

**2nd Stage of Horticulture
Department
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TOPICS

- **APPROACHES OF SOIL SCIENCE STUDY.**
- **SOIL PROFILE DESCRIPTION.**

Approaches of Soil Science Study

- There are two main approaches of soil science study, viz.
- **a) Pedology**
- **b) Edaphology**

a) Pedology

- Pedology: (From the Greek word 'Pedon' means soil or earth; 'logia' means study).
- It is a branch of soil science that focuses on understanding and characterizing soil **formation, evolution, morphology and classification** of soils in the context of the natural environment.
- Actually, the pedologists are concerned with the study of soil as a natural body at the earth surface without considering its many practical utilities.

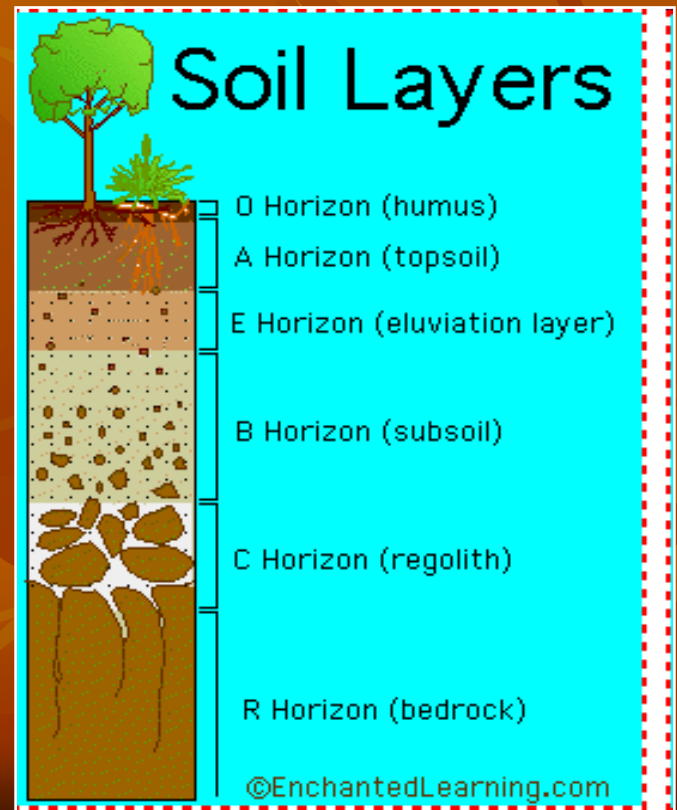
b) Edaphology

- Edaphology: (From the Greek word 'Edaphos' means soil or ground). It considers the soil as a medium of growth for living beings, especially for plants.
- It deals with the study of the **physical, chemical, mineralogical and biological properties** of the soil in relation to the plant growth.
- It also predicts the influences of the soil on human behavior and the use of land for growing the plants and for other uses.
- It is important from the crop production point of view. The edaphologists study the properties of the soil in relation to crop production. The sub fields of Edaphology are **agricultural soil science and environmental soil science.**

SOIL PROFILE DESCRIPTION

What is a Soil Profile?

- A **Soil Profile** is a vertical section of the soil extending through all its horizons and into the parent material.
- It is a vertical cross-section of layers of soil found in a given area.



What is a Soil Horizon?

- **Soil horizons** are a layers of soil , approximately parallel to the surface, having distinct characteristics produced by soil forming processes.
- Or
- are the layers in a soil profile used to classify soil types.
- Horizons based on **color, texture, roots, structure, rock fragments**, and any unique characteristic worth noting.
- **Master Soil Horizons** are depicted by a capital letter in the order (from top down): **O, A, E, B, C, and R**

What is a Soil Horizon?

- *The Simplest soil profile has horizon: **A** = topsoil, **B** = subsoil
C = parent material;*

But most have **O**, **A**, **E**, **B**, **C**, and **R**

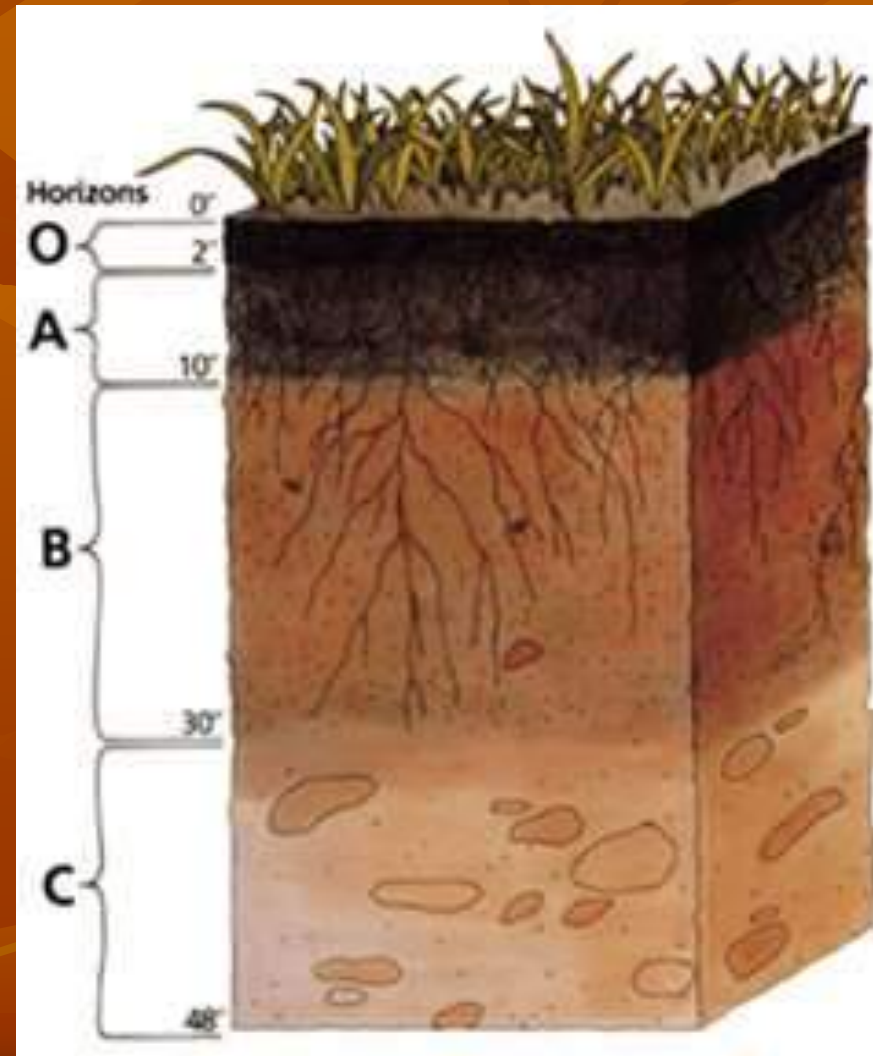


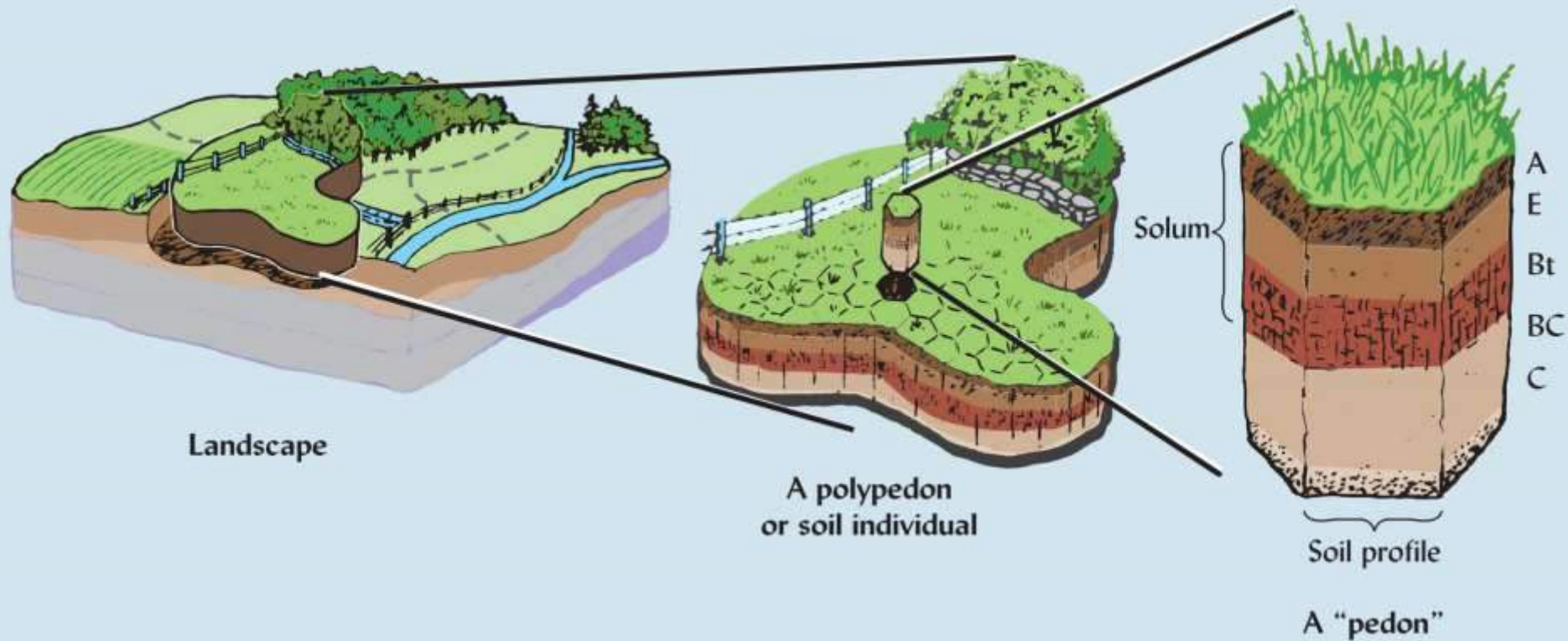
Horizon Vs Layer

- Horizon: soil materials that having distinct characteristics (properties) formed largely by soil forming processes.
- A layer in the soil deposited by a geologic force (wind, water, glaciers, oceans, etc.) and not relating to soil forming process.

Soil Pedon

- Pedon is the smallest unit of soil that shows characteristics of all horizons of a particular soil. It extends from the ground surface down to bedrock. Typically represents 1-10 m² of surface area.
- A pedon is a 3-dimensional sample of a body of soil that is 1 m² at the surface and extends to the bottom of the soil.





- Soil varies across a landscape, but soils in specific locations display specific characteristics.
- Polypedon is a group of similar, closely associated pedons.
- Soil Series is a group of like polypedons

Soil Pedon and Soil Profile

- In a simple way , we can consider a "Pedon" as a 3-D structure (minimum 1 m² surface up to 10 m²) that contain all the properties of the studied soil.
- The soil profile is defined as a vertical section of the soil from the ground surface downwards to where the soil meets the underlying rock.
- In this way, a soil profile could be one of the vertical face of a pedon

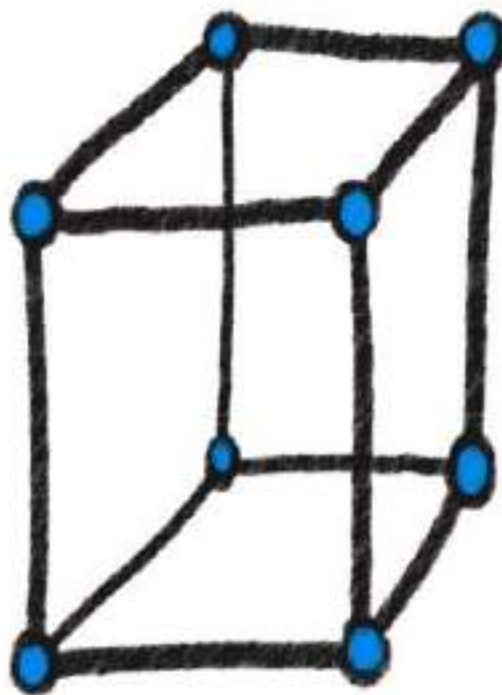
1D



2D



3D



es

Soil Horizon & Layer Designation

- Soil horizons designated by a combination of: CAPITAL LETTERS-lower case letters- NUMERALS.
- Master horizons are major layers designated by capital letter such as O, A, E, B, C and R.
- Subordinate Distinctions: Lower case letters used as suffixes to designate specific master horizons. i.e. Ap, Bw, Cg
- Vertical Subdivisions: A horizon designated by a single combination of letters which needs to be subdivided. i.e. Bw1, Bw2, Cg1, Cg2.

Master Horizons – O Horizon

- 0 Horizon: Organic horizons are dominated by organic material.
- **Field Criteria**
 - 20% organic matter,
 - Dark color (never used by itself)
 - Low strength, light dry weight, high fiber content
 - Typically a surface horizon-if buried may indicate Disturbance
- **Subordinate Distinctions of O Horizon**
 - Oa-Highly decomposed organic material (Muck)
 - Oe-Moderately decomposed organic material (Mucky Peat)
 - Oi-Slightly decomposed organic material (Peat)

Master Horizons – O Horizon

H or O

H = wet

O = dry



Master Horizon – A Horizon

- **A Horizon** : Mineral horizons that have formed at the soil surface or just below the O horizon and typically ranging from 6-30 centimeters thick
- **Field Criteria**
 - Mineral soil material
 - Mix of well decomposed organic matter and mineral material
 - Surface mineral horizon
 - Typically dark in color-darker than underlying horizons
- **Typical Subordinate Distinctions of A Horizon**
 - Ap-Plowing or other disturbance



Master Horizon – E Horizon

- **E Horizon** : Mineral horizon in which the major characteristic is loss of clay, iron and aluminum oxides by eluviation or leaching and ranging from not being present to several centimeters thick
- **eluviation** vs **illuviation**
- **Field Criteria**
 - Lighter in color than over or underlying horizon
 - Near surface, below O or A horizons and above a B horizon

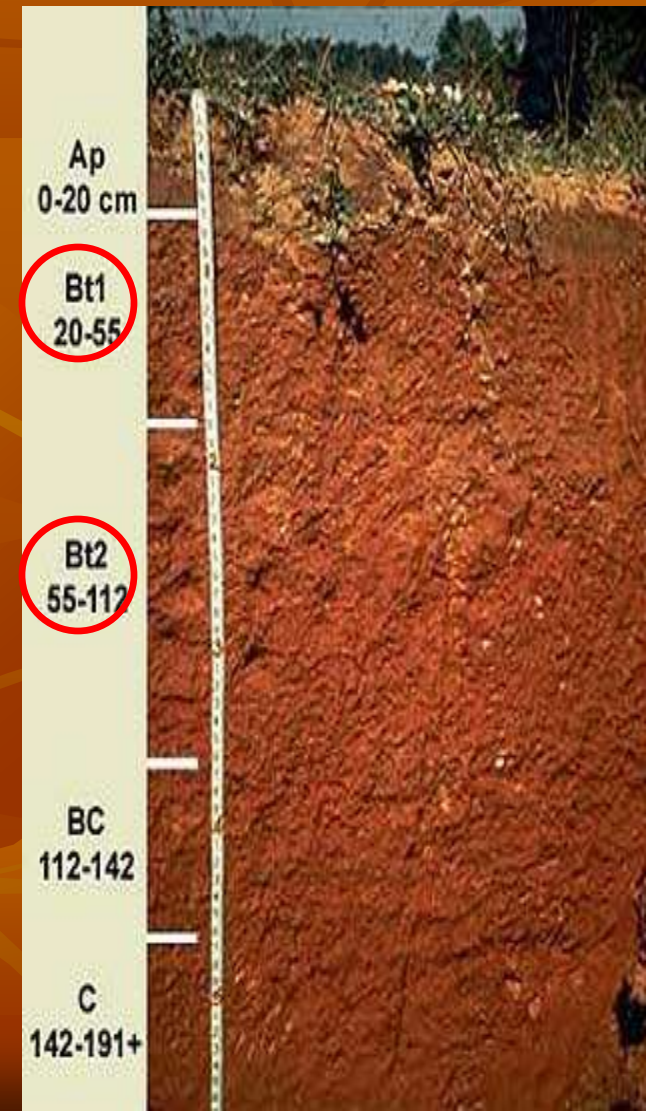


A vs. E horizon

- A horizons have a high OM content
- E horizons have low OM content
- E horizons often feel sandier (coarser) than the A horizon
- E horizons have a higher value (colour of **higher value** or lower chroma)

Master Horizon – B Horizon

- B Horizon: Mineral horizon that includes layers in which illuviation or accumulation of materials has taken place.
- **Field Criteria**
 - Subsurface horizon formed below an O, A, E horizon and above the C horizon
 - Formed as a result of soil forming processes
 - Weakest expression is color development
 - Illuvial concentration-zone of accumulation



Subordinate Distinctions

- Bg-Strong gleying, indicates prolonged periods of saturation
- Bs-Iluvial accumulation of sesquioxides (*A sesquioxide is an oxide containing three atoms of oxygen with two atoms of another element*) aluminium oxide (Al_2O_3).
- Bh-Iluvial accumulation of humus (spodic)
- Bt-Accumulation of clay

E vs B horizon

- E horizons are sandier (coarser) than B horizons
- E horizons are higher in value
- B horizons have more clay
- B horizons have more Fe

Master Horizon – C & R Horizons

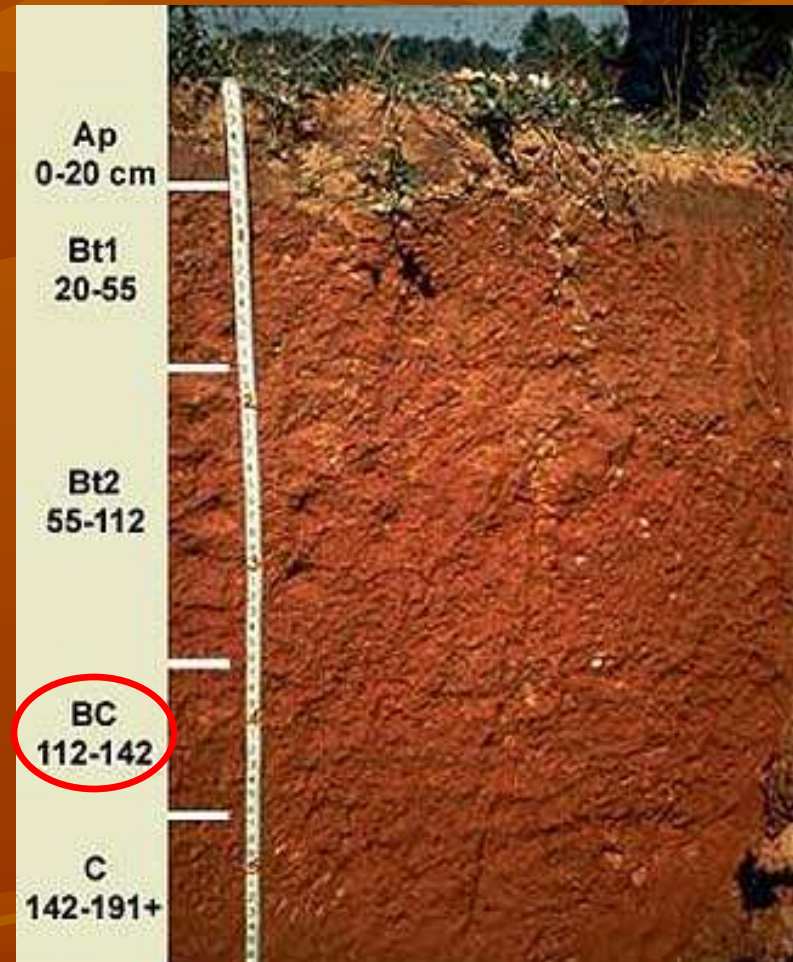
- **Horizon – C** is Referred to as substratum. These horizons and layers are little affected by soil forming processes (unweathered geologic material).
- **Field Criteria**
- Little affected by soil-forming processes
- Geologic layering
- Lack of color development, color of unweathered geologic material
- **Subordinate Distinctions of C Horizons**
- Cg-Strong gleying, indicates prolonged periods of saturation
- **R Layer**: Underlying consolidated bedrock

Master Horizon – C & R Horizons

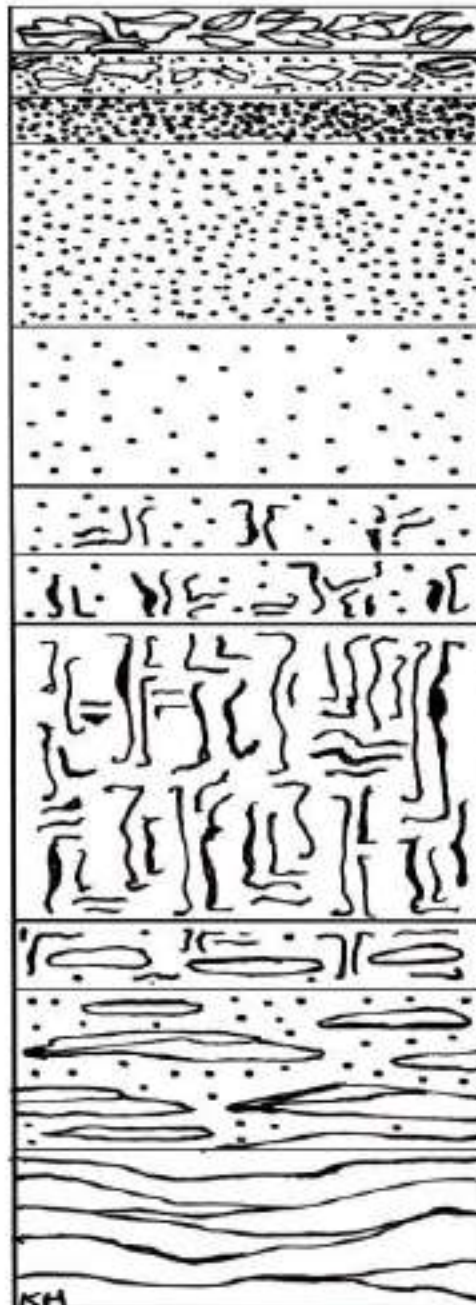


Transitional Horizons

- Transitional horizons are layers of soil between two master horizons.



Idealized soil profile



- Oi Loose, easily recognizable, organic debris
- Oe Partially decomposed organic materials
- Oa Fully decomposed organic materials

A Surface mineral horizon; darker and higher in organic matter. If plowed, will be designated **Ap**

E Eluviated horizon; light colored zone of maximum leaching of clay, iron, aluminum, and soluble organic matter. Often mixed into **Ap**

EB Transition from **E** to **B**; more like **E** than **B**

BE Transition from **E** to **B**; more like **B** than **E**

B Subsurface zone of maximum accumulation of clay, iron, etc. Common features include development of blocky and/or prismatic structure, clay coatings on larger particles, red and yellow colors from accumulation of iron oxides

BC Transition from **B** to **C**; more like **B** than **C**

C Weathered parent material such as saprolite, oxidized sediments, unconsolidated bedrock, etc.

R Hard bedrock; not always seen

Writing Soil Profile Descriptions

- First step- prepare suitable pedon for describing
- Stand back and view the horizons from a distance
- Determine approximately how many distinct horizons are present.



PROFILE DESCRIPTION

GENERAL INFORMATION

Location : 2° 58.844' N, 101° 42.722' E
 Parent Material : Shale
 Drainage : Well drained
 Terrain : Undulating
 Vegetation/Land Use : Grass
 Classification : Clayey, kaolinitic, isohyperthermic, subactive Typic Paleudult.
 Series : BUNGOR

PROFILE DESCRIPTION

Ap 0 – 23 cm

Yellow (10 YR 7/6) clay; fine, moderate subangular blocky structure; friable; many fine pores; many fine roots; few channels; diffuse boundary

Bt1 23 – 50 cm

Yellowish brown (10 YR 5/4) clay; moderate, medium to fine subangular blocky structure; moderately friable; thin patchy cutans on ped faces; few fine roots; few channels; diffuse boundary.

Bt2 50 – 78 cm

Dark yellowish brown (10 YR 4/6) clay; weak to moderate, medium to large, subangular blocky structure; firm; thin patchy cutans on ped faces; very few fine roots; very few channels; diffuse boundary.

Bt3 78 – 107 cm

Dark yellowish brown (10 YR 4/6) clay; weak, medium to large, subangular blocky structure; firm; thin patchy cutans on ped faces; very few fine roots; diffuse boundary.

Bt4 > 107 cm

Strong brown (7YR 5/6) clay; some fine reddish brown (5 YR 5/4) mottles; medium to large, weak subangular blocky structure; firm; thin patchy cutans on ped faces; no root.



ANALYTICAL DATA

HORIZON		Ap	B ₁₁	B ₁₂	B ₁₃	B ₁₄
pH (H ₂ O)		4.71	4.55	4.37	4.42	4.64
Exchangeable cation (cmol _c /kg)	Ca	0.50	0.21	0.21	0.27	0.24
	Mg	0.12	0.05	0.03	0.04	0.03
	K	0.12	0.10	0.07	0.06	0.12
	Na	0.06	0.03	0.03	0.03	0.03
ECEC (cmol _c /kg)		0.80	0.39	0.34	0.40	0.42
CEC (cmol _c /kg)		7.20	6.60	6.40	6.90	7.00
Total (%)	N	0.14	0.07	0.06	0.05	0.04
	O.C	1.46	0.78	0.61	0.49	0.35
Available P (mg /kg)		9	10	11	11	11
Granulometry (%)	Sand	42.36	34.12	31.97	26.97	25.57
	Silt	11.62	11.56	9.54	10.97	11.34
	Clay	45.91	54.17	58.34	61.96	63.02



THE END

Any Questions???