

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Soil orders found in Pakistan

SOIL CLASSIFICATION

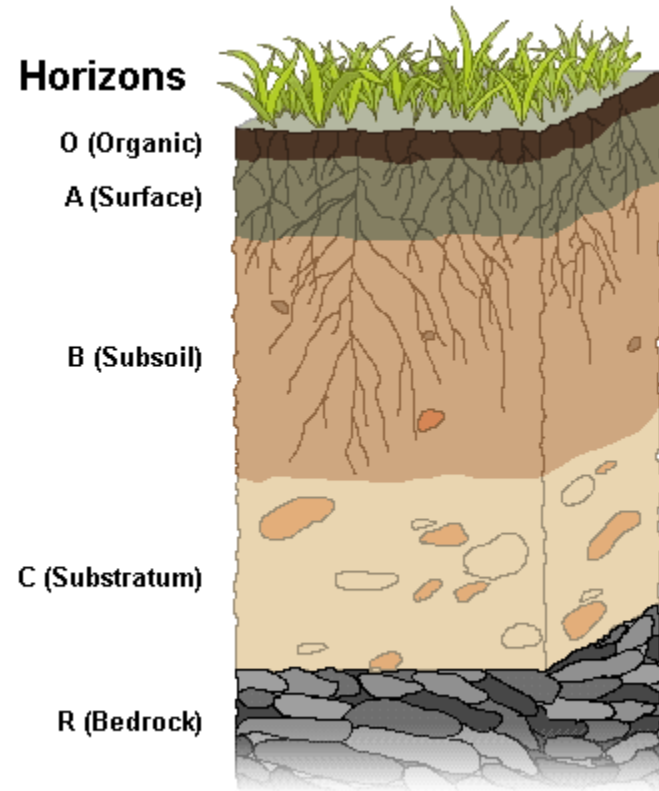
“Soil classification is the systematic grouping of soil into various categories based on morphological, mineralogical and chemical features.”

SOIL TAXAMONY

“Taxonomy is the science that deals with laws and principles of soil classification.”

Soil Profile

- Soil profile: a vertical section of soil from the ground surface to the parent rock.



CATEGORIES OF SOIL TAXONOMY

- Six levels of the categories in the hierarchy of soil taxonomy:
 - 1) Order
 - 2) Sub-order
 - 3) Great group
 - 4) Sub-group
 - 5) Family

ORDERS

There are twelve orders all over the world:

Order Name	Formative Element	Memory Device
Alfisols	alf	Pedalfer
Andisols	and	Andolike
Aridisols	id	Arid
Entisols	ent	Recent
Histosols	ist	Histology
Inceptisols	ept	Inception
Mollisols	oll	Mollify
Oxisols	ox	Oxide
Spodosols	od	Podzols
Ultisols	ult	Ultimate
Gelisols	gl	Frozen
Vertisols	ert	Invert

THE 12 ORDERS OF SOIL TAXONOMY

ALFISOLS

Alfisols are soil orders in temperate to warm areas. These soils result from weathering processes that leach the most mobile cations (calcium, magnesium, and potassium) into the subsoil, where they can harden and impede root and water flow. They commonly have a surface layer of forest litter and are produced by forest soils.

ALFISOLS MAKE UP ABOUT 10% OF THE WORLD'S KNOWN LAND SURFACES.

ANDISOLS

Andisols have been weathering processes that generate volcanic ash soils, forming volcanic ash soils. These processes can result in an extremely high water and nutrient holding capacity. As a group, Andisols tend to be highly productive soils. They are usually well-drained soils with a high water holding capacity, as in these strongly weathered soils. They are common in cool temperate regions with high precipitation, and are associated with volcanic regions.

ANDISOLS MAKE UP ABOUT 3% OF THE WORLD'S KNOWN LAND SURFACES.

ARIDISOLS

Aridisols are soils that are too dry for the growth of mesophytic plants. The lack of moisture greatly restricts the intensity of weathering processes and limits most soil development processes to the upper part of the soil. Aridisols often accumulate calcium, salt, sodium carbonate, and sulfates that can be toxic to some soils in more humid environments.

Aridisols are common in the deserts of the world.

ARIDISOLS MAKE UP ABOUT 12% OF THE WORLD'S KNOWN LAND SURFACES.

ENTISOLS

Entisols are soils that show little or no evidence of pedogenic feature development. Entisols occur in areas that are too young, too shallow, or too dry to show evidence of soil development. They are found in many temperate and tropical climates. They occur in many temperate and tropical climates. They occur in many temperate and tropical climates.

ENTISOLS MAKE UP ABOUT 18% OF THE WORLD'S KNOWN LAND SURFACES.

GELISOLS

Gelisols are soils that have permafrost near the soil surface and/or have evidence of permafrost. Soil freezing and/or ice segregation.

Gelisols are common in the higher latitudes or at high altitudes.

GELISOLS MAKE UP ABOUT 9% OF THE WORLD'S KNOWN LAND SURFACES.

HISTOSOLS

Histosols have a high content of organic matter and are peat soils. These soils are formed from the decay of plant material in wetlands, bogs, and swamps. They are characterized by their high organic content and their ability to store large amounts of water. They are found in wetlands, bogs, and swamps. They are found in wetlands, bogs, and swamps.

HISTOSOLS MAKE UP ABOUT 1% OF THE WORLD'S KNOWN LAND SURFACES.

INCEPTISOLS

Inceptisols are soils of moderate to limited weathering that generally exhibit only moderate degrees of soil weathering and development.

Inceptisols have a wide range of characteristics and occur in a wide variety of climates.

INCEPTISOLS MAKE UP ABOUT 8% OF THE WORLD'S KNOWN LAND SURFACES.

MOLLISOLS

Mollisols are soils that have a thick surface horizon that is 10 to 20 cm deep and organic content. They are found in grasslands and prairies. They are found in grasslands and prairies. They are found in grasslands and prairies.

Mollisols often have a high content of organic matter and are found in grasslands and prairies. They are found in grasslands and prairies. They are found in grasslands and prairies.

MOLLISOLS MAKE UP ABOUT 7% OF THE WORLD'S KNOWN LAND SURFACES.

OXISOLS

Oxisols are highly weathered soils in areas of warm climates. They are distributed by two primary methods, such as quartz, kaolinite, and iron oxides. They tend to have a high water holding capacity.

Oxisols often have a high water holding capacity and are found in warm climates. They are found in warm climates. They are found in warm climates.

OXISOLS MAKE UP ABOUT 8% OF THE WORLD'S KNOWN LAND SURFACES.

SPODOSOLS

Spodosols have a high content of organic matter and are found in cool temperate regions. They are characterized by their high organic content and their ability to store large amounts of water. They are found in cool temperate regions. They are found in cool temperate regions.

Spodosols often have a high content of organic matter and are found in cool temperate regions. They are found in cool temperate regions. They are found in cool temperate regions.

SPODOSOLS MAKE UP ABOUT 4% OF THE WORLD'S KNOWN LAND SURFACES.

ULTISOLS

Ultisols are soils that have a high content of iron and aluminum. They are found in warm temperate regions. They are found in warm temperate regions. They are found in warm temperate regions.

Ultisols often have a high content of iron and aluminum and are found in warm temperate regions. They are found in warm temperate regions. They are found in warm temperate regions.

ULTISOLS MAKE UP ABOUT 8% OF THE WORLD'S KNOWN LAND SURFACES.

VERTISOLS

Vertisols are soils that have a high content of clay and are found in warm temperate regions. They are characterized by their high clay content and their ability to shrink and swell. They are found in warm temperate regions. They are found in warm temperate regions.

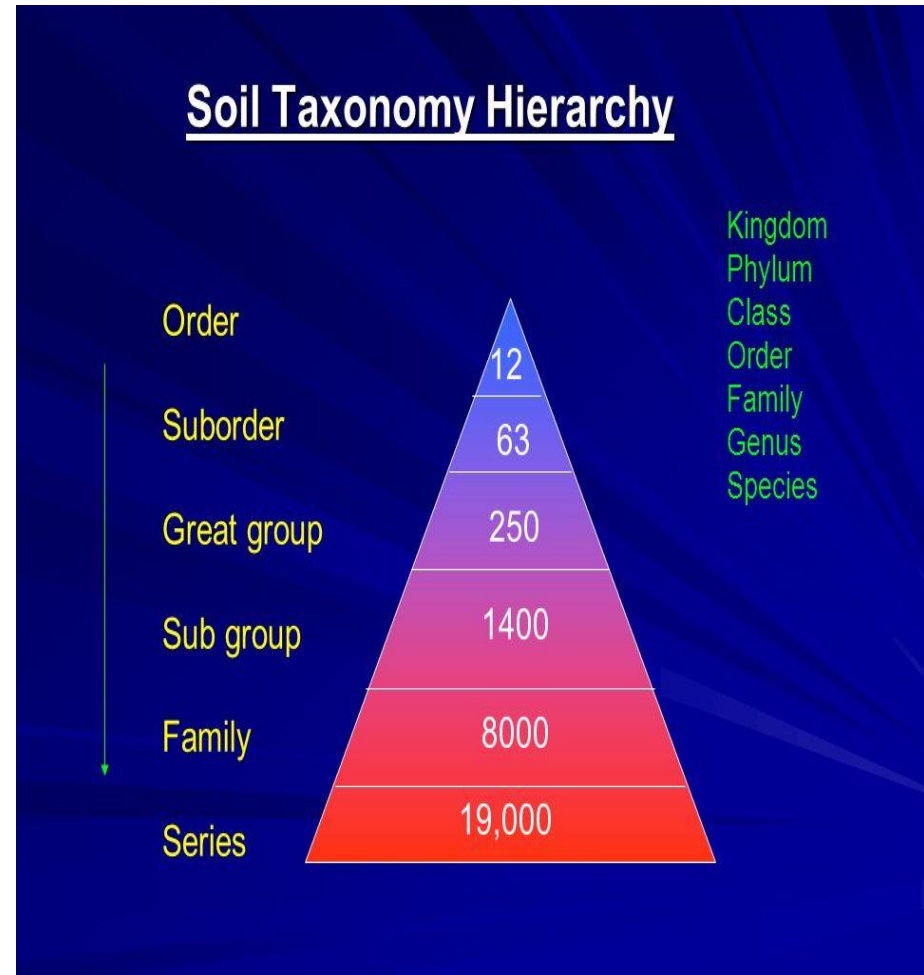
Vertisols often have a high content of clay and are found in warm temperate regions. They are found in warm temperate regions. They are found in warm temperate regions.

VERTISOLS MAKE UP ABOUT 2% OF THE WORLD'S KNOWN LAND SURFACES.

US System of Soil Taxonomy

The US System classification scheme contains 6 categories:

1. Order – the most general grouping
2. Suborder - defined by moisture, temp, dominating chemical or textural Features
3. Great Group - by differentiating horizons
4. Subgroup - three types: typical (typic), intergrade, not one of the other two
5. Family - plant growth or engineering properties.
6. Series – common name, like yours and mine.



Cont....

- In addition to these categories, we have the soil Phase (or soil Type), which refers to surface properties such as texture, thickness, slope, coarse fragments, salinity, erosion, etc.
- This is added to a series name (like Aiken clay loam, eroded phase).
- **Order, Sub-Order, Great Group, Sub-Group, Family, Series and Phase or Type**

Table 7-1 Formative Elements and Their Connotations for Names of Great Groups and Other Designations in the U.S. Soil Taxonomy System.

<i>Element</i>	<i>Connotation</i>	<i>Element</i>	<i>Connotation</i>
Acr	Extreme weathering	Hist	Presence of organic materials
Al	High aluminum, low iron	Hum	Presence of organic matter
Alb	Albic horizon	Hydr	Presence of water
Anhy	Very dry	Kand, kan	1:1 layer silicate clays
Anthr	Anthropic epipedon	Luv	Illuvial
Aqu	Aquic conditions	Melan	Black, presence of organic carbon
Argi	Argillic horizon	Moll	Mollic epipedon
Calci, calc	Calcic horizon	Natr	Natric horizon
Cry	Cold	Pale	Excessive development
Dur	Duripan	Petr	Cemented horizon
Dystr, dys	Low base saturation	Plac	Thin pan
Endo	Implying a groundwater table	Plagg	Plaggen epipedon
Epi	Implying a perched water table	Plinth	Presence of plinthite
Eutr	High base saturation	Psamm	Sandy texture
Ferr	Presence of iron	Quartz	High quartz content
Fibr	Least decomposed stage	Rhod	Dark red color
Fluv	Floodplain	Sal	Salic horizon
Fol	Mass of leaves	Sapr	Most decomposed stage
Fragi	Fragipan	Somb	Sombric horizon
Fragloss	Both <i>fragi</i> and <i>gloss</i>	Sphagn	Presence of sphagnum
Fulv	Dark brown color, presence of organic carbon	Sulf	Presence of sulfides or their oxidation products
Glac	Ice lenses or wedges	Torr	Torric moisture regime
Gloss	Glossic horizon	Ud	Udic moisture regime
Gyps	Gypsic horizon	Umbr	Umbric epipedon
Hal	Salty	Ust	Ustic moisture regime
Hapl	Minimum horizon development	Verm	Wormy or mixed by animals
Hem	Intermediate stage of decomposition	Vitr	Presence of glass
		Xer	Xeric moisture regime

Source: Soil Survey Staff, *Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys*, 2nd edition, Agriculture Handbook 436, USDA, Washington, DC, 1999, 128-129.

◆ 7:3 Constructing Taxonomic Names

The complete taxonomic class for a soil indicates the *order*, *suborder*, *great group*, *subgroup*, *family*, and *series* of that particular soil. These taxonomic class names can be quite long and complex. The name is constructed from **formative elements** coined from various roots in Latin, Greek, or other languages (see Table 7-1). From each soil order a **root**, or portion of the order name, is used to designate the order in the complete taxonomic class name. Examples of these roots are *od* for Spodosols, *id* for Aridisols, and *oll* for Mollisols. As an example of a complete taxonomic classification, the **Obispo** soil is officially classified as **clayey, magnesian, thermic lithic Haploxeroll**. Dissecting this class name into its formative elements reveals the following:

Series	Obispo (from San Luis Obispo County, California)
Family	Clayey, magnesian, thermic (indicating a high clay content, magnesium from serpentine minerals, and a thermic temperature regime)
Subgroup	Lithic (indicating shallow to bedrock)
Great group	Haploxeroll (indicating simple, or minimal horizon development)
Suborder	Xeroll (indicating a xeric moisture regime)
Order	Mollisol (as indicated by the root <i>oll</i>)

Table 2-4 Twenty-Nine Soil Groups Used in the FAO Soil Classification System

Group Name	Description
Leptosol*	Shallow soil over hard rock or gravel, similar to some Entisols
Cambisol	Soil with cambic horizon, similar to Inceptisols
Acrisol	Soil with low-base-saturation argillic horizon, similar to Ultisols
Arenosol	Soil of loamy sandy or coarser texture, similar to Psammments
Calcisol	Soil with a calcic or petrocalcic horizon
Ferralsol	Highly weathered soil with sesquioxide clays, similar to Oxisols
Gleysol	Soil with reducing conditions due to wetness
Luvisol	Soil with intermediate-base-saturation argillic horizon, similar to Alfisols
Podzol	Soil with a spodic horizon, similar to Spodosols
Kastanozem	Steppe soil with chestnut color, similar to some Mollisols
Lixisol	Soil with low-activity clays but high base saturation
Fluvisol	Little-altered soil from alluvial deposits, similar to Fluvents
Vertisol	Self-mixing soil, similar to Vertisols
Albeluvisol	Soil with an irregular, tongued boundary between an eluvial horizon and an argillic horizon
Solonchak	Soil with a salic (saline) horizon
Histosol	Organic soil with a histic horizon, similar to Histosols
Regosol	Thin soil over parent material, similar to some Entisols
Chernozem	Prairie soil with a mollic surface horizon and subsoil carbonates, usually formed in loess, similar to some Mollisols
Nitisol	Soil with shiny nut-shaped peds
Phaeozem	Soil with mollic surface horizon, but no carbonates in upper 100 cm
Soloňetz	Soil with natric (sodic) horizon, similar to Natrargids
Planosol	Soil with an eluvial horizon above an abrupt boundary to an impermeable subsoil
Andosol	Soil formed in volcanic ash, similar to Andisols
Umbrisol	Soil with umbric (thick, dark, acidic) surface horizon
Alisol	Soil with argillic horizon but appreciable exchangeable Al, similar to some Ultisols
Gypsisol	Soil with a gypsic horizon
Anthrosol	Soil with plaggen or other human-made features
Cryosol	Soil with permafrost, similar to Gelisols
Durisol	Soil with cemented horizon

*Soil groups are listed in approximate order of declining abundance. Leptosols, the most common soils, occupy about 16.55 million km².

Source: *Dominant Soils of the World*, FAO, Rome, 1999 (<http://www.fao.org>).

ORDER IN PAKISTAN

- THERE ARE SIX ORDER IN PAKISTAN

1. Aridisols

2. Entisols

3. Inceptisols

4. Alfisols

5. Vertisols

6. Mollisols

Aridisols>Entisols>Inceptisols>Alfisols>Vertisols
>Mollisols

ORDERS

1. **Alfisols**: Relatively high base saturation; not organic rich; evidence of clay transport.
2. **Andisols**: Soils derived major properties from volcanic parent material. High P fixation.
3. **Aridisols**: Arid soils; Low in organic matter; high in salts and pH.
4. **Entisols**: Not well-developed even after long periods (can occur anywhere)
5. **Histosols**: Soils formed from organic matter(peats and mucks).
6. **Inceptisols**: Moderately weathered soils.

ORDERS

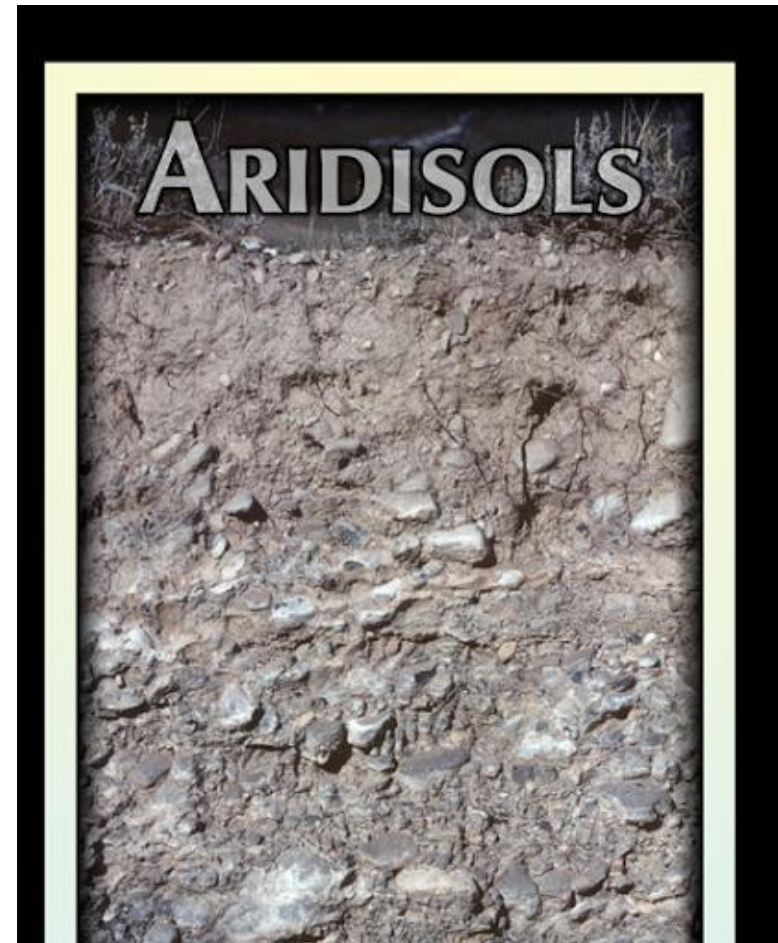
7. **Mollisols**: Brown-black surface horizons; High in organic matter, vermiculite or smectite.
8. **Oxisols**: Highly-weathered; Only quartz, kaolinite, and Fe and Al oxides left (e.g., tropical rainforest).
9. **Spodosols**: Evidence of Fe, Al, and organic matter transport; Often a whitish E Horizon (e.g., boreal forest).
10. **Ultisols**: low base saturation soils.
11. **Vertisols**: Mixed soils; Swelling clays, frost, etc cause lower horizons to mix with upper horizons; Often characterized by cracks.
12. **Gelisols**: Frozen soils

ARIDISOLS:

Description:

Extent: 259710 Km²

- ❖ Aridisols have a very low concentration of organic matter.
- ❖ Water deficiency is the major defining characteristic of Aridisols.
- ❖ *Also required is sufficient age to exhibit sub-soil weathering and development.*
- ❖ **Occurring:** Arid and Semi-arid Climates
- ❖ **Land Use:** Wheat, Cotton, Rice and fodder Purposes

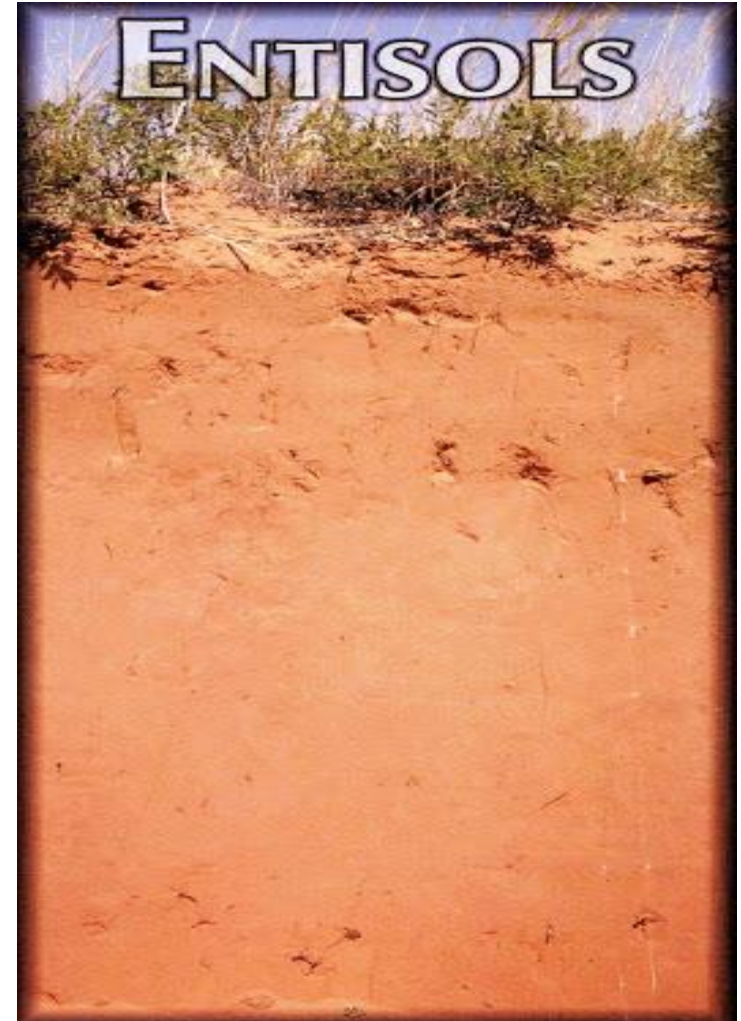


ENTISOLS:

Description:

Extent: 177000 Km²

- ❖ These soils lack any soil profile development except for some humification and homogenization in the surface horizon.
- ❖ **Occurring:** Dry Climate
- ❖ **Land Use:** Use for winter crops (Mustard, grams, wheat)



INCEPTISOLS:

- **Description:**
- **Extent:** 27700 Km
- ❖ They form quickly through alteration of parent material.
- ❖ They are more developed than Entisols.
- ❖ *They have no accumulation of clays, iron oxide, aluminum oxide or organic matter.*
- ❖ **Occurring:** Sub-humid areas
- ❖ **Land Use:** Wheat, apple, apricot, millet, maize, grazing livestock etc.



ALFISOLS:

Description:

Extent: 8350 Km²

- ❖ They have a clay-enriched subsoil and relatively high native fertility.
- ❖ "*Alf*" refers to aluminum (*Al*) and iron (*Fe*).
- ❖ **Occurring:** Alfisols form in semiarid to humid areas.
- ❖ **Land Use:** Grazing livestock, Wheat and Rice.



VERTISOLS:

- **Description:**
- **Extent:** 8350 Km²
- ❖ A Vertisols is a soil in which there is a high content of expansive clay known as montmorillonite that forms deep cracks in drier seasons or years.
- ❖ *Alternate shrinking and swelling causes self-mulching.*
- ❖ **Occurring:** Sub humid areas
- ❖ **Land Use:** Rice, Berseem, Wheat, Mustard, Sorghum and gram under irrigation.



MOLLISOLS:

Description:

Extent: 6100 Km²

- ❖ Mollisols have deep, high organic matter, nutrient-enriched surface soil.
- ❖ *Dark in colour*
- ❖ **Occurring:** Sub-humid highlands
- ❖ **Land Use:** Wood cutting and grazing of livestock





**Thank
You!!!**