Project : Soil Texture Analysis

Project on Soil Texture

The material presented on this project is in the form of project deliverables—a proposal, a process log, and a report.

Proposal

The Problem and Approach to Solution

Soil properties (soil depth, soil texture, soil carbon) are important for their key role in supporting ecosystem services, plant growth, water availability and maintaining carbon stocks. Soil depth is defined as the depth (in cm) to a lithic or paralithic contact (USDA Soil Survey Manual). Soil texture indicates the relative content of particles of various sizes, such as sand, silt and clay in the soil. Texture influences the ease with which soil can be worked, the amount of water and air it holds, and the rate at which water can enter and move through soil.

Hence, we aim to study soil texture, which is the main physical property of soil and plays an indispensable role in farming.For example, Inventories of soil carbon stocks are needed to assess the possible impacts of global climate change on soil organic , inorganic carbon content in relation to potential greenhouse gas emissions.

Hence, we propose to compare various soil textures in Indian subcontinent so as to identify their impact on climate change and the greenhouse effect. Further, we drew a detailed analysis of their distribution and studied their characteristics.For example, we studied that **Loam soils** generally contain more nutrients, moisture, **and** humus than **sandy soils**, have better drainage **and** infiltration of water **and** air than **clay**-rich **soils.**

Scope

Soil texture is the main physical property of the soil and it defines the fraction of sand, silt and clay present in the sample. But for our exploratory study on soil texture in Indian

subcontinent, we restrict our attention to top four soils i.e. Sandy, Loamy, Clayey and Clayey Skeletal soil.

Sources of Data

Data for this project has been derived from Bhuvan, Indian Geo-Platform of ISRO, from project National Information System for Climate and Environment Changes, under Terrestrial Sciences group and Indian Soil Datasets product. Link of that dataset is https://bhuvan-app3.nrsc.gov.in/data/download/index.php

Further, we selected Soil Texture property of that dataset and selected multiple classes, like Loamy, Clayey, Clayey Skeletal and lastly, Sandy.

Reference

Bhuvan, Indian Geo-Platform of ISRO, Internet URL: https://bhuvan.nrsc.gov.in/bhuvan_links.php accessed on 11/09/2019.

Process Log:

This section has the list of major steps that we took to complete our project.

Download Files

1. Open https://bhuvan.nrsc.gov.in/bhuvan_links.php and click onto Open Data Archive.
2. Openhttps://bhuvan-app3.nrsc.gov.in/data/download/index.php to get the category of data which needs to be downloaded. Further, select the project and group of the project whose dataset needs to be acquired.

Build an ArcGIS Pro Document

1. Start **ArcGIS Pro** and clear the default selection of map and layers.
2. Add the following data using the add data section in the map pane.
3. The soil data consist of the following files - data_spec_fclayey.asc, data_spec_fsandy.asc, data_spec_fskeletal.asc, data_spec_floamy.asc.
4. Add the first layer fsandy.asc_Band_1 in the form of raster band. Open the Symbology pane from the properties and check the display background bar in the mask option.
5. In the primary symbology pane select the stretch option and values between 0 to 10000.
6. Add the second layer floamy.asc_Band_1 in the form of raster band. Open the Symbology pane from the properties and check the display background bar in the mask option.
7. In the primary symbology pane select the stretch option and values between 0 to 10000.
8. Add the third layer fclayskeletal.asc_Band_1 in the form of raster band. Open the Symbology pane from the properties and check the display background bar in the mask option.
9. In the primary symbology pane select the stretch option and values between 0 to 10000.
10. Add the fourth layer fclayey.asc_Band_1 in the form of raster band. Open the Symbology pane from the properties and check the display background bar in the mask option.
11. In the primary symbology pane select the stretch option and values between 0 to 10000.
12. Finally select all the four layers, in order to get the soil texture spread over the entire country.

Report

The report is included as appendix A.

Reference

Kendall, K. E., and J. E. Kendall. 1995. *Systems Analysis and Design*, third edition, Englewood Cliffs, NJ:
Prentice Hall, 7-11.

APPENDIX A
Report

Soil Texture Analysis over Indian Subcontinent

By

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Introduction

Soil depth is defined as the depth (in cm) to a lithic or paralithic contact (USDA Soil Survey Manual). The soil depth and texture class data available at different scales and various sources of 1: 250,000 and 1:50,000 scales were rasterized with a cell size of 5km x 5km. The datasets were integrated using GIS analysis tools like Union and decision rules were applied to generate different soil depth classes viz. Very shallow (< 25 cm), Shallow(25-50 cm), Moderately shallow (50-75 cm), moderately deep (75-100 cm), Deep (100-150 cm), Very deep (> 150 cm). Similarly, the soil texture fraction product consists of soil texture classes viz. Sandy (contains 85% or more sand , percentage of silt and 1.5 times the percentage of clay shall not exceed 15), Loamy (contains 7-27% clay, 28-50 % silt and less than 52 percent sand), clayey(contains 35% or more clay, less than 45% sand and less than 40 % silt) and clayey skeletal (clayey and have 35 percent by volume fragments coarser than 2 mm, with enough fine earth to fill interstices larger than 1 mm). The soil depth and soil texture pixels which were falling under built-up and water body classes (as generated under Land use / land cover AWiFS project) were erased for generating final soil depth layer. The grid wise fraction area of each soil depth and soil texture class was generated for 5 km X 5 km grid for the entire country. The data is provided as long integer format. To convert the data to fraction area of grid cell, the number has to be divided with 10000.

In this paper, we compared maps displaying the soil content especially their texture and characteristics of Indian subcontinent.

Data Sources

We downloaded the dataset from Bhuvan website, open https://bhuvan.nrsc.gov.in/bhuvan_links.php and click onto Open Data Archive.It will redirect to https://bhuvan-app3.nrsc.gov.in/data/download/index.php so as to select the category of data which needs to be downloaded. Further, select the project and group of the project whose dataset needs to be acquired.

For every soil, below is the screenshot attached wrt their distribution.

Fig1: Loamy Soil

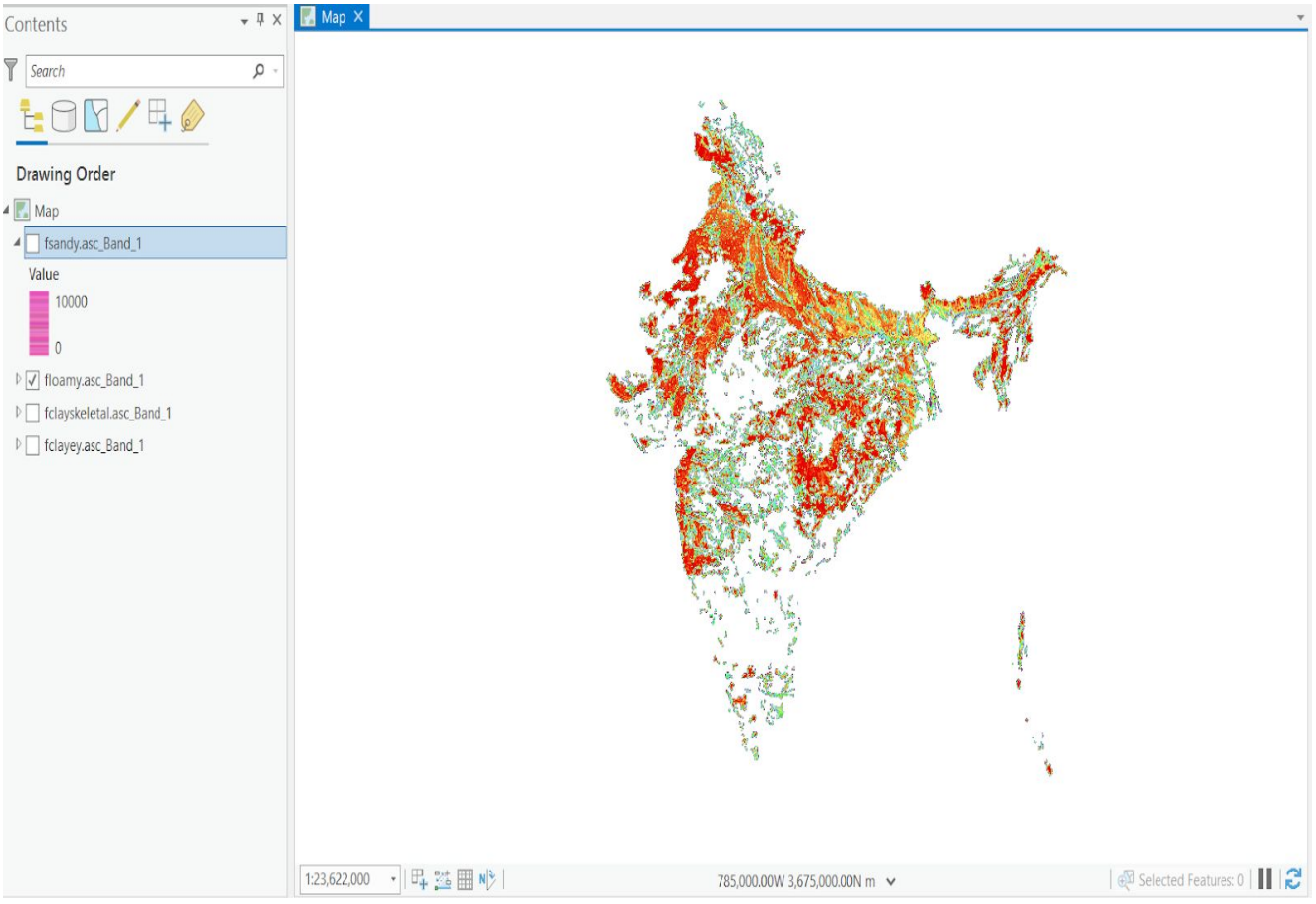


Fig2: Clayey Soil

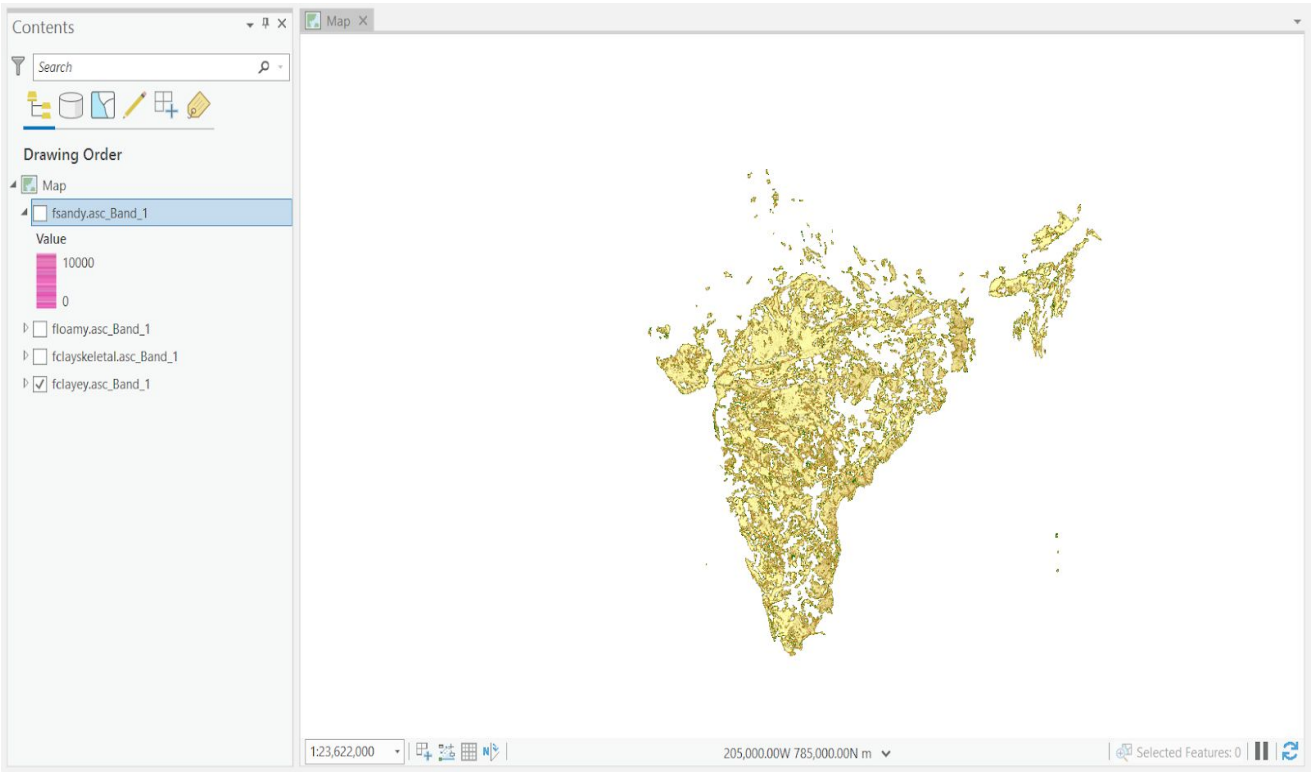


Fig3: Clayey Skeletal

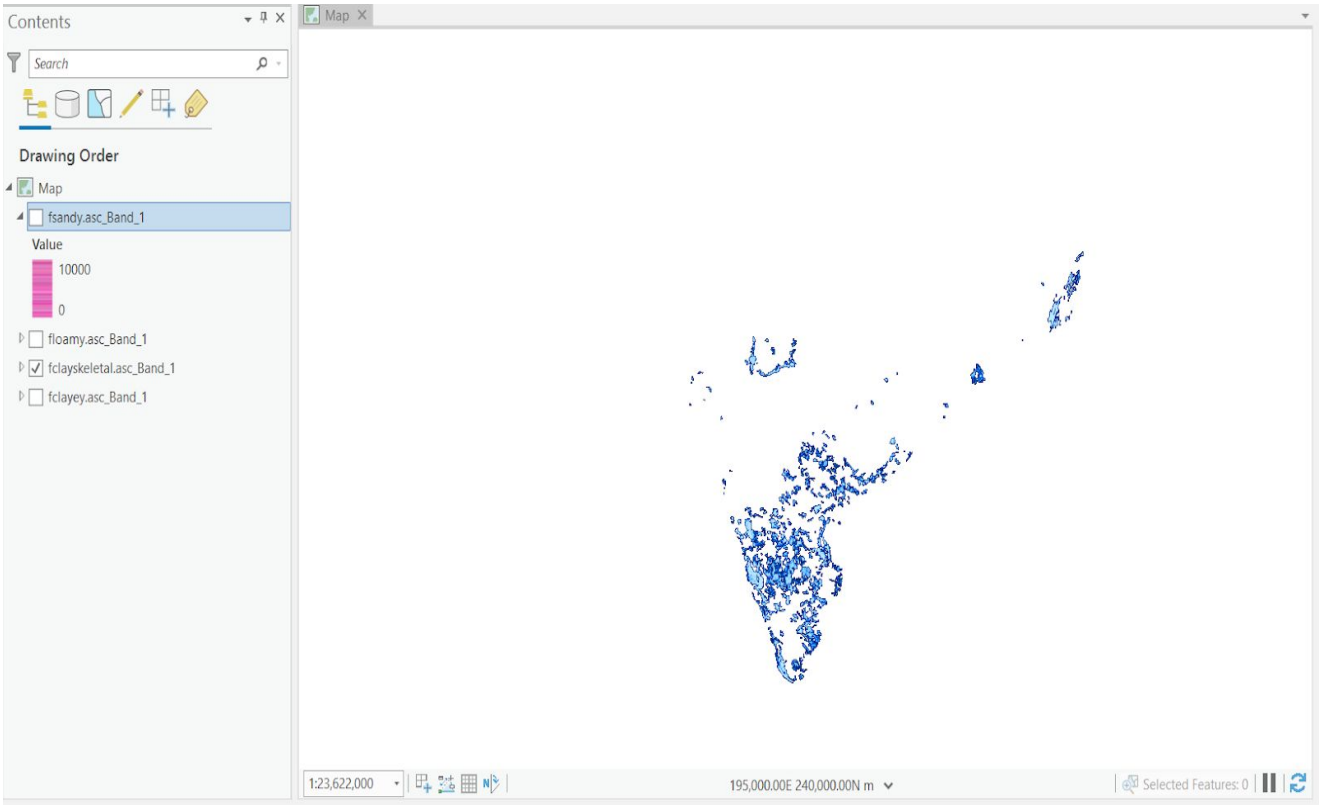


Fig4: Sandy Soil

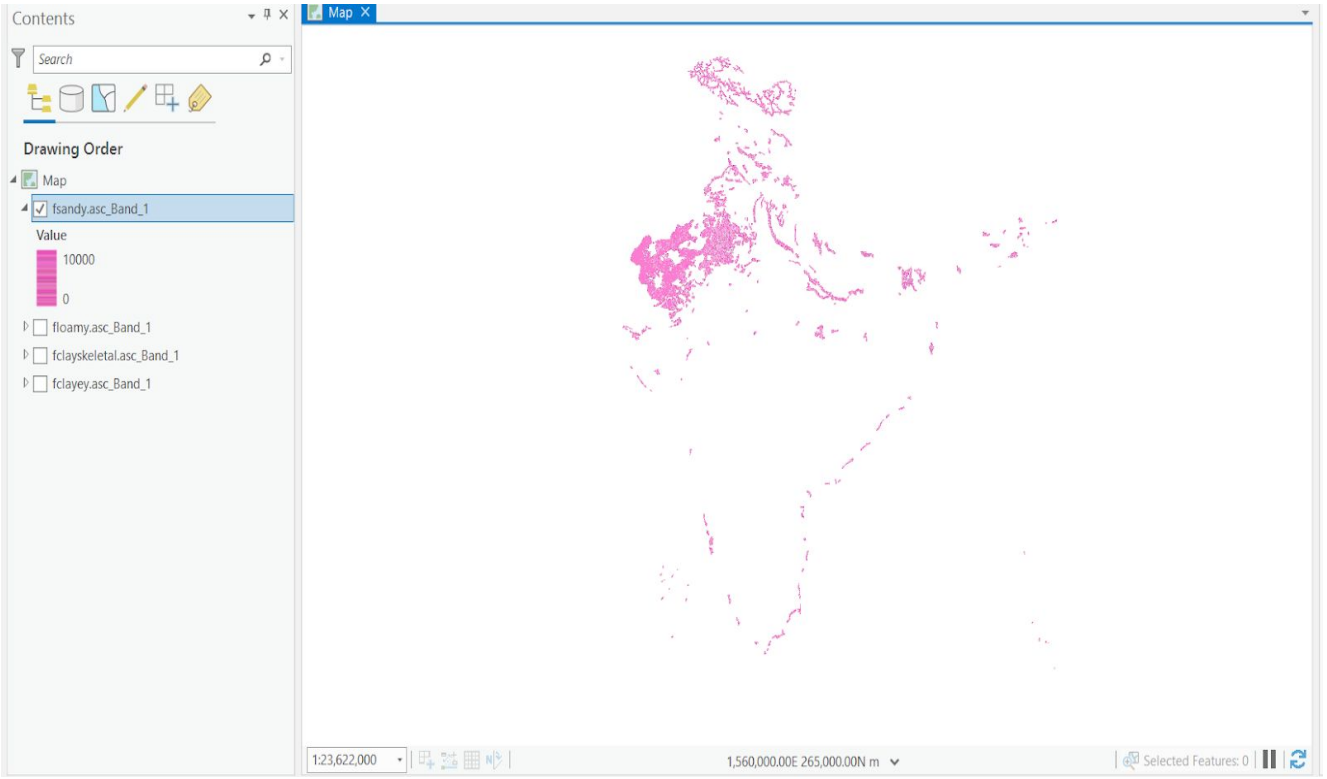
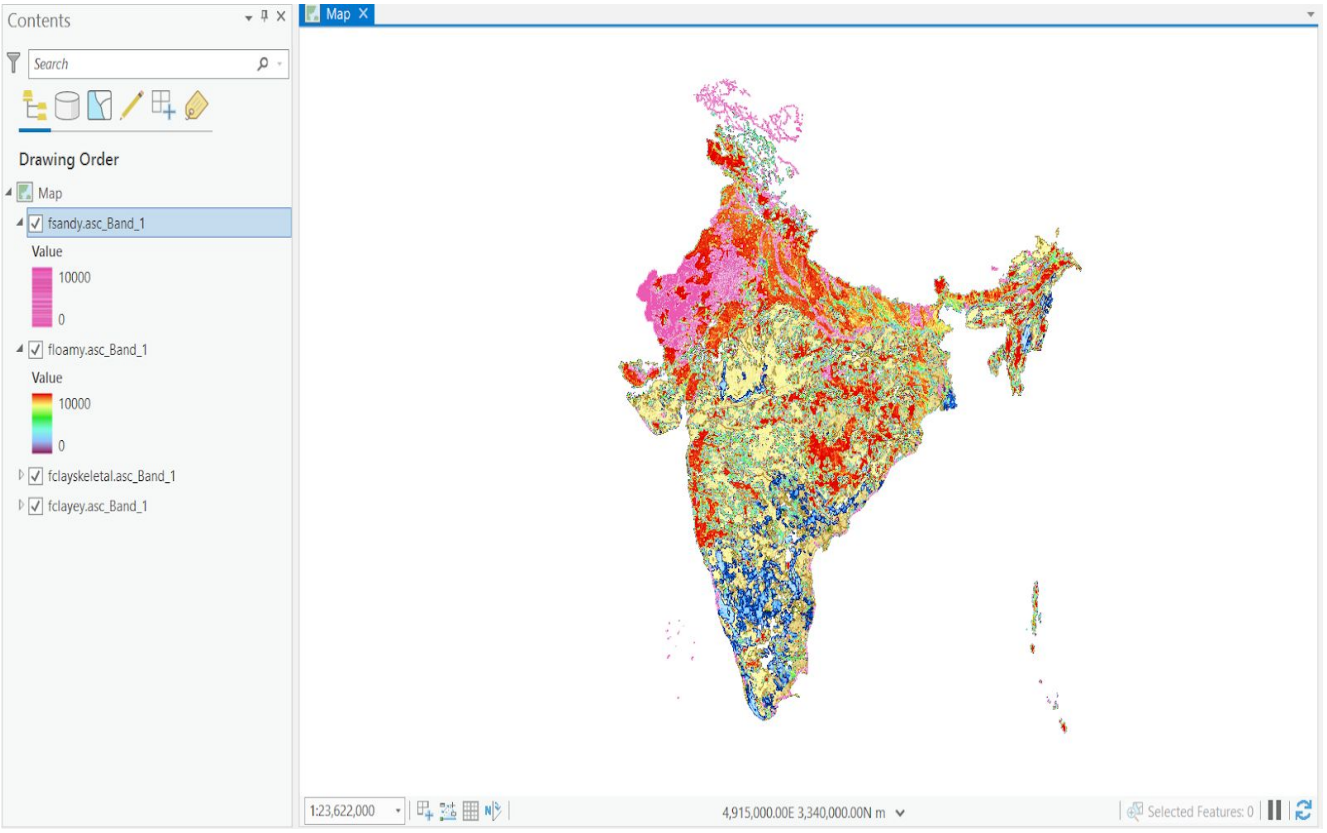


Fig5: Overall soil analysis



Conclusion

This report analyzed the distribution of soil textures in various states of India and color coded various soil classes so as to get a holistic view of soil texture distribution. For example, Loamy soil generally lies along the Ganga - Brahmaputra plains. In the peninsular region, this soil is mostly found in the deltas of river Godavari and Krishna[fig1], while Clayey soil lies in areas such as Gujarat, Madhya Pradesh and Maharashtra. It is also found in states like Tamil Nadu, Andhra Pradesh and Karnataka. This type of soil has the capacity to hold a lot of moisture.See fig2 and fig3 for clayey soil distribution.

On similar lines, Sandy soil are largely observed in arid and semi-arid regions of north-western plains and along the coastline, and also to some extent in cold desert areas of the country. These regions experience low rainfall with high temperature in summer, and low tempera- ture in winter as shown in fig4.

References

Bhuvan, Indian Geo-Platform of ISRO, Internet URL: https://bhuvan.nrsc.gov.in/bhuvan_links.php accessed on 11/09/2019.