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A factor: It is the computed longtime average annual soil loss carried by runoff from specific field slopes in specified cropping and management systems. It is expressed in the RUSLE model in tons/acre/year.

A horizon: The name given to the surface (top) layer of a soil profile. This horizon has more organic matter and dense microbial population hence greatest biological activity than other layers or horizons, such as B horizon and C horizon. It is also referred to as the surface mineral horizon with decomposed organic matter. This is the most important horizon from crop nutrition and microbial activity point of view. As the top soil, it is also the first layer to be lost during soil erosion and its protection is aimed at by various soil conservation measures.

AB-DTPA extraction reagent: An acronym for an extraction reagent of 1 M ammonium bicarbonate ($\text{NH}_4 \text{HCO}_3$) in 0.005 M diethylenetriaminepenta acetic acid (DTPA) that has a pH of 7.6 and is used for the extraction of phosphorus (P), potassium (K), sodium (Na), iron (Fe), manganese (Mn), and zinc (Zn) from alkaline soils.

abiotic enzymes: Enzymes (exclusive of live cells) that are (i) excreted by live cells during growth and division; (ii) attached to cell debris and dead cells; (iii) leaked into soil solution from extant or lysed cells but whose original functional location was on or within the cell. Synonymous with exoenzymes.

abiotic factor: (i). Not biotic i.e., not living: Factors like pH, temperature, moisture etc are abiotic. These factors play a major role in plant nutrition, microbial activity and crop growth. (ii). Physical, chemical and other non-living environmental factors. They are essential for living plants and animals of an ecosystem, providing the essential elements and nutrients that are necessary for growth. The abiotic elements also include the climatic and pedologic components of the ecosystem.

ablation till: Loose, permeable till deposited during the final down-wasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

abrasion: Breakdown of clods, crusts, and plant material by the impact of particles moved by wind in saltation. The impacting particles may also abrade. Abrasion causes soil aggregates to break down progressively as wind erosion continues.

absolute humidity: Measurement of atmospheric humidity. In a system of moist air, the ratio of the mass of water vapour present to the volume occupied by the mixture; that is, the density of the water vapour component. Absolute humidity is normally expressed in grams of water vapour in a cubic metre of air.

absolute water requirement: Also called consumptive use of water. This is the quantity of water in ha-cm per crop season absorbed by the crop together with the evaporation from the crop producing land. It includes the water used by evapotranspiration and retained in plant body.

absolute weed: These are the plants, which are undesirable regardless of time and place.

absolute zero: Considered to be the point at which theoretically no molecular activity exists or the temperature at which the volume of a perfect gas vanishes. The value is 0° Kelvin, -273.15° Celsius and -459.67° Fahrenheit.

absorption spectroscopy: This is a technique for determining the concentration and structure of a substance by measuring the amount of electromagnetic radiation the sample absorbs at various wavelengths.

absorption spectrum (pl. spectra): This is a plot that shows how much radiation a substance absorbs at different wavelengths. Absorption spectra are unique for each element and compound and they are often used as chemical “fingerprints” in analytical chemistry. The spectrum can be represented by a plot of either absorbance or transmittance versus wavelength, frequency, or wavenumber.

absorption, active: It is movement of ions and water into the plant root because of metabolic processes by the root, frequently against an electrochemical potential gradient.

absorption, passive: It is movement of ions and water into the plant root from diffusion along a chemical potential gradient.

absorption: It is uptake of matter or energy by a substance. The process by which atoms, molecules, or ions are taken up from the soil solution or soil atmosphere and retained on the surfaces of solids by chemical or physical binding.

absorptivity: It is the absorbance of a solution per unit of path length and per unit concentration; $a = A/l$

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humus and hydrous oxides contribute to soil acidity at low pH. Acid soils range from slightly acid (pH 6.1-6.5) to extremely acid (pH below 4.5). Micronutrient availability, except in case of Mo is usually higher in acid soils than in alkaline soils. Very acid soils can be amended with calcitic or dolomitic limestone and calcium-rich industrial by products such as sugar factory press mud, paper mill sludge etc.

acid sulphate soil: The acid sulphate soils, also known as cat clays, have a soil pH as low as pH 3.0 when drained. This is caused by the presence of dilute sulphuric acid resulting from sulphide oxidation. Some soils are also salt-affected. They often contain toxic amounts of Fe, Al and sulphate but are generally poor in most major nutrients. Potentially acid sulphate soils occur in tidal swamps. Such soils often produce very low yields, sometimes less than 1 tonne/ha of grain. However, even small amounts of lime, in combination with phosphate rock may increase the yield to 2–3 tonnes/ha. After complete amelioration, which is not easy, these soils can produce yields as high as normal soils. The best way to manage such soils is amelioration with lime, phosphate rock and a general increase in nutrient levels, which requires substantial capital input. However, these soils are generally used in their natural state for growing paddy rice as flooding increases soil reaction. Where the main problem is Fe toxicity, using cultivars with high tolerance to Fe can solve the problem to a certain extent.

acid-forming fertilizer: A kind of fertilizer that leaves behind an acidic effect in the soil (reduces soil pH). Mostly such fertilizers, which lack a metallic cation, are acid forming. Their continuous use makes a soil acid (lowers pH) and reduces soil quality and hence productivity. The excess acidity can be neutralized by lime application. This is generally of practical importance in case of nitrogenous fertilizers. Example: ammonium sulphate, ammonium chloride, anhydrous ammonia and urea.

acidic cations: Cations that, on being added to water, undergo hydrolysis resulting in an acidic solution. Hydrated acidic cations donate protons to water to form hydronium ions (H_3O^+) and thus in aqueous solutions are acids. Examples in soils include Al^{3+} and Fe^{3+} .

acidification: It is a process of becoming more acid. pH 7 is neutral, above this is alkaline below pH 6 is

acidic. i.e. acidification of the soil. The reduction in pH of the soil is generally brought about by removal of cations (mainly Ca^{2+} and Mg^{2+}) by leaching or removal in the crop.

acidity (soil): This is a chemical condition caused by acidic environment (excess of H^+). Acidity has adverse effect on the establishment of inoculated bacteria especially in very acid soils associated with the toxicity of aluminium and manganese or calcium deficiency. Soils become acid when basic elements, such as calcium, magnesium, sodium, and potassium held by soil colloids are replaced by hydrogen ions. Soils formed under conditions of high annual rainfall are more acid than are soils formed under more arid conditions. Soils formed under low rainfall conditions tend to be generally basic with soil pH readings above 7.0. However, intensive farming over a number of years with nitrogen fertilizers or manures can result in soil acidification. Water (H_2O) combines with carbon dioxide (CO_2) to form a weak acid — carbonic acid (H_2CO_3). The weak acid ionizes, releasing hydrogen (H^+) and bicarbonate (HCO_3^-). The released hydrogen ions replace the calcium ions held by soil colloids, causing the soil to become acid. The displaced calcium (Ca^{2+}) ions combine with the bicarbonate ions to form calcium bicarbonate, which, being soluble, is leached from the soil. The net effect is increased soil acidity.

acidity potential: The amount of exchangeable hydrogen ion in a soil that can be rendered free or active in the soil solution by cation exchange. Usually expressed in milli equivalents per unit mass of soil.

acidity, active: The activity of hydrogen ion in the aqueous phase of a soil expressed as a pH value.

acidity, exchange: The acidity of a soil that can be neutralized by lime or a solution buffered in the range of 7 to 8.

acidity, free: The titratable acidity in the aqueous phase of a soil.

acidity, residual: Soil acidity that is neutralized by lime or a buffered salt solution to raise the pH to a specified value (usually 7.0 or 8.0) but which cannot be replaced by an unbuffered salt solution. It can be calculated by subtraction of salt replaceable acidity from total acidity.

acidity, salt-replaceable: The aluminium and hydrogen that can be replaced from an acid soil by an unbuffered salt solution such as KCl or NaCl.

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acidity, total: The total acidity including residual and exchangeable acidity. Often it is calculated by subtraction of exchangeable bases from the cation exchange capacity determined by ammonium exchange at pH 7.0. It can be determined directly using pH buffer-salt mixtures (e.g. BaCl₂ plus triethanolamine, pH 8.0 or 8.2) and titrating the basicity neutralized after reaction with a soil.

acidophile: Term referring to acid loving. An organism that grows well under acidic conditions. Example: *Acetobacter diazotrophicus*.

acidulant: It is a substance added to food or beverages to lower pH and to impart a tart, acid taste. Phosphoric acid is an acidulant added to cola drinks.

acidulation: It is a process of treating a fertilizer source with an acid. The most common process is treatment of phosphate rock with an acid (or mixture of acids) such as sulphuric, nitric, or phosphoric acid.

acre-foot (acre-ft): The volume of water required to cover 1 acre of land (43,560 square feet) to a depth of 1 foot. Equal to 325,851 gallons or 1,233 cubic metres.

actinomycetes: A group of microorganisms, intermediate between bacteria and true fungi, that usually produces a characteristic branched mycelium. These organisms are responsible for the earthy smell of compost.

actinorhizal plants: Plants, which are nodulated by *Frankia* - a nitrogen-fixing actinomycete. The resulting nitrogen-fixation is similar to that by *Rhizobium* in symbiosis with legumes. Example: *Alnus*, *Casuarina* etc.

activated charcoal: Charcoal, which has been treated to remove impurities. Activation carried out by heating charcoal under partial aeration. Used in chemical analysis.

activated coal: This is the most commonly used adsorption medium, produced by heating carbonaceous substances or cellulose bases in the absence of air. It has a very porous structure and is commonly used to remove organic matter and dissolved gases from water. Its appearance is similar to coal or peat. Available in granular, powder or block form; in powder form it has the highest adsorption capacity.

activated sewage sludge: It is biologically active sewage sludge which has been obtained by repeated exposure of sewage to atmospheric oxygen, thus facilitating the growth of aerobic bacteria and other unicellular micro-organisms and in the process has

been improved for use on land. On the average, nutrient content of activated sewage sludge is 5.8% N, 3.2% P₂O₅ and 0.6% K₂O. It also contains lesser and variable amounts of secondary and micronutrients and toxic heavy metals. Care has therefore to be taken while deciding the optimum application rates considering its composition. A potential organic fertilizer.

activator: A substance that can accelerate (speed up) a process, usually of decomposition. *Trichurus spiralis*, *Paecilomyces fuisporus*, and *Trichoderma viride* are used as compost activators (accelerators) as the inoculation of compost piles with such organisms speeds up the process and cuts down the compost preparation time.

active ingredient (a.i.): The potent portion of a compound (such as fertilizer, insecticide, fungicide or herbicide applied on the soil or plant) used as basis to estimate the chemical effect. Useful for comparing the strength or toxicity of chemicals.

activity index (AI): Activity index is used by the Association of Official Analytical Chemists (AOAC) to evaluate the solubility of urea formaldehyde compounds:

$$AI = \frac{\%CWIN - \%HWIN}{\%CWIN} \times 100$$

Where CWIN, nitrogen insoluble in cold water (25°C); and HWIN, nitrogen insoluble in hot water (100°C).

actual evapotranspiration: It is an average value, which represents the actual rate of water uptake by the plant. It is determined by the level of available water in the soil. Evapotranspiration comprises the simultaneous movement of water from the soil and vegetation into atmosphere through evaporation (E) and transpiration (T).

ad libitum feeding: Where animals are permitted to eat daily as much as they desire.

adaptive research: Research conducted to validate, modify and/or calibrate a new technology to specific soil, climate, socioeconomic, or environmental characteristics of a given area.

additive (fertilizer): Material incorporated in a fertilizer- (i) to improve its physical performance/condition, e.g. in storage or spreading characteristics, (ii) to provide a minor nutrient, e.g. boron, (c) to provide a non-nutrient biological action, e.g. pesticides or growth regulators.

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atmosphere above the soil. Poorly aerated soils usually contain a much higher content of CO₂ and a lower content of O₂ than the atmosphere above the soil. The rate of aeration depends largely on the volume and continuity of air-filled pores within the soil.

aerial deposition: Some nutrients are supplied in small quantities to the soil surface through aerial deposition. These include nitrates in rainwater, ammonia as a gas or dissolved in rainwater, sulphur in acid rain, salts and chlorine in marine spray and calcium in the form of dust.

aerial spraying: Application of pesticide or fertilizer in the form of spray by using aero plane or helicopter, with the objective of covering vast area in a short time.

aerobic composting: The process of composting organic wastes of plant and animal origin such as animal shed bedding, sweeping, urine, plant waste, cattle dung etc in the presence of air.

aerobic digestion: The partial biological decomposition of suspended organic matter in wastewater or sewage in aerated conditions.

aerobic: (i). Having molecular oxygen as a part of the environment. (ii). Growing only in the presence of molecular oxygen, such as aerobic organisms. (iii). Occurring only in the presence of molecular oxygen (said of chemical or biochemical processes such as aerobic decomposition).

aeroponics: A technique in growing plants wherein the plants derive their nutrients and water from a mist of air and aqueous solution that comes in contact with the roots.

aerosol: Particulate matter, solid or liquid, larger than a molecule but small enough to remain suspended in the atmosphere. Natural sources include salt particles from sea spray, dust and clay particles as a result of weathering of rocks, both of which are carried upward by the wind. Aerosols can also originate as a result of human activities and are often considered pollutants. Aerosols are important in the atmosphere as nuclei for the condensation of water droplets and ice crystals, as participants in various chemical cycles, and as absorbers and scatters of solar radiation, thereby influencing the radiation budget of the Earth's climate system.

afforestation: (i). Conversion of bare land into forestland by planting of forest trees. (ii). The

planting of a forest crop on land that has not previously, or not recently, carried a forest crop.

aflatoxin: Aflatoxin is a naturally occurring mycotoxin produced by two types of mold: *Aspergillus flavus* and *Aspergillus parasiticus*. Both species are common and widespread in nature, but *A. flavus* is more likely to infect grain, cotton seed, and peanuts grown under stressful conditions such as drought. Favourable conditions for mold growth include high moisture content and high temperature. At least 13 different types of aflatoxin are produced in nature with aflatoxin B₁ considered as the most toxic.

after-cultivation: Harrowing, rolling, tilling and other cultivations carried out in a field after the crop has emerged.

agar agar: A dried gelatin like mucilaginous substance used as solidifying agent to form the base for solid and semi solid culture media for bacteria. It is extracted from Ceylon moss (*Gelidium corneum*), red alga (*Rhodophyceae*). Chemically it is a kind of polysaccharide. It solidifies at about 38°C and melts at about 100°C. Also known as 'agar'.

agenda 2000: It is a Common Agricultural Policy (CAP) reform package proposed by the European Commission in 1998. After a number of modifications, the European Union Heads of State agreed to a package of reforms in March 1999.

agenda 21: Agenda 21 is the plan of action to achieve sustainable development that was adopted by the world leaders at the United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil, in June 1992.

aggregate demand analysis: This type of economic analysis takes place at the level of a region or a country. It gives useful information and data of total demand for that area and of the important components that create that demand. It can be extremely useful for studying government policies. However, it does not consider differences among different groups within a society and generally presents an incomplete picture of the welfare of the population.

aggregate stability: It is a measure of the stability of soil structure and soil tilth. Aggregate stability refers to the ability of soil aggregates to resist disruption when outside forces (usually associated with water) are applied. Aggregates are conglomerates of clay, silt, and sand particles that are held together by

physical and chemical forces. The bonds that hold these particles together can be broken by applying energy to the soil, for example, by shaking aggregates in water. A common method of determining aggregate stability is to place aggregates on a sieve with uniform openings and move the sieve up and down in a water bath. If a lot of soil passes through the sieve, the aggregate stability is low, while it is high if most soil remains on top of the sieve. Tillage destroys aggregates. Increasing soil organic matter content is the best method to increase aggregate stability. Crop rotations and crop mixtures can help to improve the aggregation of soils. Crops with extensive, fine root systems such as grasses and cereals stimulate aggregate stability in the long term. Crops with easily decomposed residue stimulate aggregate stability in the short term, because bacteria that feast on the residue produce polysaccharides that act as glue holding aggregates together. Amendments (such as manure or sewage sludge) that stimulate biological activity will help improve aggregate stability.

aggregate: A group of primary soil particles that cohere to each other more strongly than to other surrounding particles. Soil aggregates are groups of soil particles that bind to each other more strongly than to adjacent particles. The space between the aggregates provides pore space for retention and exchange of air and water.

aggregation: The process whereby primary soil particles (sand, silt, clay) are bound together, usually by natural forces and substances derived from root exudates and microbial activity. Soil aggregates are arranged to form soil peds, units of soil structure, classified by size, shape (platy, prismatic, columnar, angular, subangular, blocky, granular...) and grade (single-grain, massive, weak, moderate, strong). From an agronomical point of view, the most important soil aggregates are in range 3 – 1 mm.

aggressivity: It gives a simple measure of how much the relative yield increase in species 'a' is greater than that for species 'b' in an intercropping system and can be expressed as Aab:

$$Aab = \frac{Yab}{Yaa Zab} - \frac{Yba}{Ybb Zba}$$

Where,

Yaa = Pure stand yield of species a

Yab = Mixture yield of species a in combination with b

Yba = Mixture yield of species b in combination with a

Ybb = Pure stand yield of species b

Zab = Sown proportion of species a in mixture with b

Zba = Sown proportion of species b in mixture with a

agrarian policy: A policy concerned with the land or landed properties.

agrarian system: A historically constituted and durable mode of exploitation of the environment; a technical system adapted to the bioclimatic conditions of a given area and which complies with its social conditions and needs at that moment.

agribusiness: (i). Agriculturally related businesses that supply farm inputs (such as fertilizer or equipment) or are involved in the marketing of farm products (such as warehouses, processors, wholesalers, transporters, and retailers). (ii). The combination of the producing operations of a farm, the manufacture and distribution of farm equipment and supplies and the processing, storage, and distribution of farm commodities.

agric horizon: A mineral soil horizon in which clay, silt and humus derived from an overlying cultivated and fertilized layer have accumulated. The wormholes and illuvial clay, silt and humus, occupy at least 5% of the horizon by volume. The illuvial clay and humus occur as horizontal lamellae or fibres, or as coatings on ped surfaces or in wormholes.

agricultural area: Land used primarily for the production or collection of farm commodities. According to the land uses a distinction is made between arable land, land under protective cover, land under permanent crops in open air, land under permanent meadows and pastures both naturally grown or cultivated.

agricultural climatology: Climatology as applied to the effect of climate on crops. It includes especially the length of the growing period, the relation of growth rate and crop yields to the various climatic factors and the optimum and limiting climates for any given crop, the value of irrigation, and the effect of climatic and weather conditions on the development and spread of crop diseases .

agricultural economics: An applied social science that deals with the production, distribution, and consumption of agricultural or farming goods and services.

agro-chemical: General term for any chemical used in agriculture/horticulture for enhancing crop production. It includes mineral fertilizers, pesticides, herbicides, fungicides, plant growth regulators, hormones, etc. In practice however, the term is generally used for materials other than mineral fertilizers and soil amendments.

agroclimatic regions: The grouping of different physical areas within the country into broadly homogeneous zones based on climatic and edaphic factors.

agroclimatic zone: A land unit defined in terms of major climate and growing period, which is climatically the homogeneous response of a crop or a farming system.

agroclimatic: Relating to the relationship between crop adaptation and climate.

agroclimatology: Study of those aspects of climate, which are relevant to the problems of agriculture.

agro-ecological cell (AEC): An area or point with a unique combination of land, soil and climate characteristics. The agroecological cell is the basic processing unit for physical analysis in an AEZ (agro-ecological zoning) study.

agroecological zone: (i). A land resource mapping unit, defined in terms of climate, landform and soils, and/or land cover, and having a specific range of potentials and constraints for land use. Essential elements in defining an agro-ecological zone are the growing period, the temperature regime and the soil units. (ii). A major area of land that is broadly homogeneous in climatic and edaphic factors, but not necessarily contiguous, where a specific crop exhibits roughly the same biological expression. (iii). Zones of similar agricultural performance as defined by soil and climate.

agro-ecological zoning (AEZ): The division of an area of land into smaller units, which have similar characteristics related to land suitability, potential production and environmental impact.

agroecology: (i). The study of the interrelationships of living organisms with each other and with their environment in an agricultural system. (ii). The use of ecological concepts and principles to study, design, and manage agricultural systems. Agroecology seeks to evaluate the full effect of system inputs and outputs by integrating cultural and environmental

factors into the analysis of food production systems and to use this knowledge to improve these systems, taking into account the needs of both the ecosystem as a whole and the people within it.

agro-economic zones: Zones which are defined in terms of common features from an agricultural point of view. For different purposes these features will differ but may involve such dimensions as climate, soil resources, land use, ethnic groupings and market access .

agroecconomics: The economics of agriculture.

agroecosystem (=agricultural ecosystem): (i). The collection of physical, environmental, economic and social factors that affect a cropping enterprise. (ii). It is composed of the total complex of the crops or animals in an area together with overall environment and as modified by management practices.

agroforestry: Agroforestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land management unit as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. In agroforestry systems there are both ecological and economic interactions between the different components.

agrohydrology: The science dealing with the distribution and movement of rainfall and/or irrigation water and soil solution to and from the root zone in agricultural land, and with the distribution and movement of irrigation and surface water in conveyance systems on agricultural land.

agroindustry: Industry dealing with the supply, processing and distribution of farm products.

agrology: The study of applied phases of soil science and soil management.

agronomic characters: Plant characters related to crop production usually observed during plant growth; e.g., height, maturity, tiller number, panicle size, yield and quality factors.

agronomic efficiency: Denotes the units of additional crop produced per unit of input (nutrient) added externally. Example: kg grain/kg of a nutrient (macro or micro) added. Agronomic efficiency has a direct bearing on better utilization of applied nutrients, the profitability of their usage and minimization of nutrient losses.

A agronomic rate: The rate at which fertilizers, organic wastes or other amendments can be added to soils for optimum plant growth.

agronomy: (i). Science of agriculture that deals with all aspects of field crop production and soil management. (ii). A branch of agriculture dealing with all aspects of tillage, crop production and soil management including nutrient management. Derived from the Greek word “agros” meaning fields and “nomos” meaning management.

agropastoral system: A land-use system in which crops and livestock (but not trees) are the only components.

agrosilvicultural system: An agroforestry system for the concurrent production of agricultural crops (including woody perennial crops) and forest crops. The forest crops serve in either a productive or a service role. Woody perennial and agricultural crops are chosen first for their productive capacity.

agrosilvipastoral system: Any agroforestry system that includes trees or shrubs and herbaceous food crops and pastures and animals.

agrostology: A branch of science which deals with the study of grasses, their classification, management and utilization.

agrotain: Agrotain (NBPT) is a product that inhibits conversion of urea to ammonium carbonate, thereby reducing the potential for ammonia volatilization from urea materials, including UAN solutions. Like N-Serve, it might be viewed as an insurance policy that will reduce potential nitrogen losses in seasons when cultivation or rain does not incorporate the urea into the soil soon after application. It is most useful when urea or UAN are applied without incorporation to the surface of fields with high levels of crop residue, such as in no-till situations, or fields with high pH levels at the surface.

agroterrorism: The deliberate introduction of an animal or plant disease with the goal of generating fear, causing economic losses, and/or undermining stability. Agroterrorism is a subset of the more general issue of bioterrorism. An agroterrorism event would affect the production agriculture sector economically in terms of plant and animal health, and affect supply and demand. Humans could be at risk in terms of food safety or public health, especially if the chosen disease is transmissible to humans (zoonotic).

ahu rice: An early rice similar to “Aus”; grown in Assam, India.

air (=aerial) photographs: Photographs of the land surface taken from aircraft, usually at a vertical angle, normally at scales of from 1:50000 to 1:5000. For interpretation, air photographs are viewed stereoscopically to give a three-dimensional impression. Landforms, vegetation, land use and some infrastructure (especially roads and tracks) can be directly seen on air photographs, while soil properties, geology and other land properties require indirect interpretation and administrative boundaries cannot be seen. Air photographs can also be used as base maps for presentation of a land-use plan. Air photographs may be panchromatic (black and white), colour (true colour) or false colour.

air (-filled) porosity: The fraction of the bulk volume of soil that is filled with air at any given time or under a given condition, such as a specified soil-water content or soil-water matric potential.

air dry: (i). The state of dryness at equilibrium with the water content in the surrounding atmosphere. The actual water content will depend upon the relative humidity and temperature of the surrounding atmosphere. (ii). To allow to reach equilibrium in water content with the surrounding atmosphere.

air entry value: The value of water content or potential at which air first enters a porous media.

air mass: Large body of air, often hundreds or thousands of miles across, containing air of a similar temperature and humidity. Sometimes the differences between air masses are hardly noticeable, but if colliding air masses have very different temperatures and humidity values, storms can erupt.

air pollution: One or more chemicals or substances in high enough concentrations in the air to harm humans, other animals, vegetation, or materials. Such chemicals or physical conditions (such as excess heat or noise) are called air pollutants.

akiochi soil: Soil with an imbalance of nutrients associated with hydrogen sulphide toxicity. These are flooded soils where hydrogen sulphide is formed due to sulphate reduction and anaerobic decomposition of organic matter.

albedo: The fraction of the total solar radiation incident on a body that is reflected by it. Albedo can be expressed as either a percentage or a fraction of 1. Snow covered areas have a high albedo (up to about

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reaction). Gelatinization temperature of starch is estimated based on spreading value: low (6-7); intermediate (4-5); intermediate-high (3); and high (1-2).

alkaline (or basic) fertilizer: A fertilizer, which leaves behind an alkaline reaction in the soil (raises soil pH). Example: calcium nitrate, sodium nitrate.

alkaline: Having a pH higher than 7.

alkalinity: The quality, state, or degree of being alkaline.

alkalinophile: Alkali-loving. An organism that grows well at an alkaline pH (above 7). Example: *Agrobacterium*.

alkalization: Alkalinization is a next step to salinization. It takes place due to preponderance of Na ions in the exchange complex. When Na from the soluble salts enters into clay complex (due to base exchange reactions) and its proportion increases, the soils become alkaline.

allelochemicals: Non-nutritional substances produced by a plant that affect the behaviour, growth, health, or physiology of another plant or insect. Certain crop residues produce allelochemicals during decomposition, if sufficient time is allowed to lapse between the harvests and sowing of the subsequent crop, the allelochemicals produced disappear.

allelo-inhibition: Allelochemicals inhibit more the growth of plants of species other than producer species.

allelopathy: (i). An interaction between different plants or between plants and microorganisms in which substances (allelochemicals) produced by one organism affect the growth of another (usually adversely). (ii). The suppression of germination or growth or the limiting of the occurrence of plants, as a result of the release of chemical inhibitors by some plants.

alley cropping: (i). An agroforestry intercropping system in which species of shrubs or trees are planted at spacing relatively close within row and wide between row, to leave room for herbaceous cropping between, that is, in the 'alleys' (syn: hedgerow intercropping). (ii). A conservation-oriented farming system in which arable (field) crops are grown in alleys formed by trees or shrubs, mainly to hasten soil fertility restoration, enhancing soil productivity and conserving the soil. Commonly practiced in tropical and subtropical rainfed areas.

(iii). This is an advanced form of agroforestry in which food crops are planted in the alleys (inter-row area) between lines of trees, shrubs or leguminous crops. Alley crops, such as maize, millet, cassava or grasses are grown between rows of perennial trees, such as *Azadirachta indica*, *L. leucocephala* or *Gliricidia sepium*, from which leaf material can be taken for mulching, or shrubs such as *C. cajan*, that form hedges. The deep-rooting system of such perennial trees or shrubs can bring nutrients from deeper layers of the soil up to those layers where they can be taken up by the roots of agricultural crops, i.e. a form of nutrient cycling.

alley crops: When arable crops are grown in alleys formed by trees or shrubs, established mainly to hasten soil fertility restoration, enhance soil productivity and reduce soil erosion they are known as alley crops. Such crops should have slight shade tolerance and should be non-trailing, for instance sweet potato, blackgram, turmeric and ginger in between the rows of *Eucalyptus*, *subabool* and *Cassia*.

allochthonous flora: Organisms that are not indigenous to the soil but that enter soil by precipitation, diseased tissues, manure, and sewage. They may persist for some time but do not contribute in a significant way to ecologically significant transformations or interactions.

allometric relationships: The changes in the ratio between two dimensions of an organism, such as root weight:shoot weight or total dry weight: stem diameter. It can be expressed over time or, better, with reference to changes in a particular growth factor (for example, specific root or shoot activity). Important in defining partitioning of dry matter in plants.

allophane: An aluminosilicate with primarily short-range structural order. Occurs as exceedingly small spherical particles especially in soils formed from volcanic ash.

allowable soil-water depletion: Depth of soil water in the root zone readily available to the crop for given soil and climate allowing unrestricted evapotranspiration as the fraction of total available soil water between field capacity and wilting point. Expressed as mm/m.

alluvial fan: A fan or cone-shaped mass of sand and gravel deposited by a stream where it emerges from a narrow valley and spreads on to a plain or wide valley.

alluvial soil: (i) A soil developing from recently deposited alluvium and exhibiting essentially no horizon development or modification of the recently deposited materials. (ii) When capitalized the term refers to a great soil group of the azonal order consisting of soils with little or no modification of the recent sediment in which they are forming. This is by far the largest and most important soil group of India contributing the largest share to the agricultural wealth. In this immense tract though a great deal of variation exists, the main features of the soil are derived from the deposition laid by the numerous tributaries of the Indus, the Ganges, and the Brahmaputra systems. These streams, draining the Himalayas, bring with them the products of weathering of rocks constituting the mountains in various degrees of fineness and deposit them on the plains.

alluvial terraces: Flat elevated benches composed of unconsolidated alluvium found either side of a stream channel. Formed when a stream down cuts into its floodplain.

alluvial: Pertaining to alluvium; a clayey, silty, sandy, or gravelly material deposited by a stream or other bodies of running water.

alluvium: Sediments deposited by running water of streams and rivers. It may occur on terraces well above present streams, on the present flood plains or deltas, or as a fan at the base of a slope.

alternate drying and wetting (rice): Frequent draining and reflooding (aerobic and anaerobic cycle) in rice fields, especially to save water.

alternate set irrigation: A method of managing irrigation whereby, at every other irrigation, alternate furrows are irrigated, or sprinklers are placed midway between their locations during the previous irrigation.

alternate side irrigation: The practice of furrow irrigating one side of a crop row (for row crops or orchards) and then, at about half the irrigation time, irrigating the other side.

alternative agriculture/ farming: A concept of farming based on the exclusion of mineral fertilizers and synthetic pesticides but including mainly organic manures, waste recycling and biological agents, as in organic farming, in contrast to modern agriculture in which optimum use of mineral fertilizers and pesticides is sought to be made.

alternative crops: Non-traditional crops that can be grown in an area to diversify rotations and increase income.

alternative energy: Energy produced from sources other than fossil fuels (solar, wind, hydroelectric, geothermal, and biomass).

altimeter: An instrument used to measure the altitude of an object above a fixed level. For example, a laser altimeter can measure height from a spacecraft to an ice-sheet. That measurement, coupled with radial orbit knowledge, will enable determination of the topography.

altitude: Vertical distance above sea-level.

altocumulus cloud: Middle altitude cloud that is coloured from white to gray. This cloud is composed of a mixture of water droplets and ice crystals. It appears in the atmosphere as layers or patches that are well rounded and commonly wavelike. Found in an altitude range from 2,000 to 8,000 metres.

altostratus cloud: Gray-looking middle altitude cloud that is composed of water droplets and ice crystals. Appears in the atmosphere as dense sheet like layer. Can be recognized from stratus clouds by the fact that you can see the sun through it. Found in an altitude range from 2,000 to 8,000 metres.

aluminium and hydrogen toxicity: It is caused by excess water-soluble and exchangeable aluminium, usually on acid sulphate soils and strongly acidic soils. Symptoms are white or yellow interveinal blotches on the leaves. The leaves dry out and die. Roots are short and scanty and plants are stunted. Root injury is observed at pH 5.0 and lower. At these low levels, lateral root development is suppressed and in some cases root tips are killed. The roots become discoloured brown or a dull gray (similar to nematode damage). At low pH and low Ca concentrations, damage to root membranes is accentuated. At pH 5.0 and below, high Al concentrations suppress the uptake of cations such as Ca and Mg and results in deficiencies of these elements, particularly in soils with a very low cation exchange capacity (CEC). At pH 5.5 and above, however, there is little if any suppression of cation uptake.

aluminium fertilizers: Aluminium appears to be beneficial to only to a few plants, e.g. tea. Tea leaves contain 0.2–0.3 percent Al, which appears to promote growth. Where Al is considered to be

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deficient, aluminium sulphate $[Al_2(SO_4)_3]$ can be added. However, aluminium sulphate acts mainly as a soil-acidifying agent and its favourable effect on some “acid-loving” plants such as blueberries may not be due to an improved Al supply but to the mobilization of some micronutrients as a result of acidification. For most crops, even small amounts of soluble Al ions are toxic.

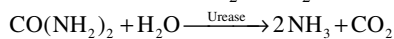
aman rice: A term used in Bangladesh and East India for lowland rice grown in the wet season during June to November. Water depth does not exceed 0.5 m.

ambient air: Air that reflects surrounding environmental conditions.

ameliorant: A substance added to a soil for the improvement of its physical and chemical properties so as to help in improving its tilth for realizing higher crop yields. Term not used for mineral fertilizers but sometimes for bulky organic manures. Example: lime to acid soils, gypsum and pyrites to alkali soils. Similar to soil amendment.

amensalism: An interaction between two organisms in which one organism is suppressed by toxins produced by the other.

amide-N: It is form of nitrogen in urea is transformed (hydrolyzed) relatively rapidly through the activity of the enzyme urease, which is ubiquitous in surface soils, to ammonia, CO_2 and H_2O :



Even at relatively low temperatures the transformation of amide-N to ammonium-N is completed within one to three days, under tropical and subtropical conditions within few hours. Where urea is not incorporated into the soil, but left on the soil surface, substantial evaporation losses of ammonia will occur, particularly on alkaline soils (soils with a high pH value). Where it is incorporated - and a superficial incorporation is sufficient - the ammonia is attracted (adsorbed) as NH_4^+ on the clay and organic matter particles of the soil and thus protected against evaporation losses.

amino acid: A group of acids containing the amino group (NH_2). In particular, any of 20 basic building blocks of proteins with a free amino (NH_2) and a free carboxyl ($COOH$) group, and having the basic formula $NH_2-CH(-R)-COOH$. According to the side group R, they are subdivided into: polar or hydrophilic (serine, threonine, tyrosine, asparagine and glutamine); non-polar or hydrophobic (glycine,

alanine, valine, leucine, isoleucine, proline, phenylalanine, tryptophane and cysteine); acidic (aspartic acid and glutamic acid) and basic (lysine, arginine, histidine). The sequence of amino acids determines the shape, properties and the biological role of a protein. Plants and many microorganisms can synthesize amino acids from simple inorganic compounds. Aspartic acid and glutamic acid play a significant role in BNF.

ammonia volatilization: It refers to the gaseous loss of nitrogen as ammonia from the soil. Ammonium N (NH_4^+-N) in the soil is either formed by mineralization of soil organic N and applied inorganic N or after hydrolysis of urea. This NH_4^+ can undergo several processes such as adsorption on soil colloids, fixation by clay minerals, nitrification, fixation by microorganisms or volatilization. Ammonium in the soil is in equilibrium with atmospheric ammonia (NH_3) through different equilibria. Volatilization usually occurs from surface applied fertilizer, especially urea, and can be severe in alkaline sandy soils during hot and dry periods.

ammonia: It is a gas at normal temperature and pressure. It is a gas containing about 80 percent of nitrogen. Under suitable conditions of temperatures and pressure, it becomes liquid (anhydrous ammonia). Another form, ‘aqueous ammonia’, results from the absorption of ammonia gas into water, in which it is soluble. Ammonia is used as a fertilizer in both these forms. Anhydrous ammonia can be applied by introducing it into irrigation water, or directly into the soil from special containers, which makes its use rather expensive. It gets converted to ammonium ions (NH_4^+) in water which is one of the main forms in which plants absorb N from soil.

ammoniated superphosphate: A product obtained from superphosphate treated with ammonia or solutions containing free ammonia. The end product provides extra nitrogen but in the process its total phosphorus content as also the water solubility of this phosphorus is decreased.

ammoniation: It is the process of introducing various ammonium sources into other fertilizer sources forming ammoniated compounds. Ammonium polyphosphates and ammoniated superphosphate are ammoniated compounds.

ammonification: A process describing the transformation of organic nitrogen (as in protein) into ammonia with the help of ammonifying

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ammonium sulphate (AS): It contains 21 per cent N and 24 percent sulphur (S). This fertilizer is non-hygroscopic, with good handling and storage characteristics. It is especially suitable for use in the humid tropics and subtropics. After application, part of the NH_4^+ is normally transformed to NO_3^- and available for plant uptake or denitrification and loss. Ammonium can also be fixed on clay minerals and retained by soil colloids preventing it from leaching. Most ammonium sulphate results as a by-product of industrial processes. It is not a widely used material, due to its relatively low nitrogen content, but may become more popular as sulphur deficiencies become more widespread. It is not as prone to nitrogen volatilization as urea, but is slightly more so than ammonium nitrate, particularly on alkaline soils.

ammonium sulphate nitrate (ASN): A fertilizer containing 26 percent N and 15 percent S, both in soluble and plant available form. It is a double salt of ammonium sulphate and ammonium nitrate in which 75 percent of total N is present as ammoniacal-N and 25 percent as nitrate-N. Agronomically, it is comparable to ammonium sulphate, except for the more mobile nitrate-N component in ASN.

ammonium thiosulphate: A liquid fertilizer containing 12 percent N and 26 percent S (thio refers to S). Fifty percent of the S is in the sulphate form and the rest is in elemental form. It can be used directly or mixed with neutral to slightly acid P-containing solutions or aqueous ammonia or N solutions to prepare a variety of NPK + S and NPKS + micronutrient formulations. It can also be applied through irrigation, particularly through drip and sprinkler irrigation.

ammonium-N (NH_4^+ -N): It is the most common form of mineral N in manure/fertilizers and other organic soil amendments. It is also subject to loss (through volatilization) into the air if manure/fertilizer is left laying on the surface of the soil. Ammonium N will bind to soil particles so does not normally leach.

amoozometer: A tool that uses a constant head of water to measure the rate of water movement in a saturated soil, and thus estimates saturated hydraulic conductivity.

amphoteric: A substance that can act as either an acid or a base in a reaction. For example, aluminium hydroxide can neutralize mineral acids ($\text{Al(OH)}_3 + 3 \text{HCl} = \text{AlCl}_3 + 3 \text{H}_2\text{O}$) or strong bases ($\text{Al(OH)}_3 + 3 \text{NaOH} = \text{Na}_3\text{AlO}_3 + 3 \text{H}_2\text{O}$).

amplitude: The magnitude of the displacement of a wave from a mean value. For a simple harmonic wave, it is the maximum displacement from the mean. For more complex wave motion, amplitude is usually taken as one-half of the mean distance (or difference) between maxima and minima.

anabaena azollae: A species of *Anabaena*, which only grows with its host *Azolla* (a fern) where it lives in the cavity of *Azolla*'s dorsal leaf lobe. It fixes nitrogen symbiotically with *Azolla*.

anabaena: A genus of blue green algae. It has 15 species e.g. *Anabaena ambigua*, *Anabaena doliolum* etc. One of the BGAs which is used as biofertilizer for flooded rice.

anaerobe: An organism, which lives and grows in the absence of free oxygen. Example: *Clostridium tetani*.

anaerobic composting: One of the methods of composting in which the decomposable wastes are kept under insufficient air/oxygen supply. Decomposable raw material is filled in pits to a height of 40-50 cm. The decomposition of organic matter is caused by microorganisms in an anaerobic (absence of air/oxygen) environment. The compost is ready within 4-5 months and contains 0.8-1.0% N. See compost.

anaerobic respiration: The metabolic process whereby electrons are transferred from a reduced compound (usually organic) to an inorganic acceptor molecule other than oxygen. The most common acceptors are carbonate, sulphate, and nitrate.

anaerobic: (i). The absence of molecular oxygen. (ii). Growing in the absence of molecular oxygen (such as anaerobic bacteria). (iii). Occurring in the absence of molecular oxygen (as a biochemical process).

andosols: Andosols (derived from Jap. ando=black) [Andisols in the US system] make up about 1% of tropical soils, originating from young, volcanic glassy ashes. Grey to black in colour, they weather rapidly to allophanes with a large pH dependent variable charge. They are very fertile soils. They have a large waterholding capacity, good porosity, allowing rapid water infiltration, and up to 20% SOM. The strong anion fixing capacity, mainly for P, increases with decreasing pH. However, this nutritional constraint can be partly compensated for by mulching.

anemometer: Mechanical instrument used to measure wind speed. These instruments commonly employ three methods to measure this phenomenon: (i). A device with three or four open cups attached to a

A anion: A negatively charged ion. Example: nitrate (NO_3^-), sulphate (SO_4^{2-}), borate [$\text{B}(\text{OH})_4^-$], molybdate (MoO_4^{2-}), chloride (Cl^-). During electrolysis, it travels to the anode (positive electrode).

annual crops: Crop plants that complete their life cycles within a season or year such as rice, wheat, maize, mustard and tobacco. They produce a crop of seed and die. Some of these crop plants may produce tillers. If such rooted tillers are separated from the main shoot and planted, each tiller will survive that season as a new plant, but will not live until another season.

annual plants: Plant species that complete their life-cycle within 12 months from the date of germination.

antagonism: In plant nutrition, the interference of one element with the absorption or utilization of other nutrient by plants.

antagonism: It is the phenomenon in which one element or substance inhibits or reduces the uptake, assimilation or performance of the other. It is not mutually beneficial or performance-enhancing. Common in soil-plant systems and largely a fall-out of nutrient imbalance. Example: P-Zn antagonism. Nutrients exhibiting antagonism are referred to as antagonistic.

antagonistic symbiosis: A symbiotic association which is destructive to one of the symbionts or partners involved in the association.

anthropogenic: Human made. In the context of greenhouse gases, emissions that are produced as a result of human activities.

antibiosis: The antagonistic association between two organisms producing detrimental effects on one of them. It could also mean an association between one organism and a metabolic product of another.

anti-caking agent: A Substance used as surface treatment for granular fertilizers to prevent caking or lump formation on storage particularly under humid conditions or on prolonged storage. Used mostly for fertilizers containing major nutrients. Example: talc, chalk, kaolin, oil, clay.

anticline: Layers of rock folded into the shape of an arch. The youngest rock layers are on the outer layer of the arch, and the oldest layers are at the core of the fold. Anticlines with reservoir-quality rocks in their core and impermeable rocks in the outer layers of the fold are excellent traps for oil and gas and are

therefore important in petroleum exploration and extraction. The opposite of a syncline.

anticyclone: An atmospheric pressure system consisting of an area of high pressure and outward circular surface wind flow. In the Northern Hemisphere winds from an anticyclone blow clockwise, while in Southern Hemisphere systems blow counterclockwise or anticlockwise.

anti-quality constituents (forages): The toxic substances present in forage plants which may either cause direct metabolic damage to the animal or interfere with some phase of digestive utilization are referred to as anti-quality constituents. The anti-quality constituents of some forage species are as follows: Castrogens (Subterranean clover, red clover, white clover), Coumarins (Sweet clover-*Melilotus* spp.), Saponins (Lucerne/alfalfa, ladino clover, bur clover, strawberry clover, trefoil), Alkaloids (*Phalaris*, *Lupins*, *Desmodium*, *Lespedeza*, *Crotalaria*), Hydrocyanic acid/HCN/ prussic acid / cyanigenetic glucosides (*Sorghum* spp., *Trifolium repens*, *Lotus* spp., *Poa aquatica*, *Zieria laevigata*, *Phyllanthus gastroemmi*, *Cynodon plectostachyus*, *Pteridium acquillinum*), Nitrate (Oat, paragrass), Oxalic acid (Napier grass, pearl millet), Mimosine (subabool- *Leucaena leucocephala*), Bloat-producing constituents-plant cytoplasmic protein (*Trifolium* spp., white clover), and Tannins (Shrub and tree spp.).

apatite: Common name of the major P-bearing compound in rock phosphates (used as raw material in the manufacture of phosphate fertilizers). General formula: $\text{Ca}_{10}(\text{PO}_4, \text{CO}_3)_6(\text{F}, \text{OH}, \text{Cl})_2$. Depending upon the dominance of F, Cl or OH in the apatite crystal structure, it is known as fluorapatite, chlorapatite or hydroxyapatite.

apedal soil material: Soil materials without peds, i.e. structureless.

apparent nutrient recovery (ANR): A conventional measure of the proportion of applied nutrient recovered in the crop biomass. If a crop absorbs 10 kg P/ha without P application and 16 kg P/ha when 30 kg P/ha is applied, then the apparent recovery of P is 20% $\{(16-10) \times 100 / 30\}$.

application rate: (i). (irrigation) Rate at which water is applied per unit area; usually in mm per hour, (ii). Weight or volume of a fertilizer, soil amendment, or pesticide applied per unit area.

application rate: The amount of fertilizer, insecticide, or herbicide applied per unit area or volume in experiments or commercial production.

applied research: Research in which results can be used immediately by the farmer and can be applied to the peculiar problems of a country or a region.

appropriate technology: It is a technology that may be suitable or proper in the context of a particular community, region, or country. It must be economically viable, technologically feasible and should fit in the socio-economic fabric of the local communities.

approved fertilizer/fertilizer grade: A fertilizer/fertilizer grade, which is recognized through fertilizer legislation and listed in the fertilizer legislation documents of a country. Example: fertilizers, which are listed in the Fertilizer Control Order (FCO) and approved for production or sale in India.

aqua regia: A mixture of nitric and hydrochloric acids, usually 1:3 or 1:4 parts HNO_3 to HCl , used to dissolve gold.

aquaculture: Aquaculture is the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators.

aqualfs: Alfisols that are saturated with water for periods long enough to limit their use for most crops other than pasture or woodland unless they are artificially drained. Aqualfs have mottles, iron-manganese concretions or gray colours immediately below the A1 or Ap horizons and gray colours in the argillic horizon. (A suborder in the U.S. system of soil taxonomy.)

aquasilvicultural system: An agroforestry system that combines trees with the raising of aquatic animals.

aquatic plant: A plant that grows and develops in standing water and provides sufficient aeration to the parts under water.

aquents: Entisols that are saturated with water for periods long enough to limit their use for most crops other than pasture unless they are artificially drained. Aquents have low chromas or distinct mottles within 50 cm of the surface, or are saturated with water at all times.

aqueous ammonia: A solution containing water and ammonia in any proportion, usually qualified by a reference to ammonia vapour pressure. Aqua ammonia for example has a pressure of less than 0.7 kg/cm^2 (10 lb/in^2). Commercial grades commonly contain 20-25% nitrogen. It is used either for direct application to the soil or for preparation of ammoniated superphosphate.

aquerts: Vertisols that are saturated with water for periods long enough to limit their use for most crops other than pasture and woodland unless they are artificially drained. Aquerts have in one or more horizons between 40 and 50 cm from the surface, aquic conditions for some time in most years and chromas of two or less in 50 percent of the pedon or evidence of active ferrous iron.

aquic conditions: Continuous or periodic saturation and reduction. The presence of aquic conditions is indicated by redoximorphic features and can be verified by measurement of saturation and reduction.

aquic moisture regime: A reducing moisture regime in a soil that is virtually free of dissolved oxygen because it is saturated by ground water or by water of the capillary fringe.

aquic: A mostly reducing soil moisture regime nearly free of dissolved oxygen due to saturation by groundwater or its capillary fringe and occurring at periods when the soil temperature at 50 cm below the surface is $>5^\circ\text{C}$.

aquiclude: A sediment body, rock layer, or soil horizon that is incapable of transmitting significant quantities of water under ordinary hydraulic gradients.

aquifer: Rock formations that store groundwater. A saturated, permeable geologic unit of sediment or rock that can transmit significant quantities of water under hydraulic gradients.

aquitard: A body of rock or sediment that retards but does not prevent the flow of water to or from an adjacent aquifer. It does not readily yield water to wells or springs but may serve as a storage unit for groundwater.

aquorizem: Soil characterized by a distinct accumulation horizon of iron oxide and manganese oxide below the traffic pan, formed as result of wetland rice cultivation.

aquox: Oxisols that have continuous plinthite near the surface, or that are saturated with water sometime

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during the year if not artificially drained. Aquox have either a histic epipedon, or mottles or colours indicative of poor drainage within the oxic horizon or both.

arable land: Land which is ploughed, and on which crops are cultivated; agriculture based on the production of field crops, such as sorghum, millet, maize and vegetables. Arable land includes all land used in most years for growing temporary crops and which is lying fallow or has not been sown due to unforeseen circumstances. Arable land does not include land under permanent crops or land under protective cover.

arboretum: A collection of specimen trees, preferably growing close to a nursery, from which seeds and cuttings can easily be gathered.

arboriculture: A general term for the cultivation of trees.

archaeobacteria: (i). Prokaryotes with cell walls that lack murein, having ether bonds in their membrane phospholipids, that are characterized by growth in extreme environments. (ii). A primary biological kingdom distinct from both eubacteria and eukaryotes.

area-time equivalency ratio: It is the ratio of number of hectare-days required in monoculture to the number of hectare-days used in intercropping to produce identical quantities of each of the component crop.

argillic horizon: A mineral soil horizon that is characterized by the illuvial accumulation of phyllosilicate clays. The argillic horizon has a certain minimum thickness depending on the thickness of the solum, a minimum quantity of clay in comparison with an overlying eluvial horizon depending on the clay content of the eluvial horizon, and usually has coatings of oriented clay on the surface of pores or peds or bridging sand grains.

arid climate: Generally extremely dry climate. W. Koeppen and others have applied the name desert climate for similar conditions of extreme aridity. Annual precipitation usually less than 10 inches. It is not suitable for crop production without irrigation.

aridic: A soil moisture regime that has no water available for plants for more than half the cumulative time that the soil temperature at 50 cm below the surface is $>5^{\circ}\text{C}$, and has no period as long as 90 consecutive days when there is water for plants while the soil temperature at 50 cm is continuously $>8^{\circ}\text{C}$.

aridisols: Mineral soils that have an aridic moisture regime, an ochric epipedon, and other pedogenic horizons but no oxic horizon. Soil order representing desert and semi-desert (arid and semi-arid) mineral soils (USA system). Example: Soils of western Rajasthan. Such soils can be (but not always) deficient in sulphur, zinc and iron. Boron toxicity is possible in these soils.

aridity index (AI): According to Thornthwaite, the degree of water deficiency below water need at any given station. It is a measure of dryness of a region and is expressed as:

$$\text{AI} = \frac{\text{No. of rainy days} \times \text{Mean precipitation / day}}{\text{Mean temperature} + 10}$$

aroma: The distinctive smell imparted by the volatile constituents present in the planting material, its distilled essential oil and oleoresin extract.

aromatic compound: Carboxylic compound containing a certain amount of unsaturation in the ring.

aromatic: Applied to a group of hydrocarbons and their derivatives characterized by the presence of the benzene ring.

arrowing: The flowering in sugarcane is referred as arrowing.

arsenic: Arsenic is a highly poisonous semi-metallic element. It can cause bladder, lung, and skin cancer and may cause kidney and liver cancer. Arsenic harms the central and peripheral nervous systems, as well as heart and blood vessels, and causes serious skin problems. It also may cause birth defects and reproductive problems. These health impacts are caused when arsenic contaminates drinking water supplies. It enters water supplies either from natural deposits in the earth or from industrial and agricultural pollution.

artesian water: Groundwater confined under hydrostatic pressure.

artesian well: A well where the water rises and flows out to the surface because of hydrostatic pressure.

artificial water bodies: Areas which are covered by water due to the construction of artifacts such as reservoirs, canals and artificial lakes. Without these structures the area would not be covered by water.

arviculture: Crop science.

ash: The mineral residue remaining after the destruction of organic material by burning. Ash of plant residues or wood is usually a rich source of potassium.

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presented by the electrons, for example, atomic number of hydrogen is 1.

atomic weight: The average weight of the neutral atoms of an element existing as a mixture of isotopes in the same ratio as found in nature.

auger (soil): A tool for boring holes into the soil. A soil auger is used to withdraw a small soil sample for observation.

augmentation cropping: When subcrops are sown to supplement the yield of the main crops, the subcrops are known as augmenting crops, for instance Japanese mustard with berseem, chinese cabbage with mustard. Here the mustard or cabbage helps in getting a higher yield of fodder in spite of the fact that berseem gives a poor yield in the first cutting.

auricle: (i). A pair of small ear-like appendages borne at the base of the leaf blade and usually arising at the sides where the ligule and the base of the collar are joined. (ii). An ear-shaped appendage, usually occurring at the junction of the leaf sheath and the blade that may not be present in older leaves.

aus rice: A photoperiod-insensitive, rainfed, drought-prone, lowland, or upland rice, broadcast and transplanted during the early part of the wet season from March to September in Bangladesh and from April to August in east India.

autecology: (i) The ecology of an individual organism or taxonomic group. (ii). The study of environmental organisms and their effects on plants.

autochthonous flora: (i). That portion of the microflora presumed to subsist on the more resistant soil organic matter and little affected by the addition of fresh organic materials. (ii). Microorganisms indigenous to a given ecosystem; the true inhabitants of an ecosystem; referring to the common microbiota of the body of soil microorganisms that tend to remain constant despite constant fluctuations in the quantity of fermentable organic matter. Contrast with zymogenous flora. Also called as oligotrophs.

autochthonous: Microorganisms and/or substances indigenous to a given ecosystem; the true inhabitants of an ecosystem; referring to the common microbiota of the body of soil microorganisms that tend to remain constant despite fluctuations in the quantity of fermentable organic matter.

autoclave: An airtight chamber that can be filled with steam under pressure or surrounded by another

chamber for the steam and that is used for sterilizing, cooking or other purposes requiring moist temperatures above 212°F or 100°C. Used for sterilization.

autotroph: An organism that produces food molecules inorganically by using a light or chemical based sources of external energy. This organism does not require outside sources of organic food energy for survival.

autotrophic nitrification: Oxidation of ammonium to nitrate through the combined action of two chemoautotrophic bacteria, one forming nitrite from ammonium and the other oxidizing nitrite to nitrate.

autotrophic: Self-nourishing organisms capable of utilizing carbon dioxide or carbonates as the sole source of carbon and obtaining energy for life processes from radiant energy or from the oxidation of inorganic elements or compounds such as iron, sulphur, hydrogen, ammonium and nitrate. Example: green plants, crops, some algae, and nitrifying bacteria.

availability (fertilizer): The extent to which the nutrients in a fertilizer can be taken up by crops, often measured approximately (in the absence of a good biological criterion) by solubility in water or dilute acids; also used of soil nutrients to describe the fraction that can be taken up by plants.

available nutrient: Form(s) of a plant nutrient in the soil or fertilizer that is immediately or potentially available for being taken up by growing plants during their growth span. This is usually a small fraction of the total nutrient content of the soil. Usually measured in soil testing laboratories for making fertilizer recommendations. Example: sodium bicarbonate-extractable P, CaCl₂-extractable S, DTPA-extractable Zn. In soils, available nutrient status if measured correctly describes the state of soil fertility at that particular time and provides a guideline for external nutrient application.

available soil water: The available water capacity of a soil refers to the maximum quantity of water that can be extracted from the soil profile by plants. It is generally defined as the difference in the amounts of water held by a soil when at field capacity and when at its permanent wilting point (-1.5 MPa matric potential). In fact, the soil water content at which non-recoverable wilting occurs is crop dependent. Because of the shape of the water retention curve at low water potentials, precise definition of permanent wilting point is less critical than that of