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Mapping of Nigerian soils, Characteristics and Management Practices: A Review

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Abstract: *This study aims to elaborate an understandable review on Nigerian soils and their characteristics. Nigeria is known for its diverse range of soil types, each with unique properties and fertility levels. Understanding the characteristics of these soils is crucial for effective agricultural practices and land management in the country. In this review, we will explore the different soil types found in Nigeria, their physical and chemical properties, as well as their suitability for various crops and agricultural practices. Additionally, we will discuss the challenges and opportunities associated with soil management in Nigeria, and provide recommendations for sustainable soil use and conservation.*

• Introduction

Soil is a three-dimensional natural body that is a collection of individually different soil bodies often said to cover the land, which is highly variable from place to place on earth (Hartemink, 2016; Simonson, 1968). The physically and chemically weathered components of the exposed lithosphere form the unconsolidated surface usually known as REGOLITH (Brantley & White, 2009) and this varies in thickness. Regolith is formed either (i) in place as bedrock weathers, termed as residual or residuum, or (ii) transported to a site by gravity, water, wind, ice, or another vector (Field & Little, 2009)..

• Material and method

The increase in soil depth and horizonation a result of the evolution of a horizon within a soil profile. Soils are records of the history of soil genesis, not mere deposition. Well-developed soil with horizon differentiation is more ordered. The more the number of horizons, the more developed a soil. Soils are results of the effects of climate, organisms, relief, and parent material expressed over long periods of time, climate being the overriding factor. The rate of soil formation is a product of all the components of individual reactions taking place in the soil from the factors of soil formation.

- Conditions for assessing soil development include the presence of distinct horizons, the depth of these horizons, and the degree of their development. These factors, along with the types and amounts of organic matter present, can help determine the maturity and fertility of a soil. By studying these characteristics, scientists can gain valuable insight into the history and potential uses of a particular soil profile. Ultimately, understanding the formation and development of soils can lead to more effective land management practices and sustainable agricultural strategies.

• Results and discussions

Ferralsols Soils: Found in southern Nigeria, these soils are highly weathered, acidic, and low in essential nutrients due to intense rainfall and leaching (Mureithi et al., 2024; Odoh et al.). They are typically red or yellow in color and have a high clay content. Ferralsols are not very fertile and are mainly used for growing crops with high nutrient requirements, such as cocoa and oil palm (Gnahoua, 2016).

Ferruginous Tropical Soils: Fagbami and Shogunle and ADESINA (2019) characterized ferruginous soils in the northern and central parts of Nigeria, these soils are generally well-drained, with reddish or brown colours due to iron and aluminium oxide content. Ferruginous tropical soils are known for their high fertility and are ideal for growing a variety of crops, including millet, sorghum, and groundnuts.

Hydromorphic Soils: Dickson (2018) reported hydromorphic soils are located in the Niger Delta and other river valleys, these soils are waterlogged for part of the year making them unsuitable for most crops.

1.**Ultisols**: Asawalam described Ultisols as highly weathered soils found in regions with a humid tropical climate and acidic with typically low in natural fertility due to intense leaching, but their structure supports agriculture when amended. They are commonly found in the southeastern and southern parts of Nigeria, especially in rainforest zones.

2. **Alfisols:** Ogidiolu and Samuel described Alfisols as fertile soils with moderate to high base saturation. They are less weathered and tend to be more inherently fertile than Ultisols and are often found in savanna regions. They are commonly found in the northern Guinea savanna and southern Sudan savanna.

3. **Inceptisols:** Imadojemu (2024) described inceptisols as young soils with minimal horizon development are found in areas with moderate to high erosion or alluvial deposits, and they are found along river floodplains, especially in the Niger and Benue River basins.

4. **Entisols:** Spaargaren (2001) and Osman and Osman (2013) characterized entisols as recent soils with little to no profile development, often found in areas of active deposition or erosion, and they are common in floodplains, coastal regions, and arid zones in the extreme north.

5. **Vertisols:** Vertisols are clay-rich soils that swell when wet and crack when dry, leading to significant challenges for construction and agriculture, are found in drier regions, especially in parts of the Sudan savanna (Neina et al., 2024; Osman & Osman, 2013).

6. **Oxisols:** Highly weathered tropical soils with low natural fertility, primarily found in areas with high rainfall and limited to regions with prolonged tropical weathering, often in southeastern region of Nigeria (Juo & Franzluebbers, 2003; Osman & Osman, 2013).

7. **Aridisols:** Ogunkunle (2016) reported soils of arid and semi-arid regions with minimal organic matter and significant salt accumulation. They are found in the arid northeastern regions (e.g., parts of Borno and Yobe States.

- 8. **Histosols:** Organic-rich soils formed in waterlogged conditions, often associated with peat or swamp environments and found in the Niger Delta and other coastal wetlands. High organic matter content, poor drainage and high-water retention are their properties as reported (2001).

• Conclusions

Mapping Nigerian soils is a crucial step towards achieving sustainable agriculture and ensuring food security in the country. By understanding the unique characteristics of each soil type and implementing targeted agricultural practices, farmers can maximize crop growth and yield while minimizing environmental impact. Additionally, mapping Nigerian soils allows for the development of tailored land use plans that take into account the specific needs of each area, ultimately promoting long-term sustainability and resilience in the face of climate change. Overall, investing in soil mapping and research is essential for the future success of agriculture in Nigeria.