

Kesuburan Tanah

PNT 3115

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1. Pengertian dan Komponen Kesuburan Tanah

Nasih Widya Yuwono

Tujuan belajar

mahasiswa dapat menjelaskan:

- pengertian kesuburan tanah;
- istilah-istilah yang sering digunakan berkaitan dengan kesuburan tanah
- urgensi menjaga dan meningkatkan kesuburan tanah
- komponen kesuburan tanah meliputi: jeluk mempan perakaran, struktur tanah, reaksi tanah, hara cukup dan seimbang, penyimpanan hara dan lengas, humus, mikrobia bermanfaat, dan bebas bahan meracun.



Bab 1. Pengertian

Pengertian kesuburan tanah

- Tanah yang subur lebih disukai untuk usaha pertanian, karena menguntungkan. Sebaliknya terhadap tanah yang kurang subur dilakukan usaha untuk menyuburkan tanah tersebut sehingga keuntungan yang diperoleh meningkat.

- Kesuburan Tanah adalah kemampuan suatu tanah untuk menghasilkan produk tanaman yang diinginkan, pada lingkungan tempat tanah itu berada. Produk tanaman berupa: buah, biji, daun, bunga, umbi, getah, eksudat, akar, trubus, batang, biomassa, naungan, penampilan dsb.

- Tanah memiliki kesuburan yang berbeda-beda tergantung sejumlah faktor pembentuk tanah yang merajai di lokasi tersebut, yaitu: Bahan induk, Iklim, Relief, Organisme, atau Waktu.
- Tanah merupakan fokus utama dalam pembahasan kesuburan tanah, sedangkan tanaman merupakan indikator utama mutu kesuburan tanah.



Bab 1. Pengertian

Definitions of Soil Fertility:

- Soil fertility is the capacity of soil to supply plant nutrients, water and oxygen in adequate amounts for optimum growth of the plant.
- The ability of a soil to provide nutrients for plant growth.
- The quality that enables a soil to provide adequate nutrients in a proper balance for specified plant growth, other factors such as light, moisture, temperature and the physical condition of the soil being favourable.

- The presence of soil properties that support plant growth including nutrients and nutrient-holding capacity, water and water-holding capacity, and air.
- The ability of the soil to support plant life and associated fauna.

Istilah yang berkaitan

- Beberapa istilah penting yang perlu diketahui dalam membahas kesuburan tanah antara lain: tanah, lahan, produktivitas tanah, evaluasi lahan, kemampuan lahan, hara, dan pupuk.

Soils

- Layer of unconsolidated material found at the Earth's surface that has been influenced by the soil forming factors: climate, relief, parent material, time, and organisms. Soil normally consists of weathered mineral particles, dead and living organic matter, air space, and the soil solution.

soils

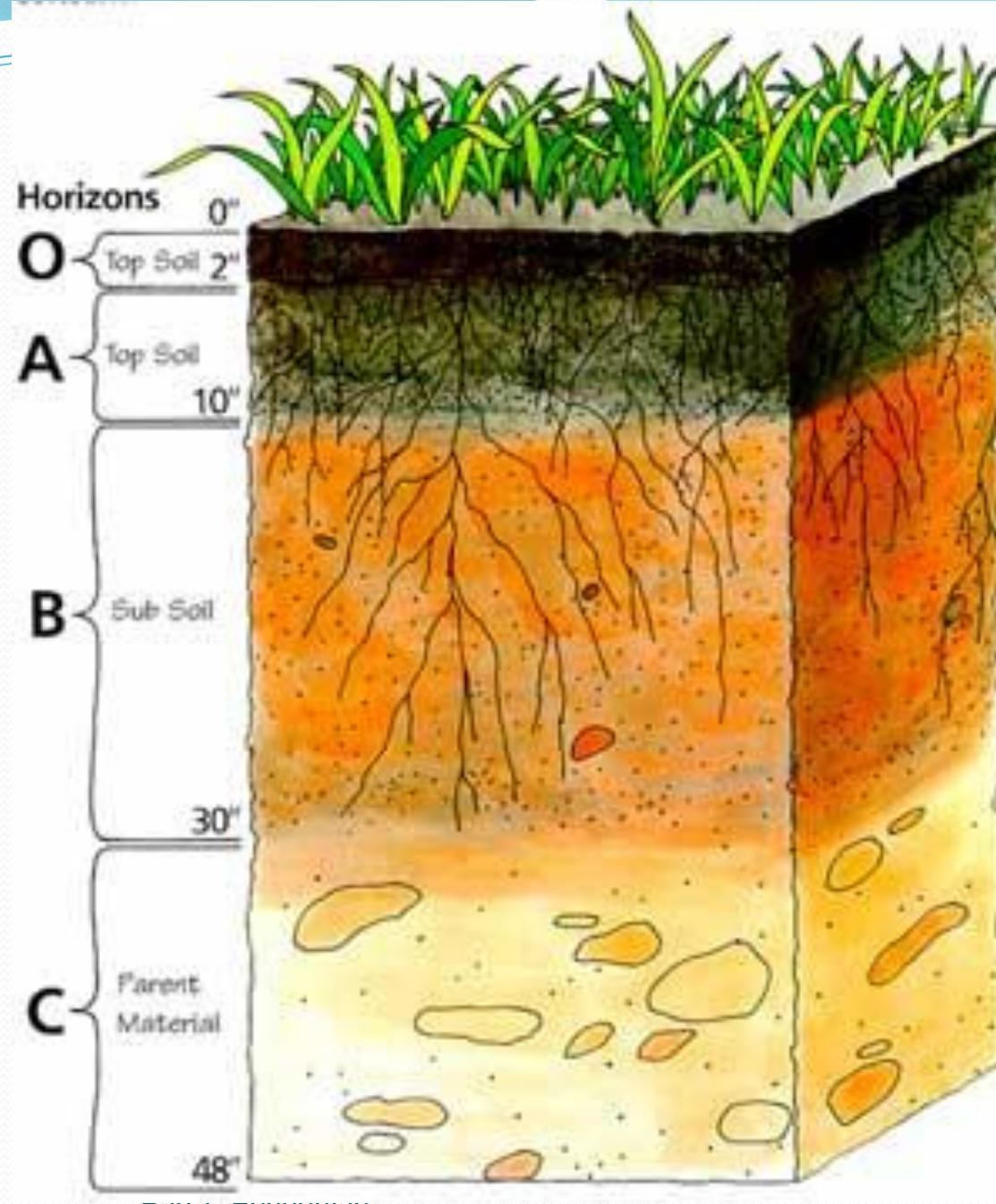
- Soil is comprised of small rock and mineral particles (which from the smallest to largest are clay, silt, and sand), organic material, air, moisture, and living organisms. Together, air and water can make up about half the volume of healthy soil. In a soil heavy with clay, water and air will have difficulty penetrating, which leaves soil organisms and plants to suffer. On the other end of the spectrum, the large size of sand particles prevents them from holding water and nutrients in the soil. Silt falls somewhere in between. Loam soil, which is a mixture of all three , is generally accepted as a preferred growing medium.

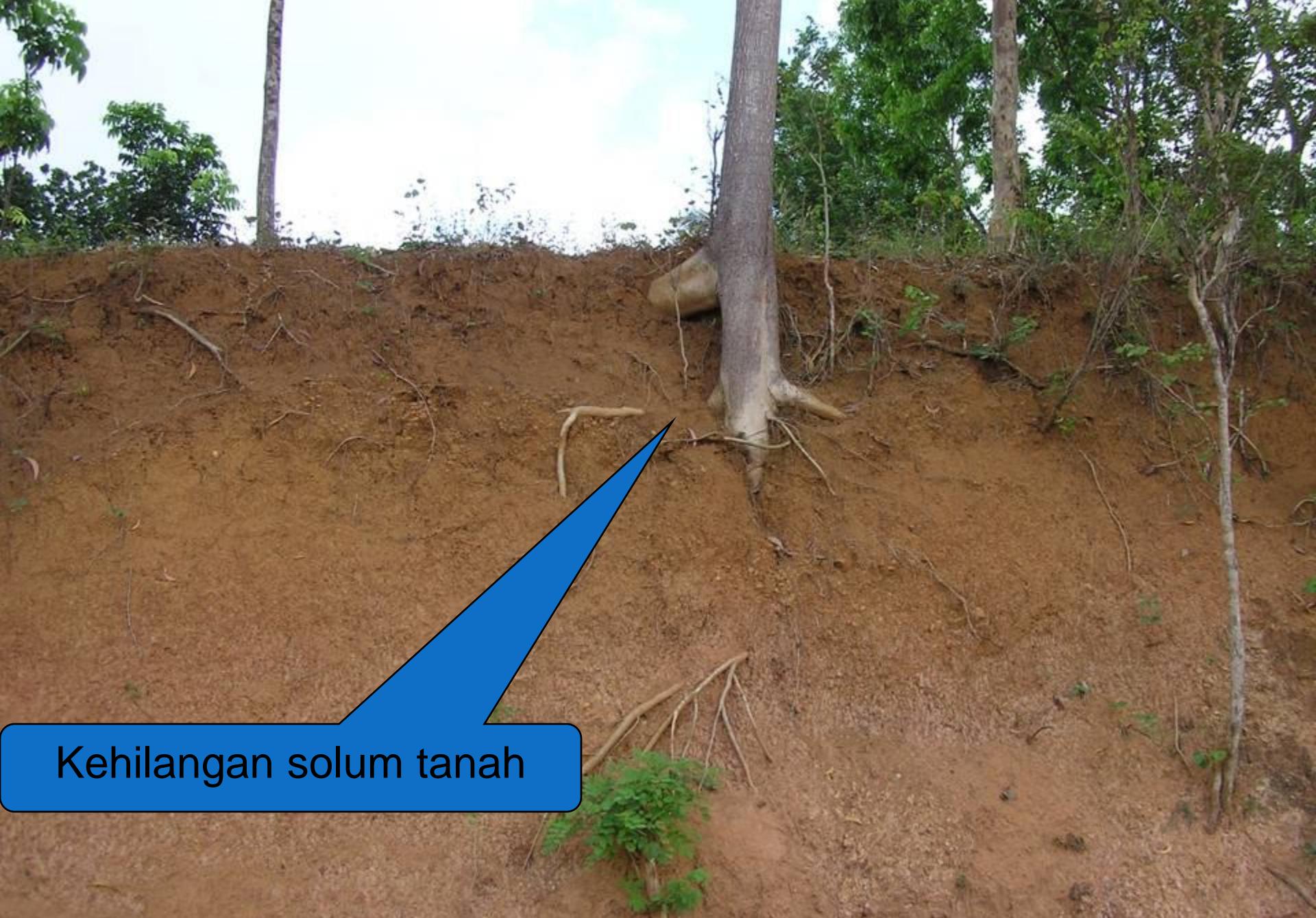
soils

- Unconsolidated earthy materials which are capable of supporting plants. The lower limit is normally the lower limit of biological activity, which generally coincides with the common rooting of native perennial plants.

soils

- A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.





Kehilangan solum tanah

LAND

- An area of the earth's surface, the characteristics of which embrace all reasonably stable, or predictably cyclic, attributes of the biosphere vertically above and below this area, including those of the atmosphere, the soil and underlying geology, the hydrology, the plant and animal populations, and the results of past and present human activity, to the extent that these attributes exert a significant influence on present and future uses of the land by humans.

Soil productivity:

- The capacity of a soil to produce a specific crop.
Productivity depends on adequate moisture and soil nutrients, as well as favorable climate.
- The capability of a soil to produce a specific crop such as fiber and forage, under defined levels of management.

Soil productivity:

- Capacity or suitability of a soil for establishment and growth of a specified crop or plant species, primarily through nutrient availability
- The capacity of a soil to produce a certain yield of crops or other plants with a specified system of management.

Land Evaluation

- The problem: *Inappropriate land use*, which leads to inefficient exploitation of natural resources, destruction of the land resource, poverty and other social problems, and even to the destruction of civilization.
- The land is the ultimate source of wealth and the foundation on which civilization is constructed. Part of the solution: *land evaluation* leading to *rational land use planning* and *appropriate and sustainable use of natural and human resources*.
- Considering these two aspects *land evaluation*, may be defined as: "the process of assessment of land performance when [the land is] used for specified purposes" (FAO, 1985), or as: "all methods to explain or predict the use potential of land" (van Diepen *et al.*, 1991).

- Key words of these definitions are: method, process, assess, explain, predict, potential, opportunities, constraints, decision making.
- Land evaluation can be a key tool for *land use planning*, either by individual land users (e.g., farmers), by groups of land users (e.g., cooperatives or villages), or by society as a whole (e.g., as represented by governments).
- There is a diverse set of *analytical techniques* which may be used to *describe* land uses, to *predict* the response of land to these in both physical and economic terms, and to *optimize* land use in the face of multiple objectives and constraints.

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LAND CAPABILITY

- The inherent ability of land to be used without permanent damage. Land capability, as ordinarily used in the United States, is an expression of the effect of physical land conditions, including climate, on the total ability to be used without damage for crops that require regular tillage, for grazing, for woodland, and for wildlife.
- Land capability involves considering (1) the risks of land damage from erosion and other causes and (2) the difficulties in land use owing to physical land characteristics, including climate.
- The ability of land to accept a type and intensity of use without permanent damage

Nutrient:

- *Nutrients are elements required to complete a plant's life cycle.*
- Elements or compounds that are essential for animal and plant growth.
- Food needed for growth by living things.
- Elements available through soil, air and water which the plant utilizes in growth. Preferably these nutrients come from Organic Matter. Organic matter is defined as plant and animal residues and remains.

nutrient

- Any of a group of elements necessary for growth; about 15 elements are necessary for aquatic plant growth but are usually available in natural waters; low levels of nitrogen or phosphorus may limit plant growth in surface waters; high levels may cause excess plant and phytoplankton growth.
- Elements required by organisms for normal life and activity.



Bab 1. Pengertian

Fertilizer :

- Substance that adds inorganic or organic nutrients to soil for the purpose of increasing the growth of crops, trees, or other vegetation.
- Any organic or inorganic material of natural or synthetic origin that is added to a soil to supply elements essential to plant growth.

Fertilizer :

- Means a substance containing 1 or more recognized plant nutrients, which substance is used for its plant nutrient content and which is designed for use, or claimed to have value, in promoting plant growth. Fertilizer does not include un- manipulated animal and vegetable manures, marl, lime, limestone, wood ashes, and other materials exempted by rules promulgated under this part.
- One that fertilizes; specifically : a substance (as manure or a chemical mixture) used to make soil more fertile.

am



Soil quality or soil health:

- The capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation. In short, the capacity of the soil to function. There are two aspects of the definition: inherent soil quality and dynamic soil quality.

Urgensi menjaga kesuburan tanah

- Jumlah penduduk Indonesia terus meningkat, sehingga kebutuhan pangan terus bertambah. Sedangkan luas lahan produktif relatif tetap atau bahkan menyusut. Lahan-lahan yang bagus di Jawa dialihfungsikan menjadi pemukiman atau kawasan industri.
- Peningkatan produksi dapat dilakukan melalui intensifikasi untuk meningkatkan produktivitas atau ekstensifikasi untuk mendapatkan lahan baru. Kunci utama dari kedua hal tersebut adalah bagaimana memelihara atau meningkatkan status kesuburan tanahnya.

- Konsep pembangunan berkelanjutan terus digalakkan agar kegiatan pertanian senantiasa menguntungkan, aman, lestari dan ramah lingkungan.
- Perlu penyusunan rekomendasi pemupukan terpadu yang bersifat spesifik lokasi disesuaikan dengan komoditas yang diusahakan dan lahan tempat usahanya. Hal ini bertujuan untuk meningkatkan efisiensi pemupukan dan mengurangi dampak pencemaran terhadap lingkungan.

Hubungan antara kesuburan tanah dengan keadaan lingkungan dapat digambarkan sebagai berikut Hara dapat bergerak menuju badan air permukaan atau air dalam tanah. Hal ini disebabkan bentang lahan saling berhubungan, lahan pertanian tidak terpisah dari lingkungan di sekitarnya.

Pengelolaan hara yang buruk, misalnya pemupukan yang berlebihan, pengelolaan rabuk yang sembarangan, akan menimbulkan beaya lingkungan.

Komponen kesuburan tanah

- jeluk mempan perakaran : solum, erosi, konservasi, daerah jelajah akar
- struktur tanah:imbangan air-udara, kemudahan ditembus akar
- reaksi tanah: kelarutan unsur, dominansi mikrobia
- hara cukup dan seimbang : macam, jumlah dan nisbah

- penyimpanan hara dan lengas: KPK, *buffering capacity*, retensi lengas
- humus: C-organik tanah, khelasi, energi untuk mikrobia
- mikrobia bermanfaat: sinergisme, daur hara dan materi
- bebas bahan meracun: toksin, limbah

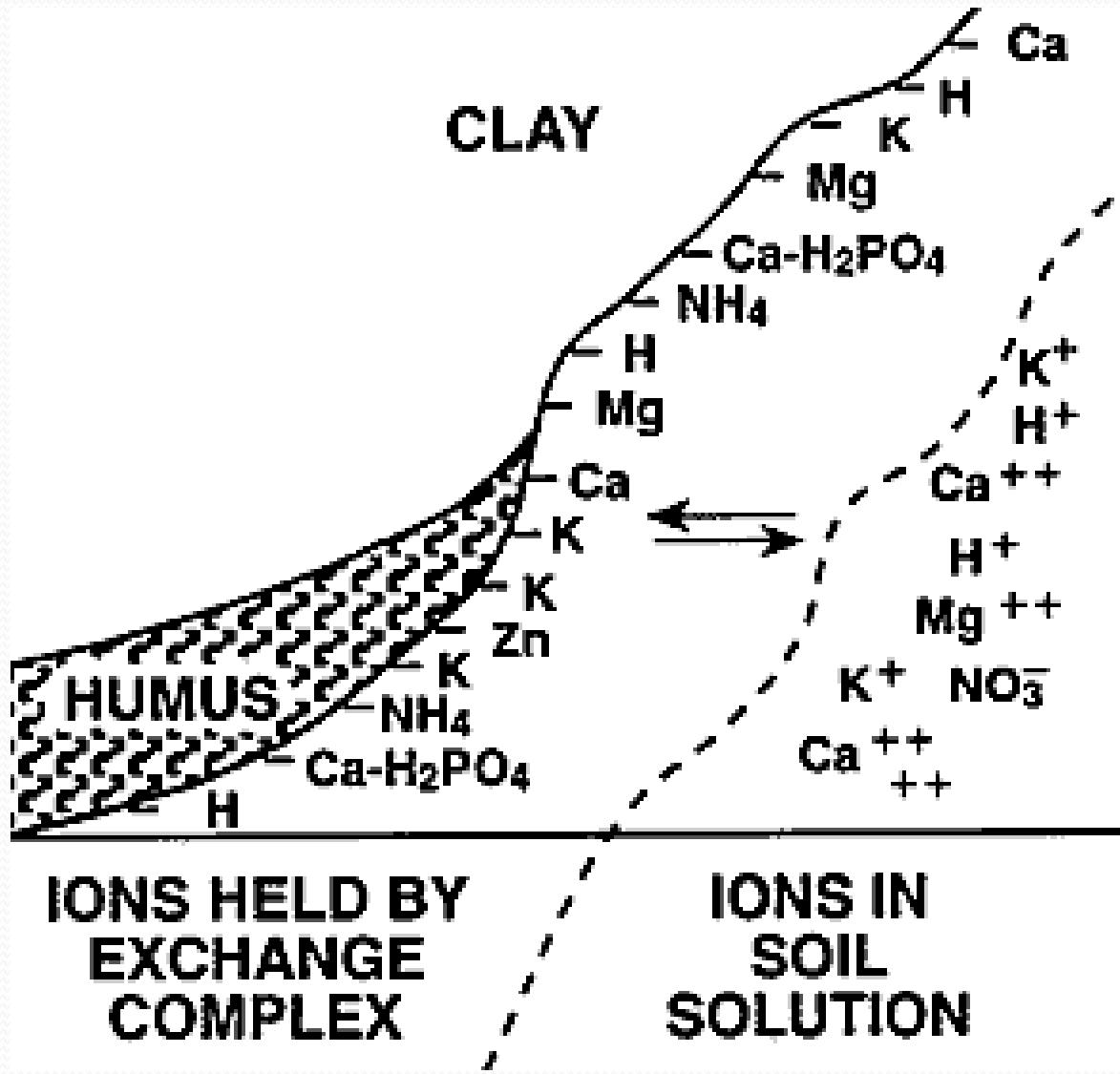
depth

- The effective depth of a soil for plant growth is the vertical distance into the soil from the surface to a layer that essentially stops the downward growth of plant roots.

- **Very Shallow** — surface is less than 10 inches from a layer that retards root development.
- **Shallow** — Soil surface is 10 to 20 inches from a layer that retards root development.
- **Moderately deep** — Soil surface is 20 to 36 inches from a layer that retards root development.
- **Deep** — Soil surface is 36 to 60 inches from a layer that retards root development.
- **Very deep** — Soil surface is 60 inches or more from a layer that retards root development.

- Soil Structure reflects how the individual soil particles clump or bind together or aggregate. Natural aggregates that can be clearly seen in the field are called "peds". Clods, on the other hand, are aggregates that are broken into shape by artificial actions such as tillage. Structure is very important since (along with texture) it affects the pore space of the soil. A dense structure will greatly reduce the amount of air and water than can move freely through the soil. Also, it will affect "root penetration" or the plant's ability to propagate roots through the soil. There are five major classes of structure seen in soils: granular, blocky, platy, prismatic and structureless.

- Cations are absorbed from the soil solution by actively growing plants. The cations are also held on exchange sites in soils. These exchange sites are negative charges associated with clay sized particles and some of the soil organic matter.
- Cations at the exchange sites are in equilibrium with the cations in the soil solution. The number of negative electrical charges can be measured analytically and is referred to as the cation exchange capacity.



Soil microbe

- Normal, fertile soils teem with soil microbes. In fact, there may be hundreds of millions to billions of microbes in a single gram [about 4 hundredths of a pound and about the size of a navy bean in volume].

Microbial Biomass in typical fertile soils

Microbial Group Wet wt. (lbs/ac)

- Bacteria 300-3,000
- Actinomycetes 300-3,000
- Fungi 500-5,000
- Protozoa 50-200
- Algae 10-1,500