TRENDS IN AGRICULTURE SCIENCE

Popular Article

Vol.3 Issue 06 June 2024, Page: 1966-1969

Soil Mapping is a Key component of Environmental Sustainability

R. Srinivasan[1] and V. Kasthuri Thilagam[2]

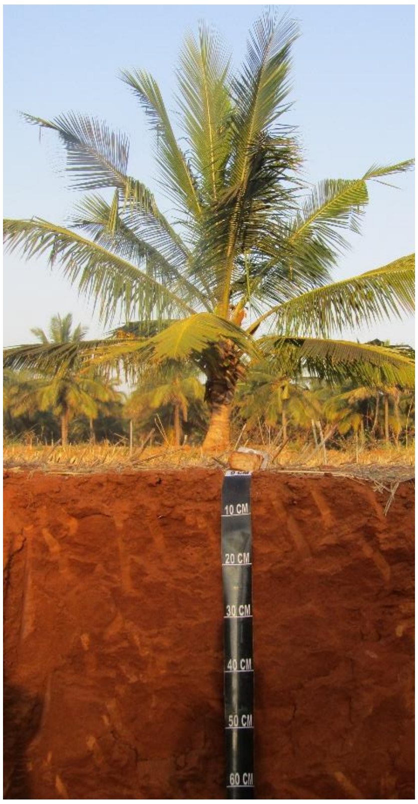
[1]ICAR-National Bureau of Soil Survey and Land Use Planning, Regional Centre, Bangalore-560024, Karnataka, India

[2]ICAR-Sugarcane Breeding Institute (SBI), Coimbatore- 641007, Tamil Nadu, India

https://doi.org/10.5281/zenodo.12594148

Introduction

Soil is the loose surface material that covers most land. It consists of inorganic particles and organic matter. Soil provides the structural support for plants used in agriculture and is also their source of water and nutrients. Soils vary greatly in their chemical and physical properties. Processes such as leaching, weathering and microbial activity combine to make a whole range of different soil types. Each type has particular strengths and weaknesses for agricultural production.



Soil provides ecosystem services critical for life: soil acts as a water filter and a growing medium; provides habitat for billions of organisms, contributing to biodiversity; and supplies most of the antibiotics used to fight diseases. Humans use soil as a holding facility for solid waste, filter for wastewater, and foundation for our cities and towns. Finally, soil is the basis of our nation's agroecosystems which provide us with feed, fiber, food and fuel.

Biophysical soil functions include nutrient cycling, water dynamics, filtering and buffering, physical stability and support of plant systems and human structures, and promotion of biodiversity and habitat. There is no one single definition of soil functions; however, the summary from the World Soil Information as "Soil is our life support system. Soils provide anchorage for roots, hold water and nutrients. Soils are home to myriad microorganisms that fix nitrogen and decompose organic matter, and armies of microscopic animals as well as earthworms and termites. We build on soil as well as with it and in it" provides a very useful summary of the importance of soils in humankind. These

Published: 28 June 2024
ISSN: 2583-7850

broad categories of soil functions require some expansion to fully understand the vital nature or soils in the food, energy, water nexus.

There are a number of soil properties related to soil functionality as shown in Fig. 1; however, the ability of the soil to provide these functions is more complex than merely listing the soil properties. Our understanding of the linkage between soil properties and soil functions and the resultant ecosystem services is incomplete (Adhikari and Hartemink, 2016). The ability of the soil to provide these functions will, however, depend upon the state of the soil properties. For example, soil water holding capacity is a soil property related to water dynamics and filtering and buffering; however, a sandy soil with a low water holding capacity will not provide those functions as well as a clay loam soil with a high-water holding capacity.

Fig. 1 Different soil functions

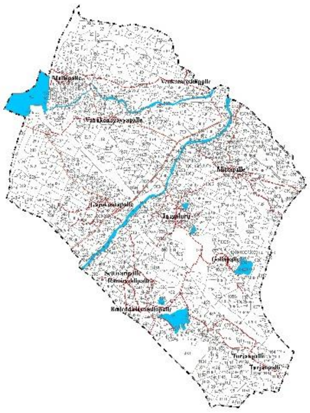
Soil Mapping:

Soil Mapping is the process of delineating natural bodies of soils, classifying and grouping the delineated soils into map units, and capturing soil property information for interpreting and depicting soil spatial distribution on a map.

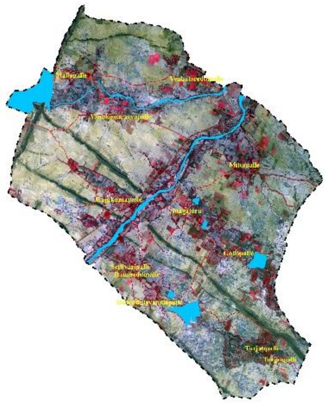
Soil mapping is a process that involves the systematic observation and recording of soil types and their distribution within a particular area. It has several important applications. It helps farmers to make informed decisions about crop selection, fertilization, and irrigation.

A detailed soil map was prepared at a scale of 1:8,000 using a village cadastral map overlaid with recent remote sensing imageries (Cartosat/quickbird) to identify major landforms. surveyor, once identified major landforms, which reflect on different slopes, parent materials, and vegetation linked to soil formation and development. Based on the delineated polygon, soils are checked by ground truth, and variability was mapped in different soil series (Fig. 2).

Official Website: trendsinagriculturescience.com
e-mail Address: trendsinagriculturescience@gmail.com
Published: 28 June 2024
ISSN: 2583-7850


Village cadastral map


Landscape


Soil map

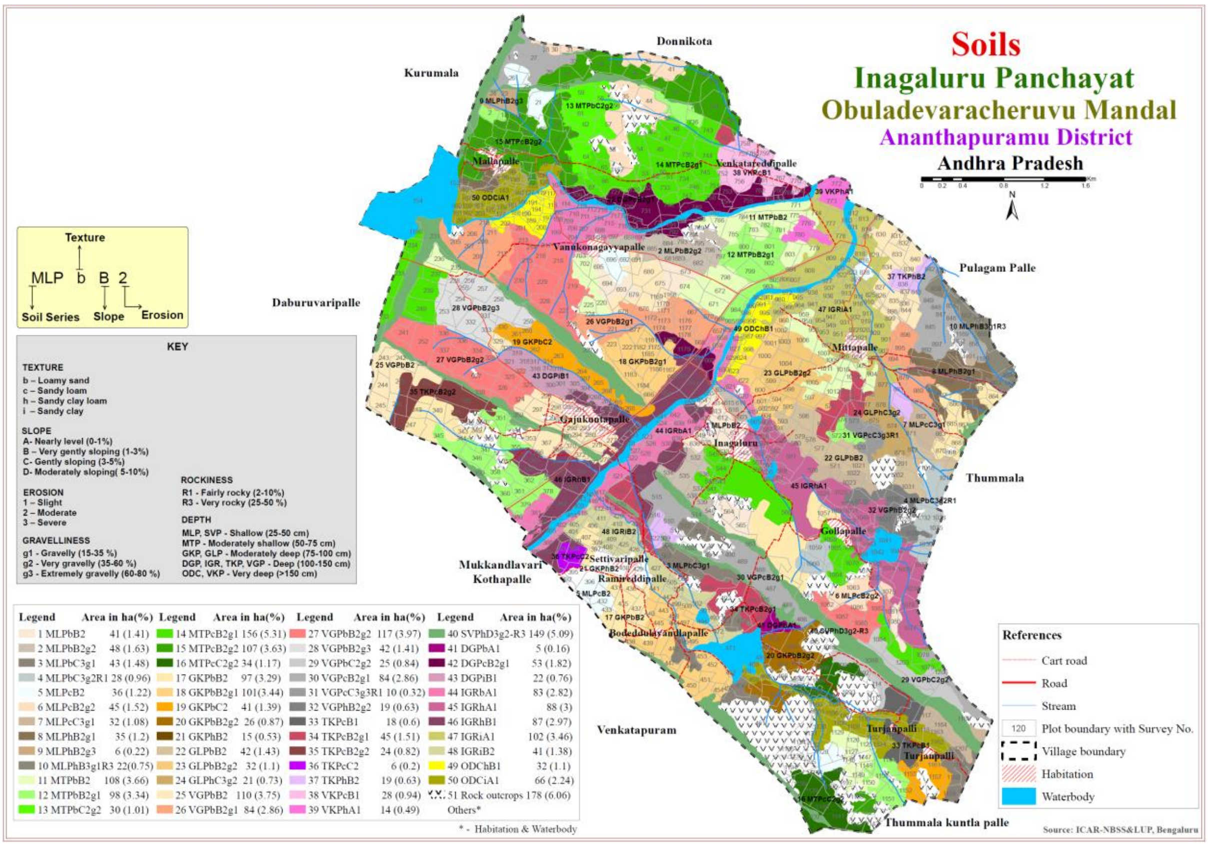


Fig. 2 Detailed Soil map

Soil information kind of map is thus essential for long-term soil management. The soil profile and its spatial distribution are two critical components for encouraging sustainable agriculture, which requires precise inputs in amount, space, and time (Srinivasan et al. 2021). Detailed soil map assists to land managers in developing strategies for soil conservation and restoration. Soil maps are also used by engineers and construction professionals to design buildings, roads, and other infrastructure projects that are compatible with local soil conditions.

The development of a numerical or statistical model of the link between environmental variables and soil qualities, which is then applied to a geographic data source to build a predictive map, it is called digital soil mapping (DSM). Geocomputational technologies developed during

Published: 28 June 2024
ISSN: 2583-7850

the last couple of decades have enabled DSM. Geoinformatics employ modern geographic information science, digital terrain modeling, remote sensing, and fuzzy logic to create extremely precise 3D soil survey maps.

However, one of the most significant challenges of soil mapping is the variability of soil types within a given area. Soil properties can vary greatly over short distances due to differences in topography, vegetation cover, and land use. To overcome this challenge, soil surveyor use statistical techniques to interpolate between sampling points and create a continuous map of soil types.

Soil mapping as a tool for agricultural management

- Soil maps can help agricultural businesses benefit from simplified and digitized soil management. They can learn about the soil characteristics beneath the ground's surface over a vast area rather than only at certain locations.
- Precision agriculture is a new farming management strategy in which farmers collect and analyze data to optimize inputs and practices for the best results.
- This information is then used to make decisions about which crops to sow and when and where to apply fertilizer, agrochemicals, or water. As a result, farmers can optimize their input use, making the most of their limited resources.

Conclusions

Soil is one of the most ubiquitous – and underappreciated – substances on Earth. Yet in several fascinating ways this miraculous substance holds the key to life. Soil helps produce our food and unearth life-saving water and minerals. Soil also filters and purifies our water, reduces flooding, regulates the atmosphere and plays a crucial role in driving the carbon and nitrogen cycles. Soil plays a vital role in either limiting or exacerbating climate change. Soil stores an extraordinary quantity of carbon: three times the amount in the atmosphere and twice the amount contained in all plants and trees. It is also key to tackling climate change as it captures and stores vast amounts of carbon. Soil is also one of the most biodiverse habitats on Earth. Managing better soils, which reflect on clear, green and safe environment.

References

Adhikari, K., & Hartemink, A. E. (2016). Linking soils to ecosystem services—A global review. Geoderma, 262, 101-111.

Srinivasan, R., Rajendra Hegde, Kasthuri Thilagam, V. and Naveen Kumar, S. (2021). Soil-site characterization on crop productivity in Alfisols of Eastern Ghats of Tamil Nadu, India. *Journal of Soil and Water Conservation* 20(4): 355-364, DOI: 10.5958/2455-7145.2021.00045.X.

Official Website: trendsinagriculturescience.com
e-mail Address: trendsinagriculturescience@gmail.com
Published: 28 June 2024
ISSN: 2583-7850