

SOIL ANALYSIS AND MATERIALS REQUIRED FOR KANHA FOREST CREATION WORKSHOP, FEB 11 TO FEB 15, 2019.

Brief:

2 soil samples were tested from the site where the forest is being built:

- Surface soil and
- Lower level soil dug out from a depth of approximately 1 meter.

The testing procedure is explained in the following video:

[Soil Testing Procedure](http://www.preranalab.com/) (courtesy of: <http://www.preranalab.com/>)

Parameters tested

- 1) **Nitrogen** – This is a key test that indicates general nutrient level in the soil. Studies suggest that forests require a total of 43 major and micro nutrient elements. There is no way of finding and providing all of these to any forest. However, we must create a healthy soil food web so that nutrient cycling happens in a self-sustainable way. A Nitrogen test helps in assessing overall soil health since Nitrogen is a critical resource for photosynthesis and subsequent plant growth. At the molecular level, Nitrogen is a building block for chlorophyll, which explains its role in photosynthesis.
- 2) **Organic Carbon** – Organic Carbon is the measurable part of Soil Organic Matter. It is a strong indicator of nutrient availability in soil, nutrient retention capacity of soil, water retention, water infiltration and root perforation space. Since organic carbon results in increased microbial activity in soil, it also plays a crucial role in creating healthy soil aggregates and soil structure.
- 3) **Soil pH** – Soil pH indicates whether the soil is acidic, alkaline or neutral. It has an effect on nutrient solubility and availability in the soil. Availability of nutrients for plant uptake will vary depending on soil pH. However, this test is done to ensure that the soil at the site has

not been altered severely due to any effluent or waste dumping. For e.g. if soil pH of a region is naturally outside the optimal range (5.5 to 7.0), then the Potential Natural Vegetation (PNV) of that geography will certainly grow in it.

Test Results

| Site and soil | Test | Result |
|------------------|----------------|---------------------------------|
| Upper level soil | Nitrogen | 140 kg/ha i.e. very low |
| | Organic Carbon | 0.4% i.e. “medium” * |
| | pH | 6.5 i.e. ”slightly acidic” ** |
| Lower Level Soil | Nitrogen | 140 kg/ha i.e. very low |
| | Organic Carbon | 0.8 % i.e. “medium” |
| | pH | 4.5 i.e. ”very strongly acidic” |

**Desirable Organic Carbon is 2%*

*** Regions that receive good rainfall are known to develop soils that are acidic*

Important observations and conclusion:

The soil at the upper as well as the lower level has low levels of nitrogen, while the lower level soil is ‘very strongly acidic’. The question that arises is that why is the soil so acidic in nature? There could be few different reasons for it:

This area was earlier used for rice cultivation. Rice cultivators of the region use high quantities of urea. Urea itself has 46% *synthetic nitrogen* (N). When urea is applied in rice fields that are water logged, most of this nitrogen stays and settles in the soil. This means that the natural nutrient content of the soil is thrown off balance. The urea loaded soil demands excessive amounts of water as the salt dries up the land and majorly impacts aeration. As a result, the soil microbial life dies, and over the years the land becomes barren. Thus, the acidic nature of the soil is due to inorganic farming on the land in the past and is a cause of concern. Secondly, the area remains water logged during heavy rains. This could also be a reason for the acidic nature of soil.

An important observation made is that while there are native grasses and trees like *Tendu*, *Saaj*, and *Palash* growing naturally in areas that have not been cultivated in the past, the abandoned rice fields have much less vegetation. It’s also noteworthy that both these places have been equally exposed to cattle grazing.

However, the Miyawaki method coupled with traditional soil enriching techniques will provide the perfect solution to stabilise the Nitrogen and pH levels in the soil.

Physical Soil Texture Test

SOP document for the same is enclosed.

Result: The soil at the site is **Sandy Loam i.e.** the soil is predominantly Sandy with small parts of silt and clay.

Steps to be taken for soil enrichment

Considering the low levels of nitrogen, medium organic carbon, strong acidic, and sandy nature of soil, the following steps need to be taken:

1. **The soil microbiology needs to be redeveloped. This will balance the low nitrogen and acidic nature of soil and start natural nutrient cycling. Soil microbiology will be reintroduced using Jeevamrutha and Ghana Jeevamrutha. These have been taken from Dr. Subhash Palekar's 'Zero Budget Farming' methods. We have found one of Dr. Subhash Palekar's students as a local supplier for these materials.**
2. **To address excessive dryness and compaction of soil, we need to mix rice husk into the soil. This will serve three purposes. Firstly, it will create spaces between soil particles for air and water to circulate better. Secondly, it becomes food for microbes, and thirdly, it acts as a perforation material inside soil and makes root growth easier.**
3. **In order to provide a medium for healthy microbes to multiply and grow, we will mix farm yard manure into the soil. Farm yard manure or *desi* cow manure provides additional nourishment to the soil and helps in retaining moisture.**
4. **A thick mulch cover will be provided to the soil so that the soil remains protected from the sun and microbial life increases in the moisture retained. For mulching we will use rice straw.**
5. **Organic carbon will automatically increase with the addition of all the biomass.**

These materials, in combination with the diverse native root systems of the trees being planted will create healthy soil with a self sustaining soil food web. This will result in ample nourishment for the species being planted.

Materials required for soil enrichment and to achieve above mentioned goals

- 1) Rice Husk: 1000 kgs**
- 2) Farm yard manure: 2500 kgs**
- 3) Mulching Material: 1000 kgs**
- 4) Soil Microbiology Enhancer Jeevamrutha (concentrated) : 100 Liters**
- 5) Soil Microbiology Enhancer Ghana Jeevamrutha: 200 kgs**