles skipping downwind by impact and rebound along a desert surface, or bounding downstream under the influence of eddy currents that are not turbulent enough to retain the particles in suspension and thereby return them to the stream bed at some distance downstream. Etymol. Latin *salto*, to jump, leap.

### salt balance (soutbalans)

The comparison between the quantity of dissolved salts carried to an area in irrigation water and the quantity of dissolved salts removed by drainage water.

### salt tolerance (soutbestandheid)

- (1) The average soil salinity required to produce a specified decrease in plant yield.
- (2) The ability, expressed qualitatively or quantitatively, of a plant species to withstand high salt concentrations in soil.

### salty soil (souterige grond)

A term not recommended for use in soil science. See saline soil.

### sand (sand)

- (1) In the RSA, a soil separate consisting of particles 2,0 - 0,05 mm in diameter. See soil separate.
- (2) A soil textural class. See soil texture.

### sand class chart (sandklasdiagram)

See soil texture.

**sandstone (sandsteen)**

A sedimentary rock, consisting mainly of grains of quartz, often with feldspar, mica and other minerals; consolidated, cemented and compacted. Sandstones can be classified according to the "cementing" material which binds the individual grains: (i) calcareous; (ii) siliceous; (iii) ferruginous; and (iv) dolomitic. Colour varies from dark brown or red through yellow to grey and white, mainly due to iron oxide content and its degree of oxidation or hydration; some sandstones have a greenish shade due to the presence of glauconite or reduced iron compounds. Sandstones may be deposited by water or wind action, and primary features (sedimentary structures and fossils) are common.

**sandy (sanderig)**

Containing a large amount of sand (applied to any one of the soil textural classes that contains a large percentage of sand). See soil texture.

**sandy clay (sandklei)**

See soil texture.

**sandy clay loam (sandkleileem)**

See soil texture.

**sandy loam (sandleem)**

See soil texture.

**sandy soil (sanderige grond)**

A qualitative term for a soil containing a large amount of sand. Cf. coarse texture; soil texture.

**sanidine (sanidien)**

See feldspar group of minerals.

**saponite (saponiet)**

See smectite.

**saprolite (saproliet)**

- (1) A soft, earthy, thoroughly decomposed rock formed *in situ* by chemical weathering. It often forms a thick (as much as 100 m) layer, esp. in a humid and tropical or subtropical climate; the colour is commonly some shade of red or brown. Cf. laterite. Syn. saprolith.
- (2) Weathering rock in various stages of decomposition. It has a general organization with respect to colour, structure or consistence which still has distinct affinities with the parent rock.
- (3) See diagnostic horizon.

**saprophyte (saprofiet)**

A plant (e.g. a fungus) that lives on decayed or decaying organic matter.

**SAR (NAV)**

See sodium adsorption ratio.

**saturate (versadig)**

- (1) To fill all the voids between soil particles with a liquid.
- (2) To form the most concentrated solution possible under a given set of physical conditions in the presence of an excess of the solute.
- (3) To fill to capacity, as the adsorption complex with a cation species, e.g. Ca-saturated.

**saturated conductivity (versadigde geleivermoë)**

See soil water : hydraulic conductivity.

**saturated flow (versadigde vloeï)**

See soil water : saturated flow.

**saturated soil paste (versadigde grondpasta)**

A mixture of soil and pure water such that all the voids between the soil particles are filled with water, while at the same time there is no accumulation of free water on the surface. At saturation the soil paste glistens as it reflects light, flows slightly when the container is tipped and the paste slides freely and cleanly off a spatula for all soils, except those with a high clay content.

**saturation extract (versadigingsekstrak)**

The soil solution obtained from a saturated soil paste.

**saturation percentage (versadigingspersentasie)**

The water content of a saturated soil paste expressed on a dry-mass basis. Cf. Soil water : saturation water content.

**sauconite (soukoniet)**

See smectite.

**savanna (savanne; grasvlakte)**

A tropical grassland, usually with scattered trees and shrubs.

**scale (of maps) (skaal (van kaarte))**

- (1) The scale of a map is the ratio of the straight-line distance between any two points on the map to the actual straight-line distance between the same two points on the earth's surface.
- (2) The scale of a map is the linear ratio or proportion between the map and the reality portrayed on the map.

**scanning curve (skandeerkromme)**

See soil water : scanning curve.

**scarp (skarp)**

A steep slope, especially one formed by erosion or faulting. Syn. escarpment. Cf. cuesta.

**schist (skis)**

A strongly foliated crystalline rock formed by dynamic metamorphism which can be readily split into thin flakes or slabs due to the well developed parallelism of more than 50% of the minerals present, particularly those of lamellar or elongate prismatic habit, e.g. mica and hornblende. The mineral composition is not an essential factor in its



definition (American usage) unless specifically included in the rock name, e.g. quartz-muscovite schist. Varieties may also be based on general composition, e.g. calc-silicate schist, amphibolite schist, or on texture, e.g. spotted schist.

**scree (talus; glooiingspuin)**

An accumulation of primary angular clasts which lies at an angle of around 36° beneath an exposed free face or cliff. The prime cause of deposition is rock fall, but other processes, such as debris flows, may contribute to their development. The largest clasts occur at the base of the scree. Syn. talus.

**screen (sifplaat (-draad))**

A perforated plate or meshed fabric used to separate coarser from finer parts, as of sand or other particulate materials. Types include:

*rotary* - An inclined, meshed cylinder that rotates on its axis and screens material placed in its upper end.

*vibrating* - An inclined screen that is vibrated mechanically and screens material placed on it. Cf. sieve.

**sealing (verseëling)**

See soil sealing; soil crust.

**secondary mineral (sekondêre mineraal)**

A mineral resulting from the decomposition of another mineral or from the reprecipitation of the products of decomposition of another mineral. Cf. primary mineral.

**sedentary soil (obsolete) (sedentêre grond; residuele grond (verouderd))**

A soil formed *in situ* from underlying parent rock, in contrast to one derived from transported parent material.

**sediment (sediment)**

- (1) Any material carried in suspension by water, which would settle to the bottom if the water lost velocity.
- (2) Fine water-borne matter deposited or accumulated in beds. Sediment is ordinarily transported as suspended sediment, by saltation or as bed load.

**sedimentary rock (sedimentêre gesteente)**

A rock formed from materials deposited from suspension or precipitated from solution and usually, but not necessarily, consolidated (i.e. cemented). The principal sedimentary rocks are sandstones, shales, limestones and conglomerates.

**sedimentation (sedimentering)**

The process of subsidence and deposition or settling of suspended matter carried by water or other liquids, by gravity.

**sedimentation crust (sedimentasiekors)**

See soil crust.

**seed bed (saadbed)**

The soil prepared by natural or artificial means to promote the germination of seed and the growth of seedlings.

**seed inoculation (saadenting)**

The process of adding microorganisms to seed, used frequently to designate the treatment of leguminous seed with symbiotic nitrogen-fixing bacteria (Rhizobia).

**seepage (sypeling)**

- (1) The loss of water by leakage and drainage from a canal, reservoir or other body of water or from a field. It is generally expressed as flow volume per unit time. Seepage into a body is referred to as influent seepage; that away from a body, as effluent seepage. Cf. soil water : infiltration; percolation.
- (2) Water escaping through or emerging from the soil along an extensive line or surface as contrasted with a spring where the water emerges from a localized spot.

**seif dune (lengteduin)**

A longitudinal dune oriented in the direction of the wind movement. It can be of considerable height and length.

**selective uptake (selektiewe opname)**

The uptake of ions by plants in ratios dissimilar to those occurring in the growth medium.

**selectivity coefficient (selektiwiteitskoëffisiënt)**

A value describing equilibrium conditions for an exchange reaction. It may be compared with the thermodynamic equilibrium constant, but differs from it in that assumptions are made regarding the activities of the ions participating in the exchange reaction.

**self-mulching (selfkrummelend)**

A process of swelling and shrinking due either to alternate wetting and drying or to freezing and thawing, which gives rise to a surface layer of well aggregated granules or fine blocky structure that do not form a crust.

**separate, soil (grondfraksie)**

See soil separate.

**sepiolite (sepioliet)**

A chain-lattice clay mineral:  $Mg_4(Si_2O_5)_3(OH)_2 \cdot 6H_2O$ . It is an extremely lightweight, absorbent, soft, compact to fibrous, and white to light-grey or light-yellow material found chiefly in Asia Minor and used for making tobacco pipes, pipe bowls, cigar and cigarette holders, and ornaments. It occurs in deposits formed from weathering of serpentine masses. Syn. meerschaum; sea-foam.

**sequum (sekwum)**

A vertical sequence of pedogenetically interrelated soil horizons.

**sericite (serisiet)**

A white, fine-grained potassium mica occurring in small scales and flakes as an alteration product of various aluminosilicate minerals, having a silky lustre and found in various metamorphic rocks, fault gangue and vein fillings of many deposits. It is a variety of muscovite, or very close to muscovite in composition, and may also include much illite.

series, soil (serie, grond-)

See soil series.

serpentine (serpentyn)

A group of common rock-forming minerals having the formula:

$(\text{Mg,Fe})_3\text{Si}_2\text{O}_5(\text{OH})_4$ . Serpentine has a greasy or silky lustre, a slightly soapy feel and a tough, conchoidal fracture; they are usually compact but may be granular or fibrous and are commonly green, greenish yellow or greenish grey (sometimes brown, black or white) and often veined or spotted with red, green and white. Serpentine is always a secondary mineral, derived by alteration of magnesium-rich silicate minerals (esp. olivines) and are found in both igneous and metamorphic rocks.

sesquan (seskwaan)

See micromorphology.

sesquioxide (seskwioksied)

A binary compound of a metal and oxygen in the proportion of 3 to 2, as  $\text{Al}_2\text{O}_3$  and  $\text{Fe}_2\text{O}_3$ . The term sesquioxides is also used generally to describe free iron, aluminium and manganese oxides in the soil.

Sesquisol (Seskwisol)

See soil classification.

settlement (afsakking)

A gradual subsidence of material. Differential settlement is the non-uniform subsidence of material from a fixed horizontal reference plane.

sewage (riool)

The waste matter from industrial and domestic sources disposed of through sewers. It contains 95-99% water. Cf. sewage sludge.

sewage sludge (rioolslyk)

Solid material, mostly organic matter, produced by a sewage treatment plant through separation of the liquid and solids in sewage. It contains important plant nutrients such as N and P, but also varying amounts of potentially hazardous chemicals. Cf. sewage.

shale (skalie)

A fine-grained, indurated, detrital sedimentary rock formed by the consolidation (as by compression or cementation) of clay, silt or mud and characterized by finely stratified structure and/or fissility that is approximately parallel to the bedding (along which the rock breaks readily into thin layers) which is commonly most conspicuous on weathered surfaces. It has an appreciable content of clay minerals or derivatives from clay minerals and of detrital quartz. Cf. mudstone; slate.

shear (afskuiwing; skuifspanning)

- (1) A distortion, strain, or failure producing a change in form, usually without change in volume, in which parallel layers of a body are displaced in the direction of their line of contact.
- (2) A force, as with a tillage implement, acting at right angles to the direction of movement.

**shear strain (skuifvervorming)**

The angular skew, in radians, of an element undergoing change of shape by tangential (shearing) forces.

**shear strength (skuifsterkte)**

The maximum resistance to shearing stresses which a specimen or element of soil can withstand before failure occurs. The shearing strength is generally considered to be made up of (i) internal friction, or resistance due to interlocking of the particles and (ii) cohesion, or resistance due to the forces tending to hold the particles together in a solid mass. The law governing the shear failure of soils is generally known as Coulomb's law and given by:

$$S = C + \sigma \tan \Theta$$

where  $S$  = shearing resistance under conditions of normal stress

$C$  = cohesion

$\sigma$  = normal stress

$\Theta$  = angle of internal friction.

The cohesion and angle of internal friction are found from a shearing strength diagram in which normal stress is plotted against shearing strength.

**shearing stress (skuifspanning)**

See shear strength.

**sheet (plaat)**

The occurrence of groups of atoms such as silicon-oxygen tetrahedra or aluminium-oxygen (hydroxyl) octahedra in a plane. Two or more such sheets comprise a layer of the layer lattice minerals. Cf. layer; lattice.

**sheet erosion (plaaterosie)**

See erosion.

**shrinkage index (krimpindeks)**

See Atterberg limits.

**shrinkage limit (krimpgrens)**

See Atterberg limits.

**shrinkage ratio (krimpverhouding)**

The ratio of a given volume change, expressed as a percentage of the dry volume, to the corresponding change in water content above the shrinkage limit, expressed as a percentage of the mass of the oven-dried soil.

**siallite (obsolete) (sialliet (verouderd))**

Weathered rock material consisting largely of aluminosilicate clay minerals and being highly leached of the alkalis and alkaline earths.

**siallitic soil (siallitiese grond)**

Soil which, during its development, has not lost appreciable amounts of silica. Its clay fraction is dominated by 2:1 layer clays. Cf. ferrallitic, fersiallitic and allitic soil.

**siderite (sideriet)**

**FeCO<sub>3</sub>, trigonal.**

**siemens (siemens)**

The SI unit for electrical conductance; the reciprocal of ohm. Cf. mho.

**Sierozem (Grey Desert Soil) (Sierozem (Grys Woestynggrond))**

A zonal great soil group consisting of soils with pale greyish A horizons grading into calcareous material at a depth of 300 mm or less, and formed in temperate to cool, arid climates under a vegetation of desert plants, short grass and scattered brush.

**sieve (sif)**

An apparatus containing a screen, used for separating particulate materials into different size fractions. Cf. screen.

**silcrete (silcrete)**

- (1) A term for a conglomerate consisting of surficial sand and gravel cemented into a hard mass by silica.
- (2) A siliceous duricrust. Syn. billy (Australia). Cf. duricrust; hardpan.

**silica (silika)**

The chemically resistant dioxide of silicon: SiO<sub>2</sub>. It occurs naturally in five crystalline polymorphs (the minerals quartz, tridymite, cristobalite, coesite and stishovite); in cryptocrystalline form (as chalcedony); in amorphous and hydrated forms (as opal); in less pure forms (such as sand, diatomite, tripoli, chert and flint) and combined in silicates as an essential constituent of many minerals.

**silica-alumina ratio (silika-alumina verhouding)**

The molecular ratio of silicon dioxide (SiO<sub>2</sub>) to aluminium oxide (Al<sub>2</sub>O<sub>3</sub>) in clay minerals or in soils.

**silica-sesquioxide ratio (silika-seskwioksied verhouding)**

The molecular ratio of silicon dioxide (SiO<sub>2</sub>) to aluminium oxide (Al<sub>2</sub>O<sub>3</sub>) plus ferric oxide (Fe<sub>2</sub>O<sub>3</sub>) in clay minerals or in soils.

**silicate (silikaat)**

A compound whose crystal lattice contains SiO<sub>4</sub>-tetrahedra, either isolated or joined through one or more of the oxygen atoms to form groups, chains, sheets, or three-dimensional structures with metallic elements. Silicates are classified according to crystal structure, i.e. nesosilicate, sorosilicate, cyclosilicate, inosilicate, phyllosilicate and tectosilicate.

**siliceous (silikahoudend)**

Relating to or containing silica, e.g. a siliceous clay; siliceous deposits.

**silicon-oxygen tetrahedron (silikon-suurstof tetraëder)**

A complex ion formed by four oxygen ions surrounding a silicon ion, with a negative charge of 4 units; the basic unit of the silicates. It is commonly written as SiO<sub>4</sub>.

**sill (intrusieplaat)**

A tabular igneous intrusion, approximately uniform in thickness, and relatively thin compared with its lateral extent, that parallels the structure of the surrounding rock. Cf. dike.

**silt (slik)**

See soil texture.

**siltstone (sliksteen)**

A fine-grained, consolidated clastic rock composed predominantly of silt-size particles.

**silty clay (slikklei)**

See soil texture.

**silty clay loam (slikkleileem)**

See soil texture.

**silty loam (slikleem)**

See soil texture.

**Silurian (Siluur)**

See geological time scale.

**single-grained structure (enkelkorrelstructuur)**

A soil structure class in which the soil particles occur almost completely as individual or primary particles with essentially no secondary particles or aggregates being present. Usually found only in extremely coarse-textured soil. Cf. soil structure.

**single superphosphate (enkel superfosfaat)**

See superphosphate.

**sink (put)**

A term used to describe the removal of material or substances during a process occurring in soil, e.g. the precipitation of compounds during water flow through soil removes solutes from the water. Cf. source.

**sinkhole (sinkgat)**

A funnel-shaped depression in the land surface caused by solution of limestone or dolomite by underground water.

**site (ligging)**

- (1) In ecology, an area described or defined by its biotic, climatic and soil conditions as related to its capacity to produce vegetation.
- (2) An area sufficiently uniform in biotic, climatic and soil conditions to produce a particular climax vegetation.

**site index (liggingsindeks)**

- (1) A quantitative evaluation of the productivity of a soil for forest growth under the existing or specified environment.
- (2) The height of the dominant forest vegetation taken at or calculated to an index age, usually 50 or 100 years.

**size limits (groottegrense)**

The limiting sizes of the various soil separates. Cf. soil separates.

**skeletal soil (skeletgrond (litosol))**

See lithosol.

**skeleton grain (skeletkorrel)**

See micromorphology.

**skewness (skeefheid)**

A measure of the symmetry of a distribution about its mean. The skewness is zero when the distribution is symmetric about its mean. A distribution is roughly symmetric when  $-0,5 < \text{skewness} < +0,5$ . When the skewness exceeds +1 or is less than -1 the distribution is highly skewed.

**slag (slak)**

Non-metallic material obtained during the smelting of metallic ores; generally formed as a molten mass floating on top of the molten metal. Sometimes used as a fertilizer on the basis of its content of plant nutrient elements. Cf. basic slag.

**slake (blus)**

- (1) The crumbling and disintegration of earth materials upon exposure to air or water; specifically the breaking up of dried clay or indurated soil when saturated with or immersed in water, or the breaking up of clay-rich sedimentary rocks when exposed to air.
- (2) The disintegration of tunnel walls in swelling clay due to inward movement and circumferential compression.
- (3) The treating of lime (CaO) with water to give hydrated (slaked) lime.

**slaked lime (gebluste kalk)**

Calcium hydroxide,  $\text{Ca}(\text{OH})_2$ ; used in agriculture as a liming material for the amendment of acid soils.

**slate (lei)**

A compact, fine-grained, metamorphic rock formed from such rocks as shale and volcanic ash, which possesses the property of fissility (cleavage) along planes independent of the original bedding (slating cleavage), whereby they can be parted into plates which are lithologically indistinguishable.

**slaty (leihoudend)**

Containing a considerable quantity of slate fragments.

**slickens (mynslik)**

Fine-textured materials separated in placer mining and in ore-mill operations; the materials may be detrimental to plant growth and so should be confined in specially constructed basins.

**slickenside (wryfvlak)**

Refers to a polished or grooved ped surface within the soil. It results from part of the soil mass sliding or moving against adjacent material along a plane, which defines the extent of the slickenside. They occur only in clayey materials with a relatively high smectite content.

**slick spots (gladde kolle)**

Barren areas having puddled or crusted, very smooth, nearly impervious surfaces, usually because of high salinity or alkalinity.

**slip (glyding)**

The downslope movement of a soil mass under wet or saturated conditions; a microlandslide that produces microrelief in soils.

**slope (helling)**

The degree of deviation of a surface from horizontal, measured in a numerical ratio, per cent, or degrees. Expressed as a ratio or percentage, the first number is the vertical distance (rise) and the second is the horizontal distance (run, as 2:1 or 200%). Expressed in degrees, it is the angle of the slope from the horizontal plane with a 90° slope being vertical (maximum) and 45° being a 1:1 slope.

**slow-release fertilizer (stadig-vrystellende misstof)**

A fertilizer usually containing nitrogen, modified to release a nutrient or nutrients slowly or in a controlled fashion, mainly to combat loss thereof through leaching. Sulphur-coated urea (SCU) and polymerized urea-formaldehyde are well-known examples. Also referred to as controlled-release fertilizer.

**sludge (slyk)**

See sewage sludge.

**smectite (smektiet)**

A group of swelling clay minerals made up of 2:1 unit layers, each layer consisting of two silicon-oxygen tetrahedral sheets enclosing one aluminium-oxygen (or hydroxyl) octahedral sheet (i.e. 2:1 unit layers). The layers are continuous in the a and b direction and are stacked one above the other in the c direction. Cations that are large on account of hydration (e.g. Ca<sup>2+</sup>) are situated between the 2:1 unit layers. Water and other polar molecules can enter between the unit layers causing the lattice to expand in the c direction. Members of the group include dioctahedral montmorillonite (Mg-rich), beidellite (Al-rich) and nontronite (Fe-rich) and trioctahedral hectorite (Mg, Li-rich), saponite (Mg-rich) and sauconite (Zn-rich). CEC ranges from 80-100 cmol<sub>e</sub>/kg and surface area from 6x10<sup>5</sup> to 8x10<sup>5</sup> m<sup>2</sup>/kg. Cf. bentonite.

**sod (sooi)**

A surface layer of grassland soil matted with entwined roots.

**sodic soil (natriumgrond)**

Soil with a low soluble salt content but sufficient adsorbed sodium to have caused significant deflocculation. The exchangeable sodium percentage (ESP) is greater than 15. See soluble salts; sodium adsorption ratio; deflocculation; saline-sodic soil; alkali soil.

**sodium adsorption ratio (SAR) (natriumadsorpsieverhouding (NAV))**

A relation between soluble sodium and soluble divalent cations which can be used to predict the exchangeable-sodium percentage of soil in equilibrium with that solution. It is defined as follows:

$$[\text{Na}]$$



$$\text{SAR} = \frac{\text{[Na]}}{([\text{Ca}] + [\text{Mg}])^{1/2}}$$

where [ ] = concentration of ions in mmol/dm<sup>3</sup>. It is a measure of the quality of a solution (saturation extract, irrigation water, etc.) as regards the Na content. Cf. adjusted SAR.

**sodium feldspar (natriumveldspaat)**

See feldspar group of minerals.

**soft (consistence) (sag (konsistensie))**

See soil consistence.

**soft carbonate horizon (sagte karbonaathorison)**

See diagnostic horizon.

**soft plinthic B horizon (sagte plintiese B-horison)**

See diagnostic horizon.

**soil (grond)**

- (1) The unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.
- (2) The unconsolidated mineral matter on the surface of the earth that has been subjected to and influenced by genetic and environmental factors of parent material, climate (including precipitation 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.
- (3) A kind of soil is the collection of soils that are alike in specified combinations of characteristics. Kinds of soil are given names in a system of soil classification. The terms "the soil" and "soil" are collective terms used for all soil, equivalent to the word "vegetation" for all plants.

**soil aeration (grondbelugting)**

The process by which air in the soil is replaced by air 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 and a correspondingly lower percentage of oxygen than the atmosphere above the soil. The rate of aeration depends largely on the volume and continuity of airfilled pores within the soil.

**soil aggregation (grondaggregasie)**

The cementing or building together of several soil particles into a secondary unit or ped, aggregate or granule. Water-stable aggregates, which will not disintegrate easily, are of special importance to soil structure.

**soil air (grondlug)**

The soil atmosphere; the gaseous phase of the soil, being that volume not occupied by solid or liquid.

**soil amendment (grondverbeteringsmiddel)**

A substance used to alter the properties of soil for the purpose of making it more suitable for a particular purpose. Examples are lime and gypsum. The term fertilizer is preferable for those amendments which provide elements essential for plant growth. Syn. ameliorating agent; ameliorant; soil conditioner.

**soil analysis (grondontleding)**

The chemical, physical and mineralogical analysis of soil samples, frequently for the purpose of determining the plant available nutrients; analyses are usually conducted in laboratories, but quick-test kits are also used. Syn. soil test.

**soil association (grondassosiasie)**

A number of defined and named taxonomic soil units, regularly geographically associated in a defined pattern. It is the principal soil mapping unit of small-scale maps. See map (soil); map unit; catena; complex.

**soil capacity (grondkapasiteit)**

The specific volume of the soil profile per unit land area available for the provision of water (and inorganic nutrient elements) to the growing plant. For water it is given by:

$$C = \frac{\sum d_{w(i)} \times (\rho_{b(i)} \times P_{m(i)} \times d_{g(i)})}{\rho_w \times 100}$$

where i	=	horizon number (1 to n)
$d_{w(i)}$	=	soil capacity of horizon i
$\rho_b$	=	soil bulk density
$P_m$	=	available water percentage (mass basis)
$d_g$	=	horizon thickness
$\rho_w$	=	density of water.

This concept was defined by W.J. Fölscher in 1970. Cf. profile available water capacity.

#### soil category (grondkategorie)

One of the ranks or levels in a system of classification. Each such rank (e.g. form, family) contains one or more classes. The classes in one category are defined at roughly the same level of abstraction.

#### soil chemistry (grondchemie)

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

#### soil classification (grondklassifikasie)

Soil classification is the ordering of soils into a hierarchy of classes. The product is an arrangement or system of classification designed to express interrelationships of soils and to serve as a filing system. Broad groupings are made on the basis of general characteristics; subdivisions on the basis of more detailed differences in specific properties. (See also: natural classification; numerical classification; technical classification.) Various soil classification systems exist. The taxonomic system for South Africa, Soil Taxonomy (USA) and the international World Reference Base for Soil Resources are outlined below.

#### (1) Soil Classification - A Taxonomic System for South Africa (Soil Classification Working Group, 1991)

In essence the system is a very simple one which employs two main categories or levels of classes - an upper or general level containing SOIL FORMS, and a lower, more specific one containing SOIL FAMILIES. Each soil form is a class at the upper level, defined by a unique vertical sequence of diagnostic horizons and/or materials. Although some forms contain only one family, most are divided into a number of families which have in common the properties of the form (that is, the prescribed sequence of horizons and/or materials), but are differentiated within the form on the basis of other defined properties. The range of variation at the family level is thus narrower than at the form level.

To date 73 soil forms and 400 soil families have been defined. Full details are given in the reference cited above.

#### (2) Soil Taxonomy (USDA, 1975; Soil Survey Staff, 1994)

In this system the category at the highest level of generalization is the soil order. The lower categories of classification are : suborder, great group, subgroup, family and series.

The properties selected to distinguish the orders are reflections of the degree of horizon development and the kinds of horizons present. The eleven orders are briefly defined below:

*Alfisols* - Soils of temperate-region forests showing moderate effects of weathering and leaching, but strong eluviation and illuviation; well-developed A2 and B horizons; base saturation usually above 35% in the B horizon.

*Andisols* - Soils, usually dark, with andic soil properties resulting mainly from the presence of significant amounts of allophane, imogolite, ferrihydrite or aluminium-humus complexes. Included are weakly weathered soils with much volcanic glass. From Japanese *ando*, dark soil.

*Aridisols* - Soils of arid regions; insufficient water to produce enough organic matter for a thick O or Al horizon; bases are not leached and accumulate in the A horizon because evaporation is greater than leaching.

*Entisols* - Recent soils that show little evidence of the factors of soil formation; common in alluvial areas and on steep slopes.

*Histosols* - Dark soils rich in organic matter (histic epipedon), usually wet, but without andic properties.

*Inceptisols* - Recent soils of humid regions that show beginning evidence of soil formation; clay and bases have not moved to any extent; B horizons may be red coloured and calcium carbonate may have leached.

*Mollisols* - Soils of the subhumid to semi-arid grasslands with deep, dark, friable surface horizons; base saturation above 35%.

*Oxisols* - Deep red soils of the tropics showing maximum effects of weathering and leaching; high in iron oxides.

*Spodosols* - Highly leached, strongly acid, coarse-textured soils of the humid forests; aluminium and iron oxides and humus have moved into the B horizon.

*Ultisols* - Soils of subtropical forests showing effects of strong weathering, leaching, eluviation and illuviation; very similar to Alfisols except base saturation is 35% or less.

*Vertisols* - Soils high in expanding clay that form large cracks on drying; self-mixing.

### (3) World Reference Base for Soil Resources (Spaargaren, 1994)

The 1974 FAO-Unesco soil classification for the Soil Map of the World has been replaced by the one described in the World Reference Base for Soil Resources (Spaargaren, 1994). Basically it remains a mono-categorical classification of soils, with

30 major soil groups having been defined. A number of the 1974 major soil groups are now obsolete - they are indicated as such in the following list.

***Acrisols*** - Acrisols are soils having a B horizon with illuvial accumulation of clay and low base saturation. (Latin *acris*, very acid).

***Alisols*** - Alisols are soils in which, through weathering of 2:1 clay minerals, large amounts of aluminium and magnesium are released, giving rise to strongly acid conditions. (Latin *alumen*, alum).

***Andosols*** - Andosols are soils formed from materials rich in volcanic glass and commonly having a dark surface horizon. These soils are dominated by amorphous material and have low bulk densities. (Japanese: *an*, dark, *do*, soil).

***Anthrosols*** - Anthrosols are soils which have been influenced by man, e.g. through cultivation, irrigation, etc. Also described as anthropogenic soils.

***Arenosols*** - Arenosols are weakly developed coarse-textured soils, usually deep. (Latin *arena*, sand).

***Calcisols*** - Calcisols are characterized by an accumulation of  $\text{CaCO}_3$  in the solum; this is or has been the most dominant soil-forming process.

***Cambisols*** - Cambisols are soils showing some changes in colour, structure and consistence due to pedogenesis, but are still in early stages of development. (*Vide* Inceptisols in USDA Soil Taxonomy). (Latin *cambiare*, change).

***Chernozems*** - Chernozems are soils with a black melanic A horizon and free lime in the subsoil. (Russian *chern*, black).

***Cryosols*** - Cryosols are developed in very cold climates and are characterized by an ice-cemented permafrost table within the solum.

***Ferralsols*** - Ferralsols are soils with a high content of sesquioxides.

***Fluvisols*** - Fluvisols are soils developed from recent alluvial deposits and having no diagnostic subsurface horizons. (Latin *fluvius*, river).

***Gleysols*** - Gleysols are soils with gley horizons, i.e. excessively wet soils.

***Glossisols*** - Glossisols are soils with an ochric surface horizon and an argic horizon whose upper boundary is irregular because of tongue-like penetrations of a lighter and coarser eluvic horizon. (Greek *glossa*, tongue).

***Greyzems*** (obsolete - 1974) - Greyzems are soils which have grey colours due to a blending of dark-coloured organic matter and white silica powder.

***Gypsisols*** - Gypsisols contain a gypsic horizon (horizon containing secondary gypsum,  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) at the soil surface or at some depth.

**Histosols** (obsolete - 1974) - Histosols are soils which are very high in fresh or decomposed organic matter, e.g. peat or muck soils. (Greek *histos*, tissues).

**Kastanozems** - Kastanozems have a dark brown or dark grey A horizon rich in organic matter and bases (melanic A) and free lime in the subsoil. (Latin *castaneo*, chestnut).

**Leptosols** - Leptosols are shallow, stony or very stony soils overlying rock, partially altered rock or strongly calcareous materials.

**Lithosols** (obsolete - 1974) - Lithosols are shallow stony soils, i.e. soils with hard rock at shallow depth.

**Lixisols** - Lixisols are characterized by a clay accumulation in the B horizon in combination with the occurrence of low activity clays and a moderate to high base saturation. (Latin *lix*, lye).

**Luvisols** - Luvisols are soils with a prominent illuvial accumulation of clay in the subsoil and moderate to high base status. It does not have a natric horizon and the subsoil is not saline.

**Nitisols** - Nitisols are red soils showing clay movement within the profile but with diffuse horizon boundaries. They have favourable physical properties and often high fertility. Usually developed from basic igneous rocks. (Compare with the rhodic concept in the USDA Soil Taxonomy).

**Nitosols** - Nitosols are characterized by the presence of a nitic horizon (see diagnostic horizon). Otherwise comparable with the earlier Nitosol.

**Phaeozems** - Phaeozems are soils with melanic A horizons (mollic epipedons but no free lime in the subsoil).

**Planosols** - Planosols are soils having a bleached horizon (E horizon) abruptly overlaying a B horizon having prominent clay illuviation and signs of wetness in the subsoil. They generally develop in level or depressed topography with poor drainage. (Latin *planus*, flat).

**Podzols** - Podzols are soils with a strongly bleached horizon over a red brown B horizon formed from illuviation of humus and iron oxides.

**Podzoluvisols** (obsolete - 1974) - Podzoluvisols are soils with a bleached horizon (E or albic horizon) overlying a B horizon showing prominent illuvial accumulation of clay.

**Rankers** (obsolete - 1974) - Rankers are shallow soils developed from siliceous material. (Austrian *rank*, steep slope).

**Regosols** - Regosols are soils with weak or no development, i.e. non-alluvial unconsolidated materials with no diagnostic sub-surface horizons. (Greek *rhegos*, blanket; connotative of loose material overlying the hard core of the earth).

**Rendzinas** (obsolete - 1974) - Rendzinas are soils with a thin mollic A horizon (melanic A) over calcareous material. (Polish *rzędzić*, noise; connotative of noise made by plough over shallow stony soil).

*Sesquisols* - Sesquisols are soils affected by groundwater and in which iron has been segregated to such an extent that a mottled layer which has been formed hardens irreversibly when exposed to the air and sunshine. Included are soils that have such a layer at shallow depth.

*Solonchaks* - Solonchaks are soils having high salinity and no well-developed subsurface horizons.

*Solonetz* - Solonetz are soils having natric B horizons, i.e. B horizons rich in sodium and/or magnesium and having prismatic structure.

*Stagnosols* - Stagnosols are soils with a perched water table showing features of oxidation and reduction caused by surface water. (Latin *stagnare*, to flood).

*Termosols* - Termosols are desert soils with a weakly developed A horizon and a moderately saline and/or alkaline subsoil.

*Umbrisols* - Umbrisols are relatively deep soils having a well-developed, dark-coloured, organic-rich, acid surface horizon. (Latin *umbra*, shade).

*Vertisols* - Vertisols have clayey topsoils, rich in swelling clays, which crack when dry.

*Yermosols* (obsolete - 1974) - Soils occurring under an aridic moisture regime.

*Xerosols* (obsolete - 1974) - Xerosols are semi-desert soils with a moderately saline and/or alkaline subsoil. (Greek *xeros*, dry).

#### soil colloid (grondkolloïed)

Soil organic and inorganic particles with very small particle size ( $10^{-6}$  to  $10^{-9}$  m, or 1 to  $10^{-3}$   $\mu\text{m}$ ) and a correspondingly large surface area per unit of mass. Clay ( $< 2$   $\mu\text{m}$ ) is sometimes classed as a colloid, although this is not strictly correct. The upper size limit of a colloid is sometimes taken as 0,5  $\mu\text{m}$  or even 0,1  $\mu\text{m}$ . Most colloidal particles are too small to be seen with the ordinary compound microscope. Soil colloids do not go into true solution as sugar or salt do, but they may be dispersed into a relatively stable suspension and thus be carried in moving water. By treatment with salts and other chemicals, colloids may be flocculated, or aggregated, into small crumbs or granules that settle out of water. Many inorganic soil colloids are really tiny crystals and the minerals can be identified with X-rays and in other ways.

#### soil colour (grondkleur)

The description of soil colour has been standardized through the use of Munsell notations. Accordingly colour is given in terms of a verbal description (e.g. yellowish brown) and a notation (e.g. 10YR5/4), the latter being compounded from notations for hue (10YR) value (5) and chroma (4). Hue refers to the dominant spectral colour which is related to the dominant wavelength of the light. Value refers to the relative lightness of colour and is a function of the total amount of light. Chroma is the relative purity or strength of the spectral colour and increases with decreasing greyness. Colour usually varies with the water content of the soil. The water status (dry or moist) must always accompany colour description and the moist colour at least must always be given. A mottled or variegated pattern of colours is common in certain soil horizons due to, *inter alia* hydromorphy, illuviation, biological activity, and rock weathering in freely drained conditions (i.e. saprolite). It is described by noting (i) the colour of the matrix and

colour or colours of the principal mottles, and (ii) the pattern of the mottling. The latter is given in terms of abundance (few, common (2 to 20% of the exposed surface), or many), size (fine, medium (5 to 15 mm in diameter along the greatest dimension), or coarse), contrast (faint, distinct or prominent), form (circular, elongated-vesicular, or streaky) and the nature of the boundaries of the mottles (sharp, clear or diffuse); of these, abundance, size and contrast are most important.

**soil compaction (grondverdigting)**

The process of bringing soils to a dense state (increasing its bulk density) by blows, vehicle passage or some other type of loading.

**soil complex (grondkompleks)**

A map unit used in soil surveys for two or more defined taxonomic units which are so intimately mixed geographically that it is undesirable or impractical, because of the scale being used, to separate them. See association, soil.

**soil conditioner (grondverbeteringsmiddel)**

- (1) A soil amendment, particularly one that promotes aggregation. Usually refers to the synthetic polymers used for this purpose, e.g. Krilium, PVA, VAMA, HPAN, etc.
- (2) Any material added to a soil for the purpose of improving its physical condition. Syn. soil amendment.

**soil conservation (grondbewaring)**

- (1) The protection of the soil against physical loss by erosion or against chemical or physical deterioration; that is, excessive loss of soil fertility by either natural or artificial means.
- (2) A combination of all management and land use methods which safeguard the soil against depletion or deterioration by natural or by man-induced factors.

**soil consistence (grondkonsistensie)**

The degree of cohesion or adhesion within the soil mass or its resistance to deformation or rupture. The following soil consistence descriptions are used for the indicated soil wetness regimes:

<i>dry</i>	-	loose; soft; slightly hard; hard or very hard
<i>moist</i>	-	friable; slightly firm; firm or very firm
<i>wet</i>	-	(both in terms of stickiness and plasticity) non-sticky; slightly sticky; sticky or very sticky; non-plastic; slightly plastic; plastic or very plastic.

**soil consociation (grondkonsosiasie)**

A soil map unit indicating an area that is occupied by a single taxonomic unit only.

**soil core (grondkern)**

An undisturbed soil sample contained in or obtained by way of a cylindrical soil sampling tube, usually consisting of an outer tube encasing segmented, removable inner cylinders.

**soil correlation (grondkorrelasie)**



The process of defining, mapping, naming and classifying the kinds of soils in a specific soil survey area, the purpose being to insure that soils are adequately defined, accurately mapped and uniformly named in all soil surveys made in a particular country. It is also concerned with the standards and techniques for describing soils and with the application and development of soil classification.

**soil creep (grondkruip)**

The 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.

**soil crust (grondkors)**

A thin surface layer on soil, ranging in thickness from less than one millimetre up to about 25 mm, which is hard and brittle when dry and much more compact than the material immediately beneath it. Cf. modulus of rupture; soil sealing. Various types of crusts may develop:

*drying crust (drogingskors)*

A desiccated surface layer in which particle sorting or the development of microhorizons has not occurred.

*structural crust (struktuurkors)*

A dense surface crust with identifiable microhorizons; a coarse sand layer is present above a washed-in layer of finer particles.

*depositional crust (afsettingskors)*

A crust developed by deposition in running water. It is often observed in furrows and is characterized by the sorting of particles into lamellae.

*sedimentation crust (sedimentasiekors)*

A crust formed by the sedimentation of particles in stationary water. It is characterized by a layer of fine particles on the surface and often curls up upon drying.

*erosion crust (erosiekors)*

A crust developed from a structural crust through the removal of the coarser surface layer by water or wind, thus exposing the washed-in layer on the surface.

*pavement crust (plaveiselkors)*

A crust formed through the continuous loss of finer particles by erosion, thus resulting in a surface layer of gravel and cobbles. Occurs mainly in arid and semi-arids region.

*biological crust (biologiese kors)*

A surface organic crust usually developed upon repeated (more or less daily) surface-applied irrigation. It consists of a dense mat of algae and fungi, sometimes mosses.

**soil degradation (gronddegradasie; grondagteruitgang)**

The physical, chemical or biological deterioration of soil. Soil erosion, soil salinization and loss of biological life, respectively, are examples.

**soil depth (gronddiepte)**

The thickness of the solum. Cf. effective soil depth.

**soil dynamics (gronddinamika)**

The study of the behaviour of soils subjected to dynamic loading conditions. It is related to the design of foundations, lateral earth pressure on structures, soil liquefaction and bearing capacity of shallow foundations.

**soil erosion (gronderosie)**

See erosion.

**soil extract (grondekstrak)**

The solution separated from a soil suspension or from a soil by filtration, centrifugation, suction or pressure.

**soil family (grondfamilie)**

An intermediate category in a soil classification system. See soil classification.

**soil fertility (grondvrugbaarheid)**

The condition of a soil that enables it to provide nutrients in adequate amounts and in proper balance for the growth of specified plants, when other growth factors, such as light, water, temperature and physical condition of soil, are favourable.

**soil filtration (grondfiltrasie)**

The removal of dissolved or suspended substances (e.g. chemicals, oils, etc.) from a liquid percolating through the soil.

**soil form (grondvorm)**

See soil classification.

**soil-forming factors (grondvormingsfaktore)**

The variables that are active in and responsible for the processes involved in the formation of soil. The factors are parent material, climate, the biotic factor, topography and time.

**soil genesis (grondgenese)**

- (1) The mode of origin of the soil with special reference to the processes and soil-forming factors responsible for the development of the solum or true soil from the unconsolidated parent material.
- (2) That branch of pedology concerned with the origin of soils.

**soil geography (grondgeografie)**

A subspecialization in physical geography concerned with the areal distribution of soil types.

**soil horizon (grondhorison)**

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, consistence, kinds and numbers of organisms present, degree of acidity or alkalinity, etc. Cf. diagnostic horizon.

The following generalized diagram and table lists the designations and properties of the major soil horizons. Very few if any soils have all of these horizons well developed, but every soil has some of them.

<b>O1</b>	Loose leaves and organic debris, largely undecomposed
<b>O2</b>	Organic debris, partially decomposed or matted
<b>A1</b>	Dark coloured due to admixture of humified organic matter with the mineral fraction
<b>A2 or E</b>	Light coloured mineral horizon
<b>A3</b>	Transitional to B but more like A than B
<b>B1</b>	Transitional to A but more like B than A
<b>B2</b>	Maximum expression of B horizon character
<b>B3</b>	Transitional to C
<b>C</b>	Unconsolidated material
<b>R</b>	Hard rock

**Horizon  
designation**

**Description**

- O** Organic horizons of mineral soils. Horizons: (i) formed or forming in the upper part of mineral soils above the mineral part; (ii) dominated by fresh or partly decomposed organic material.
- O1** Organic horizons in which essentially the original form of most vegetative matter is visible to the naked eye. The O1 corresponds to the L (litter) and some F (fermentation) layers in forest soils designations and to the horizon formerly called A<sub>oo</sub>.
- O2** Organic horizons in which the original form of most plant or animal matter cannot be recognized with the naked eye. The O2 corresponds to the H (humus) and some F (fermentation) layers in forest soils designations and to the horizon formerly called A<sub>o</sub>.
- A** Mineral horizons consisting of : (i) horizons of organic-matter accumulation formed or forming at or adjacent to the surface; (ii) horizons that have lost clay, iron or aluminium with resultant concentration of quartz or other resistant minerals of sand or silt size; or (iii) horizons dominated by (i) or (ii) above but transitional to underlying B or C.
- A1** Mineral horizons, formed or forming at or adjacent to the surface, in which the feature emphasized is an accumulation of humified organic matter intimately associated with the mineral fraction.
- A2 or E** Mineral horizons in which the feature emphasized is loss of clay, iron or aluminium, with resultant concentration of quartz or other resistant minerals in sand and silt sizes.

- A3** A transitional horizon between A and B and dominated by properties characteristic of an overlying A1 or A2 but having some subordinate properties of an underlying B.
- AB** A horizon transitional between A and B having an upper part dominated by properties of A and a lower part dominated by properties of B, and the two parts cannot be conveniently separated into A3 and B1.
- A & B** Horizons that would qualify for A2 except for included parts constituting 50% of the volume that would qualify as B.
- AC** A horizon transitional between A and C, having subordinate properties of both A and C, but not dominated by properties characteristic of either A or C.
- B & A** Any horizon qualifying as B in more than 50% of its volume, including parts that qualify as A2.
- B** Horizons in which the dominant feature or features is one or more of the following: (i) an illuvial concentration of silicate clay, iron, aluminium or humus, alone or in combination; (ii) a residual concentration of sesquioxides or silicate clays, alone or mixed, that has formed by means other than solution and removal of carbonates or more soluble salts; (iii) coatings of sesquioxides adequate to give conspicuously darker, stronger or redder colours than overlying and underlying horizons in the same sequum but without apparent illuviation of iron and not genetically related to B horizons that meet requirements of (i) or (ii) in the same sequum; or (iv) an alteration of material from its original condition in sequums lacking conditions defined in (i), (ii), and (iii) that obliterates original rock structure, that forms silicate clays, liberates oxides, or both, and that forms granular, blocky, or prismatic structure if textures are such that volume changes accompany changes in water content.
- B1** A transitional horizon between B and A1 or between B and A2 in which the horizon is dominated by properties of an underlying B2 but has some subordinate properties of an overlying A1 or A2.
- B2** That part of the B horizon where the properties on which the B is based are clearly expressed, without subordinate characteristics indicating that the horizon is transitional to an adjacent overlying A or an adjacent underlying C or R.
- B3** A transitional horizon between B and C or R in which the properties diagnostic of an overlying B2 are clearly expressed but are associated with clearly expressed properties characteristic of C or R.
- C** A mineral horizon or layer, excluding bedrock, that is either like or unlike the material from which the solum is presumed to have formed, relatively little affected by pedogenic processes and lacking properties diagnostic of A or B but including materials modified by: (i) weathering outside the zone of

major biological activity; (ii) reversible cementation, development of brittleness, development of high bulk density and other properties characteristic of fragipans; (iii) gleying; (iv) accumulation of calcium or magnesium carbonate or more soluble salts; (v) cementation by accumulations such as calcium or magnesium carbonate or more soluble salts; or (vi) cementation by alkali-soluble siliceous material or by iron and silica.

**R** Underlying consolidated bedrock, such as granite, sandstone or limestone. If presumed to be like the parent rock from which the adjacent overlying layer or horizon was formed, the symbol R is used alone. If presumed to be unlike the overlying material, the R is preceded by a Roman numeral denoting lithologic discontinuity.

**soil identification (grondidentifikasie)**

It is the assigning of a soil profile to a particular class in a classification system.

**soil individual (grondindiwidu)**

See polypedon.

**soil landscape (grondlandskap)**

It is the soil component of the landscape. Cf. land.

**soil management (grondbestuur)**

The sum total of all tillage operations, cropping practices, fertilizer, lime and other treatments conducted on, or applied to, a soil for the production of plants.

**soil management group (grondgebruiksgroep)**

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.

**soil map (grondkaart)**

A map showing the geographic distribution of soil types or other soil mapping units in relation to the prominent physical and cultural features of the earth's surface. The following kinds of soil maps are recognized:

*soil map, detailed* - A soil map on which the boundaries are shown between all soil types that are significant to potential use as field-management systems. The scale of the map will depend upon the purpose to be served, the intensity of land use, the pattern of soils and the scale of the other cartographic materials available. Traverses are usually made at 400 m, or more frequent, intervals. Commonly a scale of 1:15 000 or larger is now used for field mapping in South Africa.

*soil map, detailed reconnaissance* - A reconnaissance map on which some areas or features are shown in greater detail than usual, or than others.

*soil map, generalized* - A small-scale map which shows the general distribution of soils within a large area and thus in less detail than on a detailed soil map. Generalized soil

maps may vary from soil association maps on a scale of 1:50 000 to maps of larger regions showing associations dominated by one or more soil types (forms).

*soil map, reconnaissance* - A map showing the distribution of soils over an area as determined by traversing the area at varying intervals. The units shown are soil associations. Such a map is usually made only for exploratory purposes to outline areas of soil suitable for more intensive development. The scale is usually much smaller than for detailed soil maps and may be 1:250 000 or smaller.

*soil map, schematic* - A soil map compiled from scant knowledge of the soils of new and undeveloped regions by the application of available information about the soil-forming factors of the area. Usually on a small scale (1:1 000 000 or smaller).

#### **soil map unit (grondkaartenheid)**

A description that defines the soil component of land, identified by a symbol and a boundary on a map. When a soil class (e.g. a family or a form) is used to make such a description, the procedure is soil mapping, not soil classification. Soil classification or identification is the placing of soils in soil classes. A soil class contains only soils of that class, whereas a soil map unit seldom, if ever, refers to land that contains soils belonging only in one soil class. See soil association; soil complex; soil consociation.

#### **soil mapping (grondkartering)**

It is the delineation of areas on a map, each described in terms of a soil class (or classes) of a classification system, for the purpose of showing the geographic distribution of soils in relation to other prominent physical and cultural features of the earth's surface.

#### **soil material (grondmateriaal)**

- (1) Soil or portions of soil that have been displaced or mixed by either natural or mechanical means.
- (2) Unconsolidated and more or less chemically weathered mineral matter from which soils are developed by pedogenic processes.

#### **soil mechanics (grondmeganika)**

The science concerned with the effect of forces on the soil and the application of engineering principles to problems involving the soil.

#### **soil microbiology (grondmikrobiologie)**

A subspecialization of soil science concerned with soil-inhabiting microorganisms and their functions and activities.

#### **soil micromorphology (grondmikromorfologie)**

The microscopic study of the morphology of soils; in thin sections it reveals the microstructure, shape of the voids, coating films, and distribution of the mineral and organic constituents. See micromorphology.

#### **soil mineral (grondmineraal)**

Any mineral that occurs as a part of or in the soil. A natural inorganic compound with definite physical, chemical and crystalline properties (within the limits of isomorphism), that occurs in the soil. Cf. clay mineral.

#### **soil mineralogy (grondmineralogie)**

The branch of soil science concerned with the minerals found in the earth's crust to the depth of weathering or of sedimentation.

soil moisture (obsolete) (grondwater (verouderd))

See soil water.

soil monolith (grondmonoliet)

A mounted vertical soil section, taken to illustrate a soil profile.

soil morphology (grondmorfologie)

- (1) The physical constitution, particularly the structural properties of a soil profile as exhibited by the kinds, thickness and arrangement of the horizons in the profile and by the texture, structure, colour, consistence and porosity of each horizon.
- (2) The structural characteristics of the soil or any of its parts.
- (3) That branch of soil science concerned with the soil properties mentioned in (1).

soil organic matter (grondorganiese materiaal)

See organic matter.

soil particle (gronddeeltjie)

A discrete portion of the soil less than 2 mm in effective diameter, which can only be broken into smaller units by application of severe mechanical force as in crushing or grinding; may be of primary origin (mineral or rock fragments) or of secondary origin (clay minerals, concretions, etc.). Syn. grain.

soil pH (grond-pH)

Soil pH is the degree of acidity of a soil as determined by means of a glass or other suitable electrode or indicator at a specified soil to suspension medium ratio or specified soil water content, expressed in terms of the pH scale. Suspension media commonly used are distilled water, 1 M KCl and 0,01 M CaCl<sub>2</sub>. The suspension medium should be specified when reporting pH measurements. Descriptive terms commonly associated with certain ranges in soil pH measured in distilled water are:

extremely acid	:	< 4,5
very strongly acid	:	4,5 - 5,0
strongly acid	:	5,1 - 5,5
medium acid	:	5,6 - 6,0
slightly acid	:	6,1 - 6,5
neutral	:	6,6 - 7,3
mildly alkaline	:	7,4 - 7,8
moderately alkaline	:	7,9 - 8,4
strongly alkaline	:	8,5 - 9,0
very strongly alkaline	:	> 9,0

Syn. soil reaction. Cf. pH.

soil phase (grondfase)

A division of a soil series or other unit of classification having characteristics that affect the use or management of the soil but which do not vary sufficiently to differentiate it as a separate series. A variation in a property or characteristic such as textural class, degree of slope, degree of erosion, salt content, content of stones, etc.

soil physics (grondfisika)

The branch of soil science concerned with the state and movement of matter and with the fluxes and transformations of energy in the soil, i.e. it deals with the physical properties of soils, such as texture, structure, colour, temperature, soil water relationships, etc.

**soil pollution (grondbesoedeling)**

The addition of harmful or objectionable material to soil in concentrations or in sufficient quantities to adversely affect its usefulness or quality.

**soil population (grondpopulasie (-bevolking))**

- (1) All the organisms living in the soil, including plants and animals.
- (2) Members of the same taxa.
- (3) Delineations of the same map unit - a grouping of like things in a statistical sense.

**soil pore (grondporie)**

A particular volume, usually bounded by irregularly-shaped surfaces of particles, of the pore space of a soil. The pore space is that portion of the total soil volume occupied by air and water.

**soil profile (grondprofiel)**

A vertical section of the soil through all its horizons and extending to the underlying material. Cf. soil horizon.

**soil reaction (grondreaksie)**

See soil pH.

**soil resilience (grondherstelvermoë)**

The ability of a soil to approach its original state following utilization thereof and which resulted in loss of productivity due to chemical, physical and/or biological degradation.

**soil respiration (grondrespirasie)**

The consumption of oxygen and production of carbon dioxide by soil organisms, including plant roots.

**soil salinity (soutinhoud van grond)**

The amount of soluble salts in a soil, expressed in terms of conductivity of the saturation extract, percentage, mg/kg or other convenient units.

**soilscape (grondlandskap)**

- (1) See soil landscape.
- (2) The term "soilscape" is a contraction of the term "soil landscape", and analogous to "townscape" of architects.

**soil science (grondkunde)**

The science that deals with soils as natural phenomena, including their morphological, physical, chemical, mineralogical and biological properties, their genesis, their classification, their geographical distribution, their fertility and their management for the production of plants important to man.

**soil sealing (grondverseëling)**



The process whereby clods and aggregates (peds) on the soil surface are broken up by physical and chemical dispersive forces, particularly falling waterdrops. The detached material fills interaggregate pores thus forming a dense layer. Particle sorting occurs during the process sometimes resulting in a thin "skin" at the surface and a "washed-in" layer of finer particles immediately below the skin. Upon drying a soil crust is formed. Cf. soil crust.

**soil separate (deeltjiegroottefraksie)**

Mineral particles < 2,0 mm in diameter, ranging between specified limits. Syn. soil particle size class. Cf. soil texture.

The names and size limits used in South Africa are:

very coarse sand	-	2,0 to 1,0 mm
coarse sand	-	1,0 to 0,5 mm
medium sand	-	0,5 to 0,25 mm
fine sand	-	0,25 to 0,1 mm
very fine sand	-	0,1 to 0,05 mm
coarse silt	-	0,05 to 0,02 mm
fine silt	-	0,02 to 0,002 mm
clay	-	< 0,002 mm.

The USDA size limits differ only in that a single silt size class is defined, viz. 0,05 to 0,002 mm.

International Society of Soil Science equivalents are:

coarse sand	-	2,0 to 0,2 mm
fine sand	-	0,2 to 0,02 mm
silt	-	0,02 to 0,002 mm
clay	-	< 0,002 mm

British Standards (BS 1377:1967 for civil engineering) equivalents are:

coarse sand	-	2,0 to 0,6 mm
medium sand	-	0,6 to 0,2 mm
fine sand	-	0,2 to 0,06 mm
coarse silt	-	0,06 to 0,02 mm
medium silt	-	0,02 to 0,006 mm
fine silt	-	0,006 to 0,002 mm
clay	-	< 0,002 mm

**soil series (grondserie)**

The basic unit of soil classification, being a subdivision of a soil family and consisting of soils which are essentially alike in all major profile characteristics. It is the lowest category in a formal classification system.

**soil solarisation (grondsolarisasie)**

Exposing soil to the rays of the sun; covering the soil with a plastic sheet thereby heating it and thus killing certain micro-organisms, especially pathogens in the soil.

**soil solution (grondoplossing)**

The aqueous liquid phase of the soil and its solutes in equilibrium with the solid phase.

**soil stabilization (grondstabilisering)**

Chemical or mechanical treatment designed to increase or maintain the stability of a soil mass or otherwise to improve its engineering properties, such as by increasing its shear strength, reducing its compressibility or decreasing its tendency to absorb water. Stabilization methods include physical compaction and treatment with cement, lime or bitumen.

**soil strength (grondsterkte)**

A general term referring to the ability of a soil to resist deformation by applied forces, which could be any one of several types (e.g. shearing and compression) or combinations of these, as in penetrometer tests. This term should not be used when specific strength tests are implied as in the case of shear strength, modulus of rupture, penetrometer values, etc.

**soil structure (grondstructuur)**

The combination or arrangement of primary soil particles into secondary 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 table on the next page. Four terms, referred to as soil structure grades, describe distinctness or degree of aggregation. These are : (i) structureless, with no observable aggregation and no orderly arrangement of natural lines of weakness as in a sand (massive if coherent, single grain if non-coherent); (ii) weak, where peds are indistinct and poorly formed, being barely observable *in situ*; (iii) moderate, where peds are well formed and durable, but not distinctly separate from one another in undisturbed soil; (iv) strong, where peds are well formed and durable and distinctly separate from one another in undisturbed soil. The term apedal is often used in general to denote materials that are well aggregated in a microstructure so that well formed peds cannot be detected macroscopically. Cf. pedal.

**soil structure classes (grondstructuurklasse)**

A grouping of soil structural units or peds on the basis of size. See soil structure; soil structure types; table on the next page.

**soil structure grades (grondstructuurgrade)**

See soil structure.

**soil structure types (grondstructuurtypes)**

A classification of soil structure based on the shape of the aggregates or peds and their arrangement in the profile. Generally the shape of soil structure types is referred to as either platy, prismatic, columnar, blocky, granular or crumb. Cf. soil structure; table on the previous page.

**soil subsidence (grondversakking)**

A local mass movement that involves principally the gradual downward settling or sinking of the soil with little or no horizontal movement. Cf. subsidence.

**soil suction (gronduiging)**

See soil water : matric suction.

**soil survey (grondopname)**

The systematic examination, description, classification and mapping of soils in an area for a specific purpose. Soil surveys are classified according to the purpose of, kind and intensity of field examination. The soil survey consists of four parts:

- (a) The selection of sites for, and preparation of, soil pits;**
- (b) the description of the soil profile and identification of the soil form and/or series;**
- (c) the selection of samples for the determination of the physical and chemical properties of the profile; and**
- (d) the mapping of the soils. Cf. reconnaissance survey; soil classification; soil map.**



**soil taxonomy (grondtaksonomie)**

The theory and practice of classifying soils. The main taxonomic units in the RSA are, in order of increasing rank, series, family and form. Cf. soil classification.

**soil temperature (grondtemperatuur)**

The temperature of soil with indication of depth of measurement and type of measuring device used. Can be reported as a daily maximum, minimum, range, or mean; or as weekly, monthly or annual means; or as a continuous function of time.

Definitions of soil temperature regimes according to Soil Survey Staff (1994) are:

*cryic* (kriogenies)

A soil temperature regime that has mean annual soil temperatures of more than 0°C, but less than 8°C, more than 5°C difference between mean summer and mean winter soil temperatures at 50 cm, and cold summer temperatures.

*hyperthermic* (hipertermies)

A soil temperature regime that has mean annual soil temperatures of 22°C or more and more than 5°C difference between mean summer and mean winter soil temperatures at 50 cm. Isohyperthermic is the same, except that summer and winter temperatures differ by less than 5°C.

*mesic* (mesies)

A soil temperature regime that has mean annual soil temperatures of 8°C or more, but less than 15°C, and more than 5°C difference between mean summer and mean winter soil temperatures at 50 cm. Isomesic is the same, except the summer and winter temperatures differ by less than 5°C.

*pergelic* (vriesend)

A soil temperature regime that has mean annual soil temperatures of less than 0°C. Permafrost is present.

*thermic* (termies)

A soil temperature regime that has mean annual soil temperatures of 15°C or more, but less than 22°C, and more than 5°C difference between mean summer and mean winter soil temperatures at 50 cm. Isothermic is the same, except the summer and winter temperature differ by less than 5°C.

**soil test (grondontleding; grondtoets)**

See soil analysis.

**soil texture (grondtekstuur)**

The relative proportions of the various separates in the soil as described by the classes of soil texture shown in the soil texture and sand grade diagrams on the next page. Cf. soil separate.

**soil tilth (grondgesteldheid)**

The physical condition of soil as related to its ease of tillage, suitability as a seedbed, and its impedance to seedling emergence and root penetration.



**soil tongues (grondtonge)**

Penetrations of material of an overlying horizon into the horizon beneath it. The horizontal dimensions of a penetration (usually wider than 5 mm) are always smaller than the vertical.

**soil type (grondtipe)**

Formerly a subdivision of a soil series based on differences in the texture of the A horizon.

**soil variant (grondvariant)**

A kind of soil whose properties are believed to be sufficiently different from recognized series to justify a new series name, but of such limited extent that creation of a new series is not justified.

**soil water (grondwater)**

Water occurring in the solum.

**INTRODUCTORY NOTES:**

1. Where relevant the definitions approved by Commission I (Soil Physics) of the International Society of Soil Science are given (Bulletin of the ISSS, No 49, 25-36, 1976).
2. In most cases the term "soil", when used as a pronoun, has been omitted (e.g. "water content" instead of "soil water content").
3. The term "moisture" and all related terms in which it appears (e.g. "moisture content", "moisture potential", etc.) are regarded as obsolete. The term "water", referring to the chemical constituent H<sub>2</sub>O, is preferred. Moisture refers to a liquid phase in general and would include aqueous solutions and liquids other than water. Thus the "water content" of a soil unambiguously refers to its content of H<sub>2</sub>O, whereas "moisture content" could imply content of aqueous solution (including salts) and other liquid(s).
4. Water in soil is subject to several force fields originating from: the presence of the soil solid phase; the dissolved salts; the action of external gas pressure; and, the gravitational field. These effects may be quantitatively expressed by assigning an individual component potential to each. The sum of these potentials is designated the total potential of soil water and may be identified with the partial specific Gibbs free energy of the soil water relative to free pure water at the same temperature.
5. A number of terms relating to soil water are summarized in Tables A and B. The symbols given for the terms defined are those most commonly employed and which are preferred.

**TABLE A: Summary of terms relating to the occurrence of water in soil**

Term	Symbol	Unit(s)	Synonym(s) and derived terms
1. Water content (mass basis)	$\Theta_m$	(kg/kg)	Gravimetric water content Wetness Dry mass fraction of water Water percentage ( $\Theta_m \times 100$ )
2. Water content (volume basis)	$\Theta_v$	(m <sup>3</sup> /m <sup>3</sup> )	Volumetric water content Volume fraction of water (or liquid) Volumetric water percentage ( $\Theta_v \times 100$ )
3. Water mass fraction	$W_w$	(kg/kg)	Water content on wet basis Water percentage on wet basis ( $W_w \times 100$ )
4. Saturation water content	$\Theta_{ms}$ or $\Theta_{vs}$	(kg/kg) or (m <sup>3</sup> /m <sup>3</sup> )	Water holding capacity Saturation percentage ( $\Theta_{ms} \times 100$ ) or ( $\Theta_{vs} \times 100$ )
5. Degree of saturation	$\Theta_s$	$\frac{\text{m}^3(\text{water})}{\text{m}^3(\text{pore space})}$	Relative saturation
6. Liquid ratio	$\gamma$	$\frac{\text{m}^3(\text{water})}{\text{m}^3(\text{solid space})}$	
7. Field capacity	FC	% or a ratio	Field water capacity
8. Differential water capacity	$C_w$ or $C_\Theta$	Pa <sup>-1</sup> or J <sup>-1</sup> kg or m <sup>-1</sup>	Specific water capacity

**available water (beskikbare water)**

The portion of water in a soil that can be absorbed by plant roots. Previously considered by many as the amount of water released by the soil when the equilibrium soil water matric potential is decreased from about -10 kPa or -33 kPa (field capacity) to about -1500 kPa (permanent wilting point). Cf. total available water capacity; profile available water capacity (PAWC); wilting point.

**capillary conductivity (obsolete) (kapillêre geleivermoê (verouderd))**

See hydraulic conductivity; unsaturated conductivity.

**capillary potential (obsolete) (kapillêre potensiaal (verouderd))**

See matric potential.

**capillary pressure (obsolete) (kapillêre druk (verouderd))**

See matric pressure.

**characteristic curve (retensiekromme)**

See retentivity curve.



TABLE B: Summary of terms relating to the state of water in soil

SPECIFIC WATER POTENTIAL  (Energy/mass; J/kg)	SYM-BOL	ALTERNATIVE EXPRESSIONS OF POTENTIAL			
		Volumetric Water potential (Energy/volume; J/m <sup>3</sup> or Pa) (Pressure equiv.)	Sym-bol	Weight water potential (energy/weight; J/N or m) (Head equiv.)	Sym-bol
1. Total potential ( $\psi_T = \psi_g + \psi_p + \psi_o$ )	$\psi_T$	Total pressure (Obsolete: total stress/tension/suction)	$P_T$	Total head	$H_T$
2. Gravitational potential	$\psi_g$			Gravitational head	$h_g$
3. Pressure potential (Hydrostatic pressure potential Rigid matrix: $\psi_p = \psi_m + \psi_p^a$ )	$\psi_p$	Pressure; hydrostatic pressure; tensiometer-pressure	$p$	Pressure head	$h_p$
4. Matric potential (Rigid matrix: $\psi_m = \psi_p^w$ Swelling soils: $\psi_m = \psi_p^w + \psi_p^s$ )	$\psi_m$	Matric pressure (Obsolete: matric suction; capillary pressure; negative pressure; soil suction; soil water stress/tension/suction. Impermissible: soil water pressure)	$P_m$	Matric pressure head	$h_m$
5. Osmotic potential	$\psi_o$	Osmotic pressure	$\pi$	Osmotic pressure head	$h_o$
6. Pneumatic potential (Gas (phase) pressure potential)	$\psi_p^a$	Pneumatic pressure (Gas (phase) pressure)	$P_a$		
7. Envelope-pressure potential (overburden potential)	$\psi_p^e$	Envelope pressure (overburden pressure)	$P_e$		
8. Unloaded matric-potential (Wetness potential)	$\psi_p^w$	Unloaded matric pressure (Wetness pressure)	$p^w$		
9. Hydraulic potential ( $\psi_w = \psi_p + \psi_g$ )	$\psi_H$	Hydraulic pressure ( $P_H = p + \rho_w g z$ )	$P_H$	Hydraulic head  ( $H = h_p + h_g$ )	$H$
10. Water potential (Chemical potential) ( $\psi_w = \psi_p + \psi_o$ )	$\psi_w$	Water stress/-tension/suction (In Plant Physiology: total suction; total water stress; diffusion pressure deficit)	$P_w$		

*coefficient of permeability (obsolete)* (permeabiliteitskoëffisiënt (verouderd))  
See hydraulic conductivity; intrinsic permeability.

*cumulative infiltration* (kumulatiewe infiltrasie)

The time integral of the infiltration rate, or the total amount of water that has entered a soil in a given time under specified conditions. Also see infiltration; infiltration rate.

*darcy* (darcy)

An obsolete unit of intrinsic permeability (in metres squared) such that 1 darcy will lead to a specific discharge of 0,01 m/s for a fluid with a viscosity of 0,01 pascal-second (Pa s) under a hydraulic gradient of 1033 (pressure head of one atmosphere/cm). One darcy is approximately equal to  $10^{-12}$  m<sup>2</sup>. Cf. intrinsic permeability.

*Darcy's law* (Darcy se wet)

A law describing the rate of flow of water through porous media, named after Henry Darcy of France who formulated it in 1856 from extensive work on the flow of water through sand filter beds. In general terms it states that the rate of viscous flow of homogeneous fluids through isotropic porous media is proportional to, and in the direction of, the driving force. Specifically it may be formulated as follows:

(i) In one dimension:  $q = V/At = -K\Delta H/L$  in which

$q$  = water volume flux density

$V$  = volume of water

$A$  = cross-sectional area

$t$  = time for volume  $V$  of water to flow through the soil

$K$  = hydraulic conductivity

$\Delta H$  = hydraulic head difference over length  $L$

$\Delta H/L$  = hydraulic gradient

(Note: The direction of flow is that of the driving force ( $-\Delta H/L$ ))

(ii) In three dimensions:  $q = -K\nabla H$ .

*degree of saturation* (versadigingsgraad)

The volume of water present in a soil relative to the volume of pores. Sometimes simply termed "saturation", and may be expressed as a percentage.

*differential water capacity* (differensiële waterkapasiteit)

The rate of change of water content ( $\Theta_m$ ) or volumetric water content ( $\Theta_v$ ) with matric potential ( $\psi_m$ ) or matric pressure ( $P_m$ ). The unit of potential or pressure should be specified. Also termed specific water capacity.

*diffusivity* (diffusiwiteit)

The diffusivity (or soil water diffusivity) ( $D(\Theta)$ ) in m<sup>2</sup>/s, is the quotient of the hydraulic conductivity ( $K(\Theta)$ ) in m/s and the differential (specific) water capacity ( $c_\Theta$ ), in m<sup>-1</sup>.

(Note:  $D(\Theta) = K(\Theta)/c_\Theta = K(\Theta) \delta\psi_m/\delta\Theta$ )

*driving force* (dryfkrag)

The driving force for water flow is equal in magnitude but opposite in direction to the potential gradient. See also hydraulic gradient.

*envelope-pressure* ( $P_e$ ) (omhulsedruk)

The pressure equivalent, in Pa, of the envelope-pressure potential.

*envelope-pressure potential* ( $\psi_p^e$ ) (omhulsedrukpotensiaal)

The increment of the pressure potential ( $\psi_p$ ) following the application of an envelope pressure  $P_e$  to a soil sample with wetness  $\Theta$  and originally under zero envelope pressure, when the pressure in the gas phase ( $P_a$ ) is equal to atmospheric pressure ( $P_o$ ), according to:

$$\psi_p^e = \int_0^{P_e} \frac{d\psi_p}{\Theta P_e} dP$$

Also termed overburden potential.

*external gas pressure* (eksterne gasdruk)

See pneumatic pressure.

*external gas pressure potential* ((eksterne) gasdrukpotensiaal)

Also termed gas pressure potential. See pneumatic potential.

*field capacity* (veldkapasiteit)

The percentage or fraction of water (mass or volume basis should be specified) remaining in a soil in the field 2 to 3 days after having been thoroughly wetted and after free drainage is negligible. The term is of limited value in exact work since it does not represent a unique value. Syn. field water capacity.

*flow velocity* (vloeisnelheid)

The rate of movement of material along its flow path. (Note: Because of soil tortuosity, flow velocity is not synonymous with flux density.) Since velocity is a vector, the direction of flow velocity should always be stated.

*flux* (vloed)

The quantity of material or energy transferred through a system or a portion of a system in unit time. The quantity can be expressed in units of mass, volume, heat energy, etc. (i.e. mass flux, volume flux, heat energy flux, etc.).

*flux density* (vloeddigheid)

The flux per unit area. Volume flux density, for example, is expressed in m/s. Sometimes flux density is incorrectly termed flux.

*gravimetric water content* (gravimetrisse waterinhoud)

See water content.

*gravitational head* ( $h_g$ ) (gravitasiehoogte)

The elevation, in metres, of a point above a specified datum level.

*gravitational potential* (gravitasiepotensiaal)

The amount of useful work per unit mass of pure water, in J/kg, that must be done to transfer reversibly and isothermally an infinitesimal quantity of water from a pool of pure free water at height  $z_0$  to a point at height  $z$ .

*groundwater* (ondergrondwater)

Water that occurs beneath the water table (at which  $\psi_m = 0$ ) in soils, and in geologic formations that are fully saturated.

*head* (hoogte)

The equivalent of potential when expressed in units of length. Also termed weight potential (units J/N or m).

*hydraulic conductivity* (hidrouliese geleivermoë)

The proportionality factor ( $K$ ) in Darcy's law as applied to the viscous flow of water in soil, i.e. the volume flux density of water per unit gradient of hydraulic head. If conditions require that the viscosity of the fluid be divorced from the conductivity of the medium, it is convenient to define an intrinsic permeability. To distinguish the conductivity in water-saturated soil from that in water-unsaturated soil, the terms saturated (hydraulic) conductivity and unsaturated (hydraulic) conductivity may be used in place of hydraulic conductivity. Cf. intrinsic permeability.

*hydraulic gradient* (hidrouliese gradiënt)

The term hydraulic gradient can imply a hydraulic potential gradient, hydraulic pressure gradient or hydraulic head gradient. In each case the gradient is the change in magnitude (of potential, pressure or head) per unit of distance in the direction of maximum rate of increase thereof. The hydraulic gradient generally determines the rate and direction of water flow in soil.

*hydraulic head* (hidrouliese hoogte)

The elevation with respect to a specified reference level at which water stands in a piezometer connected to the point in question in the soil. Its definition can be extended to soil above the water table if the piezometer is replaced by a tensiometer. The hydraulic head in systems under atmospheric pressure may be identified with a potential expressed in terms of the height of a water column. More specifically it is the sum of the gravitational and hydrostatic pressure (or matric) potentials, expressed as a head ( $H = h_g + h_p$ ).

*hydraulic potential* ( $\psi_H$ ) (hidrouliese potensiaal)

The sum of the gravitational and pressure (or hydrostatic pressure) potentials, expressed in J/kg. Hence  $\psi_H = \psi_g + \psi_p$ .

*hydraulic resistance* (hidrouliese weerstand)

The hydraulic resistance per unit area of a conducting system is the ratio of the thickness to the hydraulic conductivity.

*hydraulic resistivity* (hidrouliese resistiwiteit)

The reciprocal of the hydraulic conductivity.

*hydrostatic pressure* (hidrostatiese druk)

The pressure in a body of water due to the force of gravity and the weight of surrounding water. Hydrostatic pressure is related to the depth below the surface of pure, free water by  $p = -\rho_w g z$  where  $\rho_w$  = density of water,  $g$  acceleration due to gravity,  $z$  height measured positively upwards from the free water surface. The absolute pressure in the body of water will in addition be determined by the atmospheric or external gas pressure acting on the water.

*hydrostatic pressure head* (hidrostatiese drukhoogte)

The head equivalent, in metres, of the hydrostatic pressure potential.

*hydrostatic pressure potential* (hidrostatiese drukpotensiaal)

The amount of useful work per unit mass of pure water, in J/kg, that must be done to transfer reversibly and isothermally an infinitesimal quantity of water from the surface of a pool of free water identical in composition and at the elevation of the point under consideration, to a point within the body of water.

*hysteresis* (histerese)

In the case of the water retentivity curve of a soil, in which matric potential is plotted against water content, hysteresis refers to the phenomenon that identical curves are not obtained for water uptake (wetting) and release (drying). Cf. scanning curve.

*infiltrability* (infiltreerbaarheid)

The flux (or rate) of water infiltration into soil when water at atmospheric pressure is maintained on the atmosphere-soil boundary, with the flow direction being one-dimensionally downward.

*infiltration* (infiltrasie)

The process of water entry into the soil, generally (but not necessarily) through the soil surface and vertically downward.

*infiltration rate* (infiltrasietempo)

The flux density of water passing through the (or a) soil surface and flowing into the soil.

*intrinsic permeability* (intrinsieke permeabiliteit)

The property of a porous material that relates to the ease with which fluids can pass through it; the hydraulic conductivity ( $K$ ) from the Darcy equation divided by  $\eta/\rho g$  (in which  $\eta$  is the viscosity of the fluid,  $\rho$  its density and  $g$  the acceleration due to gravity), which includes the contribution of fluid properties to the value of  $K$ . Intrinsic permeability has the dimensions of length squared.

*liquid ratio* (vloeistofverhouding)

The volume of the liquid phase per unit volume of the solid phase, expressed in  $\text{m}^3$  liquid phase per  $\text{m}^3$  of solid phase.

*matric potential* ( $\psi_m$ ) (matrikspotensiaal)

The value of the pressure potential of a soil sample at a given water content and subject to a given envelope pressure, but with the soil gas phase pressure ( $P_a$ ) equal to atmospheric pressure ( $P_o$ ). Once referred to as capillary potential, and sometimes loosely but incorrectly equated to pressure potential or hydrostatic pressure potential.

**matric pressure ( $P_m$ ) (matriksdruk)**

The gauge pressure, in pascal, to which a sample of the soil solution must be subjected isothermally in order to be in equilibrium via a membrane impermeable to the soil matrix with the soil water at the point under consideration, when the soil gas phase pressure ( $P_a$ ) is equal to atmospheric pressure ( $P_o$ ). It is also the pressure equivalent of the matric potential.

**matric pressure head (matriksdrukhoogte)**

The head equivalent, in metres, of the matric potential or matric pressure.

**matric suction (matrikssuiging)**

The negative of the matric pressure, in pascal.

**moisture equivalent (obsolete) (vogekwivalent (verouderd))**

An obsolete measure of soil water retention under standardized conditions, approximating water content at field capacity. It is the water content, as a percentage, of a previously saturated sample of soil 10 mm in thickness after it has been subjected to a centrifugal force of one thousand times gravity for 30 minutes.

**negative pressure (of soil water) (obsolete) (negatiewe druk (van grondwater) (verouderd))**

See matric pressure.

**osmotic head (osmotiese hoogte)**

The head equivalent, in metres, of the osmotic potential or osmotic pressure.

**osmotic potential ( $\psi_o$ ) (osmotiese potensiaal)**

The osmotic potential ( $\psi_o$ ) of the constituent water in soil at a specified temperature is the amount of useful work per unit mass of pure water, in J/kg, that must be done to transfer reversibly and isothermally an infinitesimal quantity of water from a pool of pure free water to a pool of free soil solution (identical in composition with the soil liquid phase at the point under consideration, and at the same height). The potential may be expressed in terms of the experimentally accessible osmotic pressure of the solution ( $\pi$ ) according to

$$\psi_o = - \int_0^{\pi} \bar{v}_w dP$$

in which  $\bar{v}_w$  is the partial specific volume of the constituent water in the soil solution.

Note:  $\bar{v}_w$  is temperature dependent.

**osmotic pressure ( $\pi$ ) (osmotiese druk)**

The osmotic pressure ( $\pi$ ) is the gauge pressure, in pascal, to which a sample of the soil solution at atmospheric pressure and specified temperature must be subjected in order

to be in equilibrium via a membrane, impermeable to the solutes, with pure water at the same pressure and temperature.

(Note: By comparing the definitions of matric pressure and osmotic pressure, it will be seen that the negative osmotic pressure ( $-\pi$ ) acts additively to the matric pressure.)

*osmotic stress/tension/suction* (osmotiese spanning/suiging)

Identical to osmotic pressure as defined above. It can be interpreted as the negative of the negative osmotic pressure, in pascal.

*overburden potential* (bolaagpotensiaal)

See envelope-pressure potential.

*permeability* (deurlatendheid; permeabiliteit)

A qualitative term describing the ability of a porous medium to conduct fluids. Cf. hydraulic conductivity.

*pneumatic potential* ( $\psi_p^a$ ) (gasdrukpotensiaal)

The pneumatic potential ( $\psi_p^a$ ) is the increment of the pressure potential ( $\psi_p$ ) upon the introduction of an excess gas pressure  $\bar{P}_a = P_a - P_o$  (in which  $P_a$  = pressure in the gas phase of the soil and  $P_o$  = atmospheric pressure) on a soil sample with given water content and subject to a given envelope pressure. In so far as the application of  $P_a$  does not influence the geometry of the liquid phase, this potential may be calculated according to

$$\psi_p^a = \int_0^{\bar{P}_a} \bar{v}_w' dP$$

in which  $\bar{v}_w'$  is the partial specific volume of water in the soil liquid phase *in situ* (in practice it is assumed to be equal to  $\bar{v}_w$ ).

*pneumatic pressure* (gasdruk)

The pressure equivalent of the pneumatic potential.

*potential gradient* (potensiaalgradiënt)

See hydraulic gradient.

*pressure head* ( $h_p$ ) (drukhoogte)

The head equivalent, in metres, of the pressure potential ( $\psi_p$ ). Equivalent to the hydrostatic pressure head in saturated soil or liquid systems.

*pressure potential* ( $\psi_p$ ) (drukpotensiaal)

The pressure potential ( $\psi_p$ ) (also termed the tensiometer-pressure potential) of the constituent water (*in situ*), is the amount of useful work per unit mass of pure water, in J/kg, that must be done to transfer reversibly and isothermally an infinitesimal quantity of water from a pool of free soil solution (identical in composition with the soil liquid

phase at the point under consideration) at specified temperature and atmospheric pressure, to the soil liquid phase at the point under consideration. This potential may be expressed in terms of the experimentally accessible tensiometer pressure of the soil liquid phase ( $p$ ) *in situ*, according to

$$\psi_p = \int_0^p \bar{v}_w dP$$

in which  $\bar{v}_w$  is the partial specific volume of the constituent water in the soil solution.

*retentivity curve* (retensiekromme)

The curve relating matric pressure ( $P_m$ ) or matric potential ( $\psi_m$ ) (for a specified envelope pressure in case of swelling soils) or wetness pressure ( $p_w$ ) to the water content ( $\Theta_m$ ) or volumetric water content ( $\Theta_v$ ) of the soil. Because of hysteresis phenomena one may distinguish between uptake (wetting) and release (drying) boundary curves, if necessary supplemented by wetting and drying scanning curves corresponding to partial wetting and drying cycles. Also see hysteresis; scanning curve. Syn. soil water characteristic curve.

*saturated conductivity* (versadigde geleivermoë)

Also termed saturated hydraulic conductivity. See hydraulic conductivity.

*saturated flow* (versadigde vloeï)

Flow of water in soil completely saturated with water.

*saturation percentage* (versadigingspersentasie)

See saturation water content.

*saturation water content* (versadigingswaterinhoud)

The ratio of the mass of water to the dry mass of soil, for a soil completely saturated with water. Also termed the (maximum) water holding capacity. When expressed as a percentage it is termed the saturation percentage.

*scanning curve* (skandeerkromme)

The relationship between water content and matric potential when a water containing soil is subjected to water uptake (wetting) and release (drying) over a limited range of water contents; the scanning curve thus lies within the hysteresis loop. Cf. hysteresis.

*soil solution* (grondoplossing)

- (1) The *in situ* aqueous liquid phase of the soil and its solutes, in which case the term liquid phase is preferred.
- (2) A sample of the aqueous liquid phase and its solutes, obtained by some extraction procedure.

*soil suction* (grondsuijing)



See matric suction.

*soil water characteristic (curve)* (grondwaterkenkromme)

See retentivity curve.

*soil water diffusivity* (grondwaterdiffusiwiteit)

See diffusivity.

*soil water retention curve* (grondwaterkenkromme)

See retentivity curve.

*soil water stress/tension/suction* (grondwaterspanning)

See matric suction.

*solute potential* (osmotiese potensiaal)

See osmotic potential.

*specific water capacity* (spesifieke waterkapasiteit)

See differential water capacity.

*steady state* (bestendige toestand)

Refers to a transport process for which the net flux density remains constant and equal along the conducting system, i.e. the potential and gradient at each point remain constant with time (but can differ from one point to another).

*submergence potential* (hidrostatiese drukpotensiaal)

See hydrostatic pressure potential.

*tensiometer-pressure potential* (tensiometer-drukpotensiaal)

See pressure potential.

*total available water capacity* (totale beskikbare waterkapasiteit)

This is the capacity (expressed in mm water) of a soil to store water for plant use. TAWC (mm) = AW (mm/m) x effective rooting depth (m). AW differences of each horizon in anisotropic soils need to be taken into account. At best TAWC is a very rough approximation for a number of reasons, one of which is the difficulty of estimating effective rooting depth. Cf. soil capacity.

*total head* (totale hoogte)

The head equivalent, in metres, of the total potential.

*total potential* ( $\psi_T$ ) (totale potensiaal)

The total potential ( $\psi_T$ ) of the constituent water in soil at a specified temperature, is the amount of useful work per unit mass of pure water, in J/kg, that must be done by means of externally applied forces to transfer reversibly and isothermally an infinitesimal amount of water from a pool of pure, free water to the soil liquid phase at the point under consideration. Also termed total soil water potential. Cf. Table B.

*total soil water stress/tension/suction* (totale grondwaterspanning/suiging)

The pressure equivalent, in pascal, of the total potential.

*transient flow* (oorgangsvloei; onbestendige vloei)

Flow occurring under transient (state) conditions.

*transient state* (oorgangstoestand; onbestendige toestand)

Refers to a transport process for which the magnitude and possibly also the direction of the flux and potential gradient vary with time. Also termed unsteady state.

*unloaded matric potential* ( $\psi_p^w$ ) (onbelaste matrikspotensiaal)

The unloaded matric potential ( $\psi_p^w$ ) is the value of the pressure potential ( $\psi_p$ ) in a soil sample at water content  $\Theta_m$ , with the envelope pressure ( $P_e$ ) equal to zero, and the soil gas phase pressure equal to atmospheric pressure (i.e.  $\psi_p^a = 0$ ).

(Note: In a rigid matrix the envelope-pressure potential vanishes, so that  $\psi_m = \psi_p^w$ . In a swelling soil, however,  $\psi_m = \psi_p^w + \psi_p^e$ ).

*unsaturated conductivity* (onversadigde geleivermoë)

Also termed unsaturated hydraulic conductivity. See hydraulic conductivity.

*unsaturated flow* (onversadigde vloei)

Flow of water in soil not completely saturated with water.

*velocity* (snelheid)

See flow velocity.

*volumetric water content* (volumetriese waterinhoud)

The volume of the liquid phase per unit bulk volume of soil, expressed in  $m^3$  water per  $m^3$  bulk volume. Also termed volume fraction of water (or liquid). When expressed as a percentage it is termed the volumetric water percentage.

*volumetric water percentage* (volumetriese waterpersentasie)

See volumetric water content.

*water capacity* (waterkapasiteit)

See soil capacity; total available water capacity.

*water content* (waterinhoud)

The amount of water lost from the soil upon drying at  $105^\circ\text{C}$  expressed in kg water per kg of solid phase after drying. Also termed wetness, mass wetness and gravimetric water content. When expressed as a percentage it is termed the water percentage.

*water content on wet basis* (waterinhoud op nat basis)

See water mass fraction.

*water content profile* (waterinhoud profiel)

A graphic representation of the water content - depth relationship in a soil. Water content is plotted on the abscissa and depth on a descending ordinate.

*water holding capacity* (waterhouvermoë)

See saturation water content.

*water mass fraction* (watermassafraksie)

The ratio of the mass of water to the sum of the mass of water and dry soil. Also termed the water content on wet basis. When expressed as a percentage, it is termed the water percentage on wet basis.

*water percentage* (waterpersentasie)

See water content.

*water percentage on wet basis* (waterpersentasie op nat basis)

See water mass fraction.

*water potential* (waterpotensiaal)

Water potential is the difference in the chemical potential of water in an equilibrium system and the chemical potential of pure, free water at the same temperature and elevation. It is the sum of the pressure, matric and osmotic potentials (note exclusion of the gravitational potential).

*water ratio (obsolete)* (waterverhouding (verouderd))

See volumetric water content.

*water table* (watervlak)

The upper surface of groundwater; the locus of points in soil water at which the hydraulic pressure is equal to atmospheric pressure.

*wetness* (waterinhoud)

See water content.

*wetness potential* (onbelaste matrikspotensiaal)

See unloaded matric potential.

**soil water regime** (grondwaterregime (-huishouding))

A qualitative term referring to the state and availability of water in soil, especially in relation to the growth of plants.

**solarisation** (solarisasie)

See soil solarisation.

**solifluction** (solifluksie)

The slow, viscous, downslope flow of water-saturated soil.

**Solod** (Solod)

A great group of soils in the Solonetzic order occurring most commonly in the grassland and parkland regions. The soils have a dark-coloured surface ( $A_h$ ) horizon, a prominent eluvial ( $A_{he}$  or  $A_e$  horizon at least 5 cm thick, a prominent transitional (AB) horizon that breaks readily into blocky aggregates, and a darkly stained B horizon over a C horizon that is saline and usually calcareous.

**solodized soil** (gesolodiseerde grond)

A soil that has been subjected to the processes responsible for the development of a Solod and having at least some of the characteristics of a Solod. Cf. Solod.

**Solonchak** (Solonchak)

A term of Russian origin that refers to a friable, salty soil; usually with a thin salt crust on the surface. Cf. soil classification.

**Solonetz (Solonetz)**

A term of Russian origin that refers to a soil with a thin, porous topsoil underlain by a columnar horizon, usually natric. Cf. soil classification.

**soluble salts (oplosbare soute)**

Salts present in soil and which have solubility in water greater than calcium carbonate. Sodium salts, particularly NaCl, are the most common soluble salts in soils. The salt tolerance of crops varies, some being adversely affected when the electrical conductivity of the saturation extract is in the region of 200 mS/m; a large number of crops are adversely affected when the figure is 400 mS/m or higher. Cf. saline soil; saline-sodic soil; deflocculation; resistance; electrical conductivity.

**solum (solum)**

The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soils includes the A and B horizons. Usually the characteristics of the material in these horizons are quite unlike those of the underlying parent material. The living roots and other plant and animal characteristics of the soil are largely confined to the solum. Pl. sola.

**solute (opgeloste stof)**

A substance dissolved in water.

**solute potential (osmotiese potensiaal)**

See soil water : osmotic potential.

**somblic horizon (sombriese horison)**

See diagnostic horizon.

**sorosilicate (sorosilikaat)**

A class or structural type of silicate characterized by the linkage of two SiO<sub>4</sub> tetrahedra by the sharing of one oxygen, with a Si:O ratio of 2:7. An example of a sorosilicate is hemimorphite, Zn<sub>4</sub>(Si<sub>2</sub>O<sub>7</sub>)(OH)<sub>2</sub>·(H<sub>2</sub>O). Cf. nesosilicate; cyclosilicate; inosilicate; phyllosilicate; tectosilicate.

**sorption (sorpsie)**

A general term for adsorption and absorption phenomena, particularly when the specific nature of the process is not known. Cf. absorption; adsorption.

**sorptivity (sorptiwiteit)**

An infiltration parameter defined by Philip's infiltration equation:

$$I = St^{1/2} At$$

where I = cumulative infiltration

S = sorptivity

A = an infiltration parameter

t = time.

**sorting (sortering)**

- (1) The separation and segregation of rock fragments according to size of particles, density and different shapes by natural processes, mainly the action of running water or wind. "Well sorted" refers to the presence of mainly one grade size; "poorly sorted" refers to the presence of many grade sizes in a sample of material.
- (2) Statistically, it is a measure of a spread of a distribution on either side of an average. "Poorly sorted" refers to a wide and "well-sorted" to a narrow spread. Cf. kurtosis.

**source (bron)**

A term used to describe the addition of material or substances during a process occurring in soil, e.g. the dissolution of minerals during water flow through soil adds solutes to the water. Cf. sink.

**spatial variability (ruimtelike veranderlikheid)**

Refers to the variability of soil properties over both small and large areas, and to the fact that soil properties tend to be correlated over space, both vertically and horizontally. The variability and correlations are quantified by using geostatistical techniques such as variograms and kriging.

**speciation (spesiasie)**

Identification of the various chemical species present in (usually) an aqueous solution. Cf. species.

**species (spesie)**

- (1) In taxonomy, one or more groups (populations) of individuals that can interbreed within the group but that cannot exchange genes with other groups.
- (2) In chemistry, a specific ion or molecule, e.g.  $\text{Ca}^{2+}$ ,  $\text{CaSO}_4$ , etc.

**specific surface (soortlike oppervlakte)**

The total surface area of a substance per unit mass.

**specific yield (soortlike lewering)**

The quantity of water that a unit volume of permeable rock or soil, after being saturated, will yield when drained by gravity. It may be expressed as a ratio or as a percentage by volume. The sum of specific retention and specific yield equals the porosity of the material drained.

**spheroidal structure (sferoïdale struktuur)**

See soil structure.

**splash erosion (spaterosie)**

See erosion.

**spodic B horizon (obsolete) (spodiese B-horison (verouderd))**

See diagnostic horizon.

**spodic horizon (spodiese horison)**

See diagnostic horizon.

**Spodosol (Spodosol)**

See soil classification.

**spoil (uitskot)**

Soil or rock material excavated from a canal, ditch, basin or similar construction.

**springtail (veerstert)**

See Collembola.

**sprinkler irrigation (sprinkelbesproeiing)**

See irrigation methods.

**Stagnosol (Stagnosol)**

See soil classification.

**stalactite (stalaktiet)**

A cylindrical or conical mineral deposit (usually calcite or aragonite), hanging from the roof of a cavern.

**stalagmite (stalagmiet)**

A cone or ridge of calcium carbonate rising from the floor of a cave, formed by evaporation of water dripping from above.

**starter (fertilizer) (aanhitser (misstof))**

See fertilizer.

**steady flow (bestendige vloeï)**

Flow in which the rate remains constant with time across a given cross-section. Cf. soil water : steady state.

**steady state (bestendige toestand)**

See soil water : steady state.

**steppe (steppe)**

A mid-latitude, short grass vegetation cover that mantles the ground with a fairly continuous sod.

**stereo pair (stereopaar)**

Two aerial photographs of the same object taken from slightly different positions, which when viewed together gives the viewer a three-dimensional image. Syn. stereoscopic pair.

**stereoscopic pair (stereoskopiese paar)**

See stereo pair.

**sticky point (kleefpunt)**

A condition of consistence at which the soil barely fails to stick to a foreign object. Specifically and numerically the moisture percentage by mass of well-mixed kneaded soil that barely fails to adhere to a polished nickel or stainless steel surface when the shearing speed is 50 mm/s. Cf. soil consistence.

**stochastic model (stogastiese model)**

See mathematical model.

**Stokes' law (Stokes se wet)**

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 field. Used in particle-size analysis of soils by the pipette, hydrometer, or centrifuge methods. The equation is

$$v = \frac{2gr^2(\rho_1 - \rho_2)}{9\eta}$$

where

- v = velocity of fall
- g = acceleration due to gravity
- r = equivalent radius of particle
- $\rho_1$  = density of particle
- $\rho_2$  = density of liquid medium
- $\eta$  = viscosity of liquid medium.

**stone (klip)**

A rock fragment greater than 250 mm in diameter if rounded, and greater than 375 mm along the greater axis if flat. Cf. coarse fragments.

**stoneline (kliplyn)**

A concentration of stones, boulders, gravels or concretions (or mixtures of these) which occurs in the soil and appears in profile as a horizontally disposed line or layer.

**stoniness (klipperigheid)**

The relative proportion of stones in or on the soil, used in describing soils. It should be described in terms of:

- (i) abundance : few (< 20% by volume percentage)  
common (20 - 50%)  
many (> 50%)
- (ii) size : small (< 20 mm)  
medium (20 - 100 mm)  
large (> 100 mm)
- (iii) shape: flat; rounded; angular.

Cf. coarse fragments.

**stony (klipperig)**

Soil containing sufficient stones to interfere with or to prevent tillage. Used to modify soil class, e.g. stony clay loam or clay loam, stony phase. Cf. coarse fragments; stony land; stoniness.

**stony land (klipperige land)**

Areas containing sufficient stones to make the use of machinery impractical; usually 15 to 90% of the surface is covered with stones. A miscellaneous land type. See stoniness and rubble land.

**strain (vervorming)**

The relative change in dimensions or shape of a body which is subjected to stress. Associated with each type of stress is a corresponding strain, e.g. compressive strain, shearing strain, tensile strain, etc.

**stratification (stratifikasie; gelaagdheid)**

Arranged in or composed of strata or layers.

**stratified alluvium (gestratifiseerde alluvium)**

See diagnostic horizon.

**stratigraphy (stratigrafie)**

The branch of geology that deals with the definition and interpretation of stratified rocks; the conditions of their formation; their character, arrangement, sequence, age, and distribution; and especially their correlation by the use of fossils and other means.

**strengite (strengiet)**

An iron phosphate mineral,  $\text{FePO}_4 \cdot 2\text{H}_2\text{O}$ , found in some well-drained acid soils. It belongs to the isomorphous variscite-barrandite-strengite group, variscite having the formula  $\text{AlPO}_4 \cdot 2\text{H}_2\text{O}$ .

**stress (spanning)**

In a solid, the force per unit area acting on any surface within it, and expressed as kilopascal; also by extension, the external pressure which creates the internal force. The stress at any point is mathematically defined by nine values; three to specify the normal component and six to specify the shear component, relative to three mutually perpendicular reference axes. Cf. strain; shear stress.

**stria (striation) (skraap)**

Minute, usually parallel groove(s) or channel(s) such as are produced by ice moving over rock. Pl. striae.

**strip cropping (strookverbouing)**

Growing crops in a systematic arrangement of strips or bands which serve as barriers to wind and water erosion. Related terms: alley cropping; buffer strip; contour strip cropping; sod strip; wind strip cropping.

**strip mining (strookmynbou)**

A process in which rock and topsoil strata overlying ore or coal deposits are scraped away by mechanical means. Also known as surface mining.

**structural crust (struktuurkors)**

See soil crust; soil sealing.

**structure (struktuur)**

See soil structure.

**structureless (struktuurloos)**

See soil structure.

**stubble mulch (stoppeldeklaag)**

The stubble of crops or crop residues left essentially in place on the land as a surface cover during fallow and the growing of a succeeding crop. Cf. tillage systems.

**stubble tillage (stoppelbewerking)**

See tillage systems.



**stunted (verpot)**

Reduced vegetative development of plants due to unfavourable environmental conditions, e.g. drought, infertile soil, poor soil physical conditions, etc.

**subangular structure (subhoekige struktuur)**

See soil structure.

**subirrigation (ondergrondbesproeiing)**

See irrigation methods.

**submergence potential (onderwaterpotensiaal)**

See soil water : hydrostatic pressure potential.

**subsidence (versakking)**

- (1) A local mass movement that involves principally the gradual downward settling or sinking of the solid earth's surface with little or no horizontal motion and that does not occur along a free surface (not the result of a landslide or failure of a slope). The movement is not restricted in rate, magnitude, or area involved. Subsidence may be due to natural geologic processes such as solution, erosion, oxidation, thawing, lateral flow, or compaction of subsurface materials; earthquakes, slow crustal warping, and volcanism (withdrawal of fluid lava beneath a solid crust); or man's activity such as removal of subsurface solids, liquid, or gases and wetting of some types of water-deficient loess or porous deposits. Syn. land subsidence; bottom subsidence. Cf. soil subsidence.
- (2) A sinking of a large part of the earth's crust relative to its surrounding parts, such as the formation of a rift valley or the lowering of a coast due to tectonic movements. Syn. sinking.

**subsistence fertilization (onderhoudsbemesting)**

When only those nutrients removed by the crop are replaced by fertilizer application.

**subsoil (ondergrond)**

That portion of the normal soil profile underlying the A horizon. In humid climates it is lower in organic matter content, is lighter in colour, usually of finer texture, of higher bulk density, and of lower fertility than the surface soil.

**subsoiling (skeurploegbewerking)**

Breaking of compact subsoils, without inverting them, with a chisel plough which is pulled through the soil at depths of 30 to 60 cm and at spacings of 60 to 150 cm.

**substratum (onderlaag; substratum)**

Any layer lying beneath the solum, either conforming (C or R) or unconforming.

**substrate (substraat)**

- (1) In biology, the base or substance or nutrient on which an organism grows.
- (2) In chemistry, compounds or substances that are acted upon by enzymes or catalysts and changed to other compounds in a chemical reaction.

**subsurface irrigation (ondergrondbesproeiing)**

See irrigation methods.

**subsurface tillage (suboppervlakkbewerking)**

Tillage with a special sweeplike plough or blade which is drawn beneath the surface at sufficient depth so as to cut plant roots but does not invert the surface layer of soil.

**succession (suksessie)**

The progressive development of a vegetation towards its highest ecological expression, the climax; replacement of one plant community by another.

**suction (suiging)**

See soil water : matric suction.

**sulfidic horizon (sulfidiese horison)**

See diagnostic horizon.

**sulfuric horizon (sulfaathorison)**

See diagnostic horizon.

**superphosphate (superfosfaat)**

A phosphate fertilizer containing water soluble monocalcium orthophosphate  $[\text{Ca}(\text{H}_2\text{PO}_4)_2]$  and calcium sulphate. It is prepared by first refining mined phosphate-containing ore to a phosphate concentrate, which is then treated with sulphuric acid. It contains between 8% and about 11% P.

**surface-charge density (oppervlakladingsdigtheid)**

The excess of negative or positive charge per unit of surface area of soil, clay or humic substances.

**surface erosion (plaaterosie)**

See erosion: sheet erosion.

**surface runoff (oppervlakafloop)**

See runoff.

**surface sealing (oppervlakverseëling)**

See soil crust; soil sealing.

**surface soil (boggrond)**

See topsoil.

**surface tension (oppervlakspanning)**

The force per unit length (N/m) required to increase the surface of a liquid, or the energy per unit area ( $\text{J}/\text{m}^2$ ) expended in increasing the surface of a liquid.

**suspended load (gesuspendeerde vrag)**

- (1) The part of the total stream load that is carried for a considerable period of time in suspension, free from contact with the stream bed; it consists mainly of clay, silt and sand.
- (2) The material collected in, or computed from samples collected with, a suspended load sampler. Syn. suspension load; silt load; wash load.

**suspension (suspensie)**

**A mixture of solid particles and liquid in which the solids are either settling under the force of gravity or are suspended by upward currents in eddies of turbulent flow, or by Brownian motion in the case of very small particles.**

**sustainable land use (volhoubare landgebruik)**

**The continuing utilization of land such that its productivity is maintained.**

**S-value (S-waarde)**

**The sum of exchangeable (as opposed to soluble) Ca, Mg, Na and K ions expressed in cmol<sub>c</sub>/kg soil.**

**swamp (moeras)**

**An area saturated with water throughout much of the year but with the surface of the soil usually not deeply submerged; usually characterized by tree or shrub vegetation. A miscellaneous land type. Cf. marsh.**

**swelling (swelling)**

**The increase in bulk volume of a substance, usually upon addition of water.**

**swelling clay (swelklei)**

**See expanding-lattice clay.**

**swelling chlorite (swelchloriet)**

**A chlorite-like mineral, found in clays, that behaves like a chlorite on heating but has its basal spacing expanding on glycerol treatment. It contains incomplete hydroxide (brucite or gibbsite) layers and might be regarded as a special interlayering of chlorite with smectite or vermiculite. Syn. pseudochlorite.**

**swelling soil (swelgrond)**

**A soil containing expanding-lattice clay minerals which cause the soil to swell or heave upon wetting and shrink (with the formation of cracks) upon drying.**

**symbiosis (simbiose)**

**Two organisms of different species living in close association, one or both of which may benefit therefrom while neither is harmed. For example, nitrogen-fixing bacteria in the roots of legumes.**

**syenite (siëniet)**

**A group of plutonic igneous rocks consisting principally of alkali feldspar (orthoclase, microcline or perthite), usually with one or more mafic minerals such as hornblende or biotite. Small amounts of quartz (or nepheline) and plagioclase may be present. Spheue, apatite and opaque oxides are accessories.**

**synecology (sinekologie)**

**The study of groups of organisms that are associated together as a unit. Cf. autecology.**

**synergism (sinergisme)**

**The simultaneous actions of two or more agencies that together have a greater total effect than the sum of their individual effects, for example, the action of certain combinations of toxic substances. Cf. antagonism.**



## T

### tableland (tafeland)

A tract of land, with no great irregularities of surface, considerably elevated above the general surface of the area. Cf. mesa.

### tactoid (taktoïed)

A spindle-shaped body, e.g. as in vanadium pentoxide sol.

### takyr (takyr)

The unconsolidated sediment (usually fine-grained) and evaporite in a depression.

### talc (talk)

An extremely soft, whitish, greenish or greyish monoclinic mineral:  $\text{Mg}_3\text{Si}_4\text{O}_{10}(\text{OH})_2$ . It has a characteristic soapy or greasy feel and a hardness of 1 on Mohs' scale. It is easily cut with a knife. Talc is a common secondary mineral derived by alteration (hydration) of nonaluminous magnesium silicates (such as olivine, enstatite and tremolite) in basic igneous rocks or by metamorphism of dolomite rocks, and it usually occurs in foliated, granular, or fibrous masses.

### talus (talus)

Fragments of rock and soil material accumulated by gravity at the foot of cliffs or steep slopes.

### taxon (takson)

A taxonomic group in a formal system of nomenclature. Any class in any category; e.g. the Hutton soil form is a taxon in the form category.

### taxonomy (taksonomie)

Classification, especially according to natural relationships. The systematic distinguishing, ordering and naming of type groups within a subject field.

### technical classification (tegniese klassifikasie)

A technical classification of inferred rather than observed properties. Cf. soil classification; natural classification; numerical classification.

### tectosilicate (tektosilikaat)

A class or structural type of silicate characterized by the sharing of all four oxygens of the  $\text{SiO}_4$  tetrahedra with neighbouring tetrahedra, and a Si:O ratio of 1:2. Quartz,  $\text{SiO}_2$ , is an example. Cf. nesosilicate; sorosilicate; cyclosilicate; inosilicate; phyllosilicate. Syn. framework silicate.

### tensiometer (tensiometer)

A device for measuring the matric potential of soil water *in situ*; a porous, permeable ceramic cup connected through a tube to a manometer or vacuum gauge. Its measuring range is approximately 0 kPa to -85 kPa.

### Termosol (Termosol)

See soil classification.

**ternary exchange (ternêre uitruiling)**

Refers to an exchange reaction in which three ions are involved. Cf. binary exchange; quaternary exchange.

**terrace (terras)**

- (1) A level, usually narrow, plain bordering a river, lake, or the sea. Rivers sometimes are bordered by terraces at different levels.
- (2) A raised, more or less level or horizontal strip of earth usually constructed on, or nearly on, a contour and supported on the downslope side by rocks or other similar barriers and designed to make the land suitable for tillage and to prevent accelerated erosion. For example, the ancient terraces built by the Incas in the Andes.

**terraced (terraset)**

A small step on hillslopes, varying in height from a few centimetres to about one metre and running horizontally.

**terrain (terrein)**

The physical character of an area and its configuration (as in terrain studies and terrain intelligence).

**terrain classification (terreinklassifikasie)**

See land classification.

**terrain morphological units (terreinmorfologiese eenhede)**

The common terrain morphological units are:

**CREST**

**SCARP**

**MIDSLOPE**

**FOOTSLOPE**

**VALLEY BOTTOM**

**Tertiary (Tersiêr)**

See geological time scale.

**tetrahedral unit (tetraëdriese eenheid)**

This unit consists of four  $O^-$  ligands co-ordinated around a  $Si^{4+}$  atom, giving the ionic unit  $(SiO_4)^4-$ . It forms the basic structure of atomic lattices of most layer silicate minerals.

**texture, soil (tekstuur, grond-)**

See soil texture.

**textural class (tekstuurklas)**

A grouping of specified textural compositions, e.g. sandy loam, loam, etc. Cf. soil texture.

**textural classification (tekstuurklassifikasie)**

See soil texture.

**thermal analysis (termiese ontleding)**

The measurement of changes in physical or chemical properties of materials as a function of temperature, usually by heating or cooling at a uniform rate, e.g. in clay mineral analysis.

- (i) DTA (differential thermal analysis), measures the temperature difference ( $\Delta T$ ) between a sample and reference material.
- (ii) DSC (differential scanning calorimetry), measures the differential heat flow between a sample and reference material.
- (iii) TGA (thermo-gravimetric analysis), measures the mass loss or gain of a sample.

**thermal conductivity (termiese geleivermoë; hittegeleivermoë)**

The property of a substance determining the rate at which it conducts heat energy, as defined by the equation of heat conduction:

$$H = K_q (dT/dx),$$

where  $H$  = rate of heat energy flow

$K_q$  = thermal conductivity

$A$  = cross-sectional area of conductor

$dT/dx$  = temperature gradient.

The units of thermal conductivity are  $J m^{-2} s^{-1} ^\circ C^{-1}$ . Cf. thermal flux; thermal diffusivity.

**thermal diffusivity (termiese diffusiwiteit)**

The ratio of the thermal conductivity to the volumetric heat capacity. In the special case where thermal diffusivity ( $D_q$ ) is independent of distance, the transient heat flow equation in one dimension is

$$\frac{\partial T}{\partial t} = D_q \frac{\partial^2 T}{\partial z^2}$$

where  $T$  = temperature

$t$  = time

$z$  = distance

$D_q$  has units of  $m^2 s^{-1}$ .

**thermal flux (termiese vloed)**

The amount of heat conducted across a unit cross-sectional area of soil in unit time. For vertical heat flow the thermal flux ( $J_q$ ) is given by

$$J_q = -K_q \frac{\partial T}{\partial z}$$

where  $K_q =$  thermal conductivity

$\frac{\partial T}{\partial z} =$  temperature gradient

Cf. thermal conductivity.

**thermic (termies)**

See soil temperature.

**thermodynamic potential (termodinamiese potensiaal)**

See soil water: water potential.

**thermogenic soil (termogene grond)**

A soil with properties that have been influenced primarily by high temperature as a component of climate as a soil-forming factor; developed in subtropical and equatorial regions. Cf. thermosequence.

**thermophilic organism (termofiele organisme)**

An organism that grows readily at temperatures above 45°C.

**thermosequence (termoreeks)**

A sequence of related soils that differ, one from the other, primarily as a result of the temperature component of climate as a soil-forming factor. Cf. thermogenic soil.

**thixotropy (tikstotropie)**

A property of a material that permits it to become firm on standing for a short time, but on agitation its consistence becomes soft or it changes to a highly viscous fluid. It is a reversible process.

**threshold velocity (drumpelsnelheid)**

The minimum wind velocity at which particles of sand or other soil material will begin moving.

**tie-ridging (kommetjiewerking; bakkiewerking)**

A method of soil cultivation in which small basins are established on the soil surface with a suitable implement. The purpose is to allow water to pond in the basins thus preventing runoff. Cf. tillage systems.

**tile drain (dreineerpyp)**

An underground drain consisting of clay, perforated plastic, pitch fiber, asbestos-cement or cement pipe. Water enters the drain through the unsealed joints or through the perforations in the pipe.



**till (keileem; bewerk)**

- (1) Unstratified glacial drift deposited directly by ice flow and consisting of clay, sand, gravel, and boulders intermingled in any proportion.
- (2) To plough and to prepare a seedbed for planting or sowing.

**tillage (grondbewerking)**

The mechanical manipulation of soil for any purpose; but in agriculture it is usually restricted to the modification of soil conditions for crop production. Cf. tillage systems.

**tillage systems (bewerkingstelsels)***clean tillage (clean culture, clean cultivation) (skoonbewerking)*

A process of ploughing and cultivation which incorporates all residues and prevents growth of all vegetation except the particular crop desired during the growing season.

*complete tillage (volledige bewerking)*

A tillage sequence made up of one broadcast, primary tillage operation and one or more broadcast, secondary tillage operations, plus one or more cultivations, either broadcast or strip.

*conservation tillage (bewaringsbewerking)*

Any tillage sequence, the object of which is to minimize or reduce loss of soil and water; operationally, a tillage or tillage and planting combination which leaves a 30% or greater cover of crop residue on the surface.

*controlled traffic (beheerde verkeer)*

Tillage in which all operations are performed in fixed paths so that recompaction of soil by traffic (traction or transport) does not occur outside the selected paths.

*conventional tillage (konvensionele bewerking)*

Tillage operations normally performed in preparing a seedbed for a given crop grown in a given geographical area.

*incomplete tillage (onvolledige bewerking)*

The result of omitting one or more of the elements of a complete tillage system.

*minimum tillage (minimumbewerking)*

The minimum soil manipulation necessary for crop production or meeting tillage requirements under the existing soil and climatic conditions.

*mulch tillage (deklaagbewerking)*

Tillage or preparation of the soil in such a way that plant residues or other materials are left to cover the surface; also, mulch farming, trash farming, stubble mulch tillage, plowless farming; operationally, a full-width tillage or tillage and planting combination that leaves > 30% of the surface covered with crop residue.

*no-tillage (geenbewerking)*

A procedure whereby a crop is planted directly into the soil with no preparatory tillage since harvest of the previous crop; usually a special planter is necessary to prepare a narrow, shallow seedbed immediately surrounding the seed being planted.

*once-over tillage* (eenmalige bewerking)

A system whereby all tillage preparatory for planting is done in one operation or trip over the field.

*oriented tillage* (georiënteerde bewerking)

Tillage operations which bear specific relations in direction with respect to the sun, prevailing winds, previous tillage operations, or field base lines.

*ploughless farming* (ploeglose bewerking)

Tilling soil without moldboard ploughing so that the crop residue will be left on the surface; also, trash farming, stubble mulch, and subsurface tillage. Cf. mulch tillage.

*reduced tillage* (verminderde bewerking)

A tillage system in which the total number of tillage operations preparatory for seed planting is reduced from that normally used on that particular field or soil.

*ridge tillage* (rifbewerking)

A tillage system in which ridges are formed atop the planted row by cultivation, and the ensuing row crop is planted into ridges formed during the previous growing season.

*stubble mulch tillage* (stoppeldeklaagbewerking)

See mulch tillage and ploughless farming.

*subsurface tillage* (suboppervlaktbewerking)

Tillage with a sweep-like plough or blade which is drawn beneath the soil surface cutting plant roots and loosening the soil without inverting it, resulting in minimum incorporation of residues into the soil.

*surface tillage* (oppervlaktbewerking)

Cultivating or mixing the soil to a shallow depth.

**tillite** (tilliet)

A consolidated or indurated sedimentary rock formed by lithification of glacial till, esp. pre-Pleistocene till (such as the Late Carboniferous tillites in South Africa and India).

**tilth** (gesteldheid, grond-)

See soil tilth.

**time domain reflectometry** (pulsvertragingmeting)

A method used for the determination of the water content of e.g. porous materials. It involves measurement of the dwell time of an electromagnetic pulse between two conductors inserted in the material. The pulse time-delay is related to the dielectric constant of the medium, and hence to its water content.

**tinging** (tandbewerking)

A method of turf or lawn cultivation in which the soil is spiked by an implement such as a garden fork. Syn. coring. Cf. hollow-tining.

**tissue analysis (weefselontleding)**

The analysis of some specified portion of a plant, such as the leaf or stem, for its content of plant nutrients and other elements. Cf. foliar analysis.

**tonalite (tonaliet)**

See quartz-diorite.

**tongues, soil (tonge, grond-)**

See soil tongues.

**topaz (topaas)**

$\text{Al}_2\text{SiO}_4(\text{OH},\text{F})_2$ , orthorombic.

**topdressing (bobemesting; kopbemesting)**

- (1) A surface application of fertilizer to a growing crop.
- (2) A surface application of soil material to gardens, lawns, etc.

**topocadastral (topokadastraal)**

Information on the physical and cultural characteristics as well as the administrative and property boundaries of a place, as officially registered for taxation purposes.

**topography (topografie)**

- (1) The general configuration of a land surface or any part of the Earth's surface, including its relief and the position of its natural and manmade features. Not synonymous with relief. Cf. relief. Syn. lay of the land.
- (2) The natural or physical surface features of a region, considered collectively as to form; the features revealed by the contour lines of a map. In non-geologic usage, the term includes man-made features (such as are shown on a topographic map).
- (3) The art or practice of accurately and graphically delineating in detail, as on a map or chart or by a model, selected natural and man-made surface features of a region. Also, the descriptive study or representation of such features.

**toposequence (toporeeks)**

A number of different soils, occurring down the length of a slope, each with properties attributable to its relative position in the landscape.

**topsoil (boggrond)**

- (1) The uppermost part of the soil ordinarily moved in tillage, or its equivalent in uncultivated soils, ranging in depth from about 100 to 300 mm. Frequently designated as the "plough layer", the "Ap layer", or the "Ap horizon".
- (2) Soil material used to topdress roadbanks, gardens and lawns.

**tortuosity (gekronkeldheid)**

- (1) The non-straight nature of soil pores.
- (2) The tortuosity factor is the reciprocal of the increase in diffusion path that an ion must take in diffusing through the water present in the soil when it moves along a concentration gradient, as compared to the path in water.

**total dissolved solids (TDS) (totale opgeloste vastestowwe (TOV))**

The total concentration of salts in water. Usually expressed in units of  $\text{mg kg}^{-1}$  or  $\text{g m}^{-3}$ .

**total head (totale hoogte)**

See soil water : total head.

**total soil water potential (totale grondwaterpotensiaal)**

See soil water : total potential.

**total soil water stress tension/suction (totale grondwaterspanning /-suiging)**

See soil water : total soil water stress.

**total stress (totale spanning)**

See soil water : total soil water stress.

**tourmaline (toermalyn)**

Any one of a group of hard glassy minerals of variable colour consisting of complex borosilicates of aluminium with quantities of lithium, sodium, potassium, iron and magnesium in hexagonal crystalline form; used in optical and electrical equipment and in jewellery.

**toxic concentration (toksiese konsentrasie)**

The critical concentration at which a substance which is not usually toxic becomes toxic. Cf. toxicity.

**toxic element (toksiese element)**

See toxicity.

**toxicity (toksisiteit)**

The injurious or lethal effect of a substance (element, compound) on plants or other organisms.

**trace element (spoorelement)**

See micronutrient.

**trachyte (tragiet)**

An extrusive rock composed essentially of alkali feldspar and minor biotite, hornblende or pyroxene. The extrusive equivalent of syenite.

**traffic pan (ploegblad)**

See ploughsole.

**transgression (transgressie)**

An expansion of the sea resulting in the progressive submergence of land as when the sea level rises or land subsides. Cf. recession.

**transient flow (onbestendige vloei; oorgangsvloei)**

See soil water : transient flow.

**transient state (onbestendige toestand; oorgangstoestand)**

See soil water : transient state.

**transitional soil (oorgangsgrond)**

A soil with properties intermediate between those of two different soils and genetically related to them.

**transition zone (soil) (oorgangsone (grond))**

The zone between two distinct soils occupied by a transitional soil.

**transmission efficiency (transmissiedoeltreffendheid)**

The transmission efficiency of irrigation water is the percentage of the water leaving the source of supply which is delivered to the field. Cf. application efficiency; irrigation efficiency; distribution efficiency; replenishment efficiency.

**transmittance (transmittansie)**

A measure of the ability of a body to transmit radiation, equal to the ratio of the transmitted flux to the incident flux; the reciprocal of the opacity. For a plate of material the ratio of the flux reaching the exit surface to that leaving the entry surface is the internal transmittance. Cf. absorbance.

**transpiration (transpirasie)**

The process by which water in plants is transferred as water vapour to the atmosphere.

**transpiration ratio (transpirasieverhouding)**

The ratio of the mass of water transpired by a crop to the mass of above-ground dry plant matter produced.

**transported material (vervoerde materiaal)**

See drift.

**Triassic (Trias)**

See geological time scale.

**triaxial test (drie-assige toets)**

A shearing test conducted in an apparatus which permits application of known lateral and vertical stresses, and measurement of the resulting deformation of the sample.

**trickle irrigation (drupbesproeiing)**

See irrigation methods.

**trough valley (trogvallei)**

A valley with spurless, parallel walls.

**truncated soil (afgeknotte grond)**

A soil that has been cut down by accelerated erosion or by mechanical means. The profile may have lost part or all of the A horizon and sometimes the B horizon, leaving only the C horizon. Comparison of an eroded soil profile with a virgin profile of the same area, soil type and slope conditions, indicates the degree of truncation.

**tufa (toefa)**

A soft, porous rock consisting of calcium carbonate deposited from springs rich in lime. Also called: calc-tufa.

**tuff (tuf)**

A rock formed of compacted volcanic fragments usually smaller than 5 mm in diameter.

**tundra (toendra)**

A treeless, level or gently undulating plain characteristic of arctic and subarctic regions. It usually has a marshy surface which supports a growth of mosses, lichens and numerous low shrubs and is underlain by a dark, mucky soil and permafrost.

**Tundra Soil (Toendragrond)**

- (1) A soil characteristic of tundra regions.
- (2) A great soil group consisting of soils with dark-brown peaty layers over greyish horizons mottled with iron oxides and having continually frozen substrata.

**tunnelling (tonnelerosie)**

See erosion: tunnel erosion.

**turbulent flow (turbulente vloe)**

That type of flow in which any particle of a liquid may move in any direction with respect to any other particle. In this type of flow the friction head varies approximately with the second power of the velocity. It occurs at velocities higher than Reynold's velocity. Also termed sinuous or tortuous flow.

**turf (turf)**

- (1) Turf soil (e.g. "black turf") is a specific South African term for a dark, sticky clay soil. See soil classification: Vertisol.
- (2) A covering of mowed vegetation, usually a turfgrass, growing intimately with an upper soil stratum of intermingled roots and stems. Cf. turfgrass.

**turfgrass (turfgras; sooigras)**

A grass used for establishing turf, as on various kinds of sports fields. Cf. turf.

**T-value (T-waarde)**

Total exchangeable cations. (Usage not recommended). See cation exchange capacity.

**type, soil (grondtipe)**

See soil type.

## U

### **Ultisol (Ultisol)**

See soil classification.

### **ultrabasic (ultrabasies)**

Containing less than 45% silica, virtually no quartz or feldspar and composed essentially of ferromagnesian silicates, metallic oxides and sulphides, and native metals, or of all three. Said of some igneous rocks and of most varieties of meteorites.

### **ultramafic (ultramafies)**

See ultrabasic.

### **umbric A horizon (obsolete) (umbriese A-horison (verouderd))**

See diagnostic horizon.

### **umbric epipedon (umbriese epipedon)**

See diagnostic horizon.

### **umbric horizon (umbriese horison)**

See diagnostic horizon.

### **Umbrisol (Umbrisol)**

See soil classification.

### **unavailable water (onbeskikbare water)**

See soil water : available water.

### **unconformable (diskordant)**

See conformable.

### **unconsolidated material with signs of wetness (ongekonsolideerde materiaal met tekens van natheid)**

See diagnostic horizon.

### **unconsolidated material without signs of wetness (ongekonsolideerde materiaal sonder tekens van natheid)**

See diagnostic horizon.

### **undifferentiated soil group (ongedifferensieerde grondgroep)**

A soil mapping unit in which two or more similar taxonomic soil units occur, but not in a regular geographic association. For example, the steep phases of two or more similar soils might be shown as a unit on a map because topography dominates the properties. See soil association; soil complex.

### **undisturbed sample (onversteurde monster)**

A soil sample removed from a soil profile or any soil body so as not to disturb its structure. Undisturbed samples are used to determine bulk density, permeability, etc.

### **unit cell (eenheidsel)**

The fundamental three-dimensional array of atoms that forms a crystal lattice by regular repetition in space. Cf. lattice; layer.

**unsaturated conductivity (onversadigde geleivermoë)**

See soil water : unsaturated conductivity.

**unsaturated flow (onversadigde vloeï)**

See soil water : unsaturated flow.

**unspecified material with signs of wetness (ongespesifieerde materiaal met tekens van natheid)**

See diagnostic horizon.

**upper plastic limit (boonste plastiese grens)**

See Atterberg limits : liquid limit.

**upslope (helling-op)**

Indicates a movement or direction from a lower to a higher hillslope position. Cf. downslope.

**uptake (opname (absorpsie))**

See absorption.

**urban land (stedelike land)**

Areas so altered or obstructed by urban works or structures that identification of soils is not feasible. A miscellaneous land type.

**urea fertilizer (ureumkunsmis)**

Urea fertilizer consists of  $(\text{NH}_2)_2\text{CO}$ ; it may contain a small percentage of biuret which is toxic to seedlings in excessive concentrations ( $>1\%$ ). Urea contains at least 46% N. The fertilizer is manufactured in the form of small opalescent pellets and is somewhat hygroscopic.

## V

**value (colour) (waarde (kleur))**

The relative lightness or intensity of colour, approximately a function of the square root of the total amount of light. One of the three variables of colour. Cf. soil colour; chroma.

**vane shear test (skroefbladtoets)**

An *in situ* shear test in which a rod with thin radial vanes at the end is forced into the soil and the resistance to rotation of the rod is determined.

**Van der Waals' force (Van der Waals-krag)**



An extremely weak attractive force between two atoms or non-polar molecules. They are weaker than hydrogen bonds and are not involved in chemical bonding.

variant, soil (variant, grond-)

See soil variant.

variscite (variskiet)

A green orthorhombic mineral:  $\text{AlPO}_4 \cdot 2\text{H}_2\text{O}$ . It is isomorphous with strengite,  $\text{FePO}_4 \cdot 2\text{H}_2\text{O}$ . Cf. strengite.

varve (warf)

A distinct band representing the annual deposit in sedimentary materials regardless of origin and usually consisting of two layers, one a thick, light coloured layer of silt and fine sand and the other a thin, dark-coloured layer of clay.

veld (veld)

In Africa, natural vegetation usually used as grazing. It may be composed of any number of plant growth forms and need not necessarily be climax vegetation in that the species composition may be influenced by grazing management practices. Highveld refers to regions > 1500 m, Middelveld to regions 900-1500 m, and Lowveld to regions < 900 m above sea level. Well-known veld types include Fynbos, Karoo, Grassveld and Bushveld.

vermiculite (vermikuliet)

A group of platy or micaceous clay minerals closely related to chlorite and smectite having the general formula:

$(\text{Mg,Fe,Al})_3(\text{Al,Si})_4\text{O}_{10}(\text{OH})_2$ . The minerals are derived generally from the alteration of micas (chiefly biotite and phlogopite). They vary widely in chemical composition. Vermiculites differ from the smectites in that the characteristic exchangeable cation is  $\text{Mg}^{2+}$ , the lattice expands only to a limited degree (hydration and dehydration is limited to two layers of water), and they have higher layer charges per formula unit (0,6-0,9) and higher cation exchange capacity (140 to 160 cmol<sub>c</sub>/kg).

vertic A horizon (vertiese A-horison)

See diagnostic horizon.

vertical air photo (vertikale lugfoto)

An aerial photograph made with the camera axis vertical (camera pointing straight down) or as nearly vertical as possible in an aircraft. Cf. oblique air photo.

vertic horizon (vertiese horison)

See diagnostic horizon.

Vertisol (Vertisol)

See soil classification.

very coarse sand (baie-grofsand)

See soil separates; soil texture.

very fine sand (baie-fynsand)

See soil separates; soil texture.

**vesicle (gasholte; selblasie)**

- (1) An unconnected void with smooth walls in a rock formed by bubbles of steam or gas in molten lava as it cooled. Cf. amygdale.
- (2) Spherical structures formed intracellularly, by vesicular-arbuscular endomycorrhizal fungi. Cf. vesicular-arbuscular.

**vesicular-arbuscular (vesikulêr-arbuskulêr)**

A common endomycorrhizal association produced by phycomycetous fungi of the family Endogonaceae. Host range includes most agricultural and horticultural crops. Often abbreviated to VA.

**vitreous (glasagtig)**

- (1) Having the lustre of broken glass, quartz, calcite.
- (2) Having no crystalline structure.

**virgin soil (onversteurde grond)**

A soil in its natural state, undisturbed by man.

**vivianite (vivianiet)**

A mineral :  $\text{Fe}_3(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$ . It is colourless, blue, or green when unaltered, but grows darker on exposure to the atmosphere. It occurs as monoclinic crystals, fibrous masses or in an earthy form in copper, tin and iron ores, and in clays, peat, and bog iron ore. Syn. blue iron earth; blue ochre.

**vlei (vlei)**

A low-lying area subject to periodic or continuous wetness. Cf. marsh; swamp.

**void (ruimte)**

A general term for pore spaces or other openings in soil (or rock). In addition to pore space, the term includes vesicles, solution cavities or any openings, either primary or secondary; also called interstices. Cf. porosity.

**void ratio (ruimteverhouding; porieverhouding)**

The ratio of the volume of void or pore space to the volume of solid particles.

**volume fraction of water (volumetriese waterinhoud)**

See soil water : volumetric water content.

**volumetric water content (volumetriese waterinhoud)**

See soil water : volumetric water content.

**volumetric water percentage (volumetriese waterinhoud)**

See soil water : volumetric water content.

**volumetric water potential (volumetriese waterpotensiaal)**

See soil water : Table B.

**vugh (kristalholte; grondholte)**

- (1) A small cavity in a rock or vein, usually lined with crystals.
- (2) A micromorphology term. See micromorphology.

## W

**waning slope (afnemende hang)**

A slope which is concave upward, decreasing downslope.

**waste (afval)**

All matter foreign to soil, whether of industrial, municipal, household or agricultural origin, that may be disposed of in dumping sites or on soil.

**waste land (uitskotland)**

Land not suitable for, or capable of, producing materials or services of value. A miscellaneous land type.

**water content (wetness) (waterinhoud)**

See soil water : water content.

**water culture (waterkultuur)**

See hydroponics.

**waterlogged (versuip)**

Soil or land saturated with water. It may result from excessive rain, irrigation or seepage, coupled with inadequate drainage, and is detrimental to the growth of most crop plants.

**water mass fraction (watermassafraksie)**

See soil water : water mass fraction.

**water percentage (waterpersentasie)**

See soil water : water content.

**water potential (waterpotensiaal)**

See soil water : water potential.

**water ratio (obsolete) (waterverhouding (verouderd))**

See soil water : liquid ratio.

**water requirement (waterbehoefte)**

The total quantity of water, regardless of its source, required by crops for their normal growth under field conditions. It may include water applied in irrigation, precipitation and soil water available to the crops. Cf. irrigation requirement.

**watershed (waterskeiding; opvanggebied)**

- (1) The line, ridge or summit of high ground separating waters flowing to different rivers or basins. Syn. divide.
- (2) A catchment area. Cf. catchment.

**water-stable aggregate (waterstabile aggregaat)**

A soil aggregate which is stable to the action of water such as falling drops, or agitation as in wet-sieving analysis.

**water table (watervlak)**

See soil water : water table.

**water tension (waterspanning)**

See soil water : matric potential.

**water use efficiency (watergebruiksdoeltreffendheid)**

Yield of crop produced per unit of water consumed.

**water yield (waterleivering)**

The total outflow from a drainage basin through either surface channels or subsurface aquifers.

**waxing slope (aanwassende helling)**

A slope that is convex upwards, increasing down-slope.

**weathering (verwering)**

- (1) The disintegration and decay of rock, so producing *in situ* a mantle of waste, depending on : the nature of the rock, the relief and the potency of the climatic agents.
- (2) Weathering may be mechanical or physical (frost action, temperature change), chemical (solution, carbonation, hydrolysis, oxidation, hydration) or biological (the presence of moss and lichen, tree roots, worms, moles, rabbits; this is not strictly weathering, but it assists, both mechanically and physically). The work of wind and rain (except for the latter providing lubrication of material and water which may freeze in cracks) are not included in weathering, since they involve transport of material, and are part of erosion.

**weathering sequence (verweringsreeks)**

A list of minerals according to their relative stability to weathering. The fundamental basis of establishment of weathering sequence lies with one or more of the following criteria: relative persistence with age of formation, geographic correlation with weathering intensity factors, particle-size (specific surface) function, and persistence as a function of depth in the formation.

**wetland (natland)**

A flat area covered permanently, occasionally, or periodically by fresh or salt water up to a depth of 6 m (e.g. flooded pasture land, marshland, shallow inland lakes, rivers and their estuaries, intertidal mud flats).

**wetness (waterinhoud)**

See soil water : water content.

**wetting zone (benattingszone)**

When a homogeneous profile is examined at any moment during infiltration under ponding, it is found that the surface of the soil is saturated, perhaps to a depth of

several millimetres or centimetres, and that beneath this zone of complete saturation is a lengthening zone of apparently uniform, nearly saturated soil, which is known as the transmission zone. Beyond this zone there is a wetting zone, in which soil wetness decreases with depth at a steepening gradient down to a wetting front, where the water gradient is so steep that there appears to be a sharp boundary between the wet soil above and the dry soil beneath. Cf. soil water: infiltration.

**wilderness land (wildernisland)**

A land area left untouched and in a natural state, with no human control or interference.

**wild-flooding irrigation (onbeheerde vloedbesproeiing)**

See irrigation methods.

**wilting point (verwelkpunt)**

It is the water content of a soil below which a majority of plants wilt permanently. The latter occurs when the hydraulic conductivity of the soil has decreased to such an extent that water will not move rapidly enough towards the roots of plants to satisfy their requirement, even during periods of low water demand, such as at night. Temporary wilting occurs when the water flow to the roots is insufficient to meet their requirement during short periods of high demand. Wilting point is estimated in the laboratory as the amount of water contained in an undisturbed soil sample that has been saturated, then drained to equilibrium at a pressure differential of 1 500 kPa. It is commonly expressed as a percentage of the dry mass of soil or as mm water per m depth of soil. Cf. permanent wilting percentage; soil water: total available water capacity.

**windbreak (windbreker)**

Trees, shrubs, or other vegetation planted perpendicular, or nearly so, to the principal wind direction to protect soils, crops, homesteads, etc. from wind and snows.

**wind erosion (winderosie)**

The detachment, transportation, and deposition of loose topsoil by wind action, especially in duststorms in arid or semiarid regions or where a protective mat of vegetation is inadequate or has been removed. Cf. deflation.

## X

**xenolith (xenoliet)**

A term applied to rock fragments that are foreign to the body of igneous rock in which they occur.

**xerophyte (xerofiet)**

A plant which grows in an area of limited water supply, such as in a desert.

**Xerosol (obsolete) (Xerosol (verouderd))**

See soil classification.

## Y

**yellow-brown apedal B horizon (geelbruin apedale B-horison)**

See diagnostic horizon.

**Yermosol (obsolete) (Yermosol (verouderd))**

See soil classification.

**yield value (meegeewaarde)**

The force required to overcome the cohesive forces in a plastic material and initiate flow.

**young soil (jong grond)**

A soil beginning to form. Cf. immature soil; mature soil.

## Z

**zeolite (seoliet)**

A hydrated alumino-silicate of the alkali and alkali earth metals with an infinitely extended three-dimensional anion network and an atomic ratio  $O:(Al\ Si)=2$ . When heated, zeolites give off water continuously rather than in stages and on re-exposure to water vapour will re-absorb the lost water. They occur typically in amygdales and cavities in basic volcanic rocks and in other late-stage hydrothermal environments. Many have a significant capacity for ion exchange.

**zero point of charge (ZPC) (zero-ladingspunt (ZLP))**

The ZPC is the pH at which there is an equal number of positive and negative charges on a colloid. It is determined primarily by the permanent negative charges (in the case of soil) and the pH-dependent charges.

**zeta potential (zetapotensiaal)**

See electrokinetic potential.

**zircon (sirkoon)**

$ZrSiO_4$ , tetragonal. Cf. accessory mineral; heavy mineral.

**zonality (sonaliteit)**

In soil science, the concept of zonality was a recognition of the influence which the climates of the world have had in determining the properties of soils. Its usefulness is reduced by the important effects which non-climatic soil-forming factors (especially parent material, time and drainage) have on soil properties. Cf. azonal soil; intrazonal soil; zonal soil.

**zonal soil (obsolete) (sonale grond (verouderd))**

One of the three primary subdivisions (orders) in soil classification formerly used in the United States. Subdivisions of zonal soils were based on properties reflecting differing influences of climate and vegetation on soil development.

**zymogenous flora (simogene flora)**

Organisms found in soils in large numbers immediately following the addition of readily decomposable organic materials. Cf. autochthonous.

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