

Standard Operating Procedure (SoP) for Afforestation by Miyawaki Method



Affores 木木
Native. Wild. Forever.



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PREFACE

Air pollution is a global crisis and high concentrations of harmful gases and particles in our atmosphere negatively affect the health of humans, animals and plants. It also causes temperatures to rise, intensifying climate change. But there's a natural remedy: forests. Trees act as the earth's purification system by absorbing airborne chemicals and releasing oxygen. To tackle global air pollution, we need to halt deforestation and plant billions of trees.

Plantation or green belt (GB) grown around the roads, factories and industrial premises improves the condition of land, mitigates air pollution as the plants serve as a sink for pollutants and check the flow of dust, etc. and also reduces the level of noise pollution.

But the challenge lies in availability of space for raising plantation and the time of establishment of plantation to control air pollution besides restoration of natural ecosystem for making the green belt or plantation sustainable. The rising air pollution levels in major cities around roads, commercial areas, industrial areas etc. may be controlled by raising plantation and green belt but space availability for raising the plantation especially inside the old unplanned settlements needs to be examined. The Miyawaki Technique is a solution for this challenge as these forests may be developed in a very short interval of time in very small spaces that are available in the cities and have found to have manifold effectiveness in control of air pollution in a very short period of time besides their strength of restoring natural ecosystems. Miyawaki forests may be developed in small vacant spaces, backyards and even in narrow roadside strips of about 4-5 meters. This method is becoming one of the most effective methods of developing micro ecosystems & micro climate in the cities having large impact in control of air pollution.

This Standard Operating Procedure (SoP) has been developed by Uttar Pradesh Pollution Control Board with technical inputs from "Afforest" (www.afforestt.com) which is a for profit social enterprise on a mission to bring back native forests. We extend our gratitude to "Afforest" for their support and joining hands for the mission of bringing back the natural ecosystems. This SoP aims at helping the Government Departments/Agencies, NGOs, Industrial Units, educational institutions to develop micro forests with an objective to control air pollution and bring back natural ecosystems around them. The comprehensive training material along with the power point presentations and video clips provided by Afforest is available on the portal <http://www.upecp.in> for further reference and Uttar Pradesh Pollution Control Board may also be contacted for any further assistance.

CHAPTER-1

1.0 Introduction to the Miyawaki Method

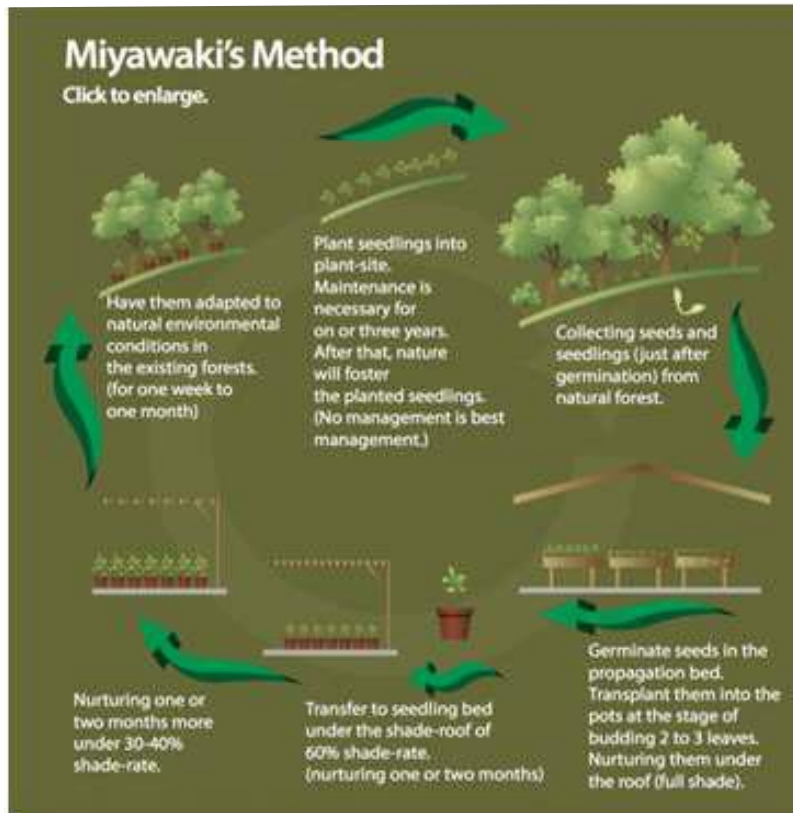
AKIRA MIYAWAKI is a Japanese botanist and expert in plant ecology, specializing in seeds and the study of natural forests. He is active worldwide as a specialist in the restoration of natural vegetation on degraded land. Since 1993, he has been Professor Emeritus at Yokohama National University and Director of the Japanese Center for International Studies in Ecology. He received the Blue Planet Prize in



2006. As a young graduate student in the late 1950s, Akira Miyawaki learned about the emergent concept of Potential Natural Vegetation (PNV). This, along with his studies in phytosociology—the way plant species interact with each other—guided his explorations of the vegetation growing throughout his native Japan. Eventually, he began visiting Shinto sites and observing their chinju no mori, or "sacred shrine forests." Miyawaki determined that these were time capsules, showing how indigenous forest was layered together from four categories of native plantings: main tree species, sub-species, shrubs, and ground-covering herbs. Using this four-category system, along with his surveys of these sites and his knowledge of PNV and phytosociology, Miyawaki designed his own system for planting forests. Miyawaki has planted over 40 million trees in this way, in 15 countries, including, especially, his own. At the age of 91 he continues to plant trees -90 million of them are slated to be put in along Japan's coast as a buffer against future catastrophic tsunami damage. And disciples like Shubhendu Sharma have emerged to pick up where he will eventually leave off.

Miyawaki is a technique pioneered by Japanese botanist Akira Miyawaki, that helps build dense, native forests in a short time.

Miyawaki method: It works like this: the soil of a future forest site is analyzed and then improved, using locally available sustainable amendments—for example, rice husks from a nearby mill. About 50 to 100 local plant species from the above four categories are selected and planted as seedlings in a random mix like you would find growing naturally in the wild. The seedlings are planted very densely—20,000 to 30,000 per hectares as opposed to 1,000 per hectare in commercial forestry. For a period of two to three years, the site is monitored, watered, and weeded, to give the nascent forest every chance to establish itself. During this early period, the plantings compete with each other for space and access to light and water—a battle that encourages much faster growth. In conventional afforestation techniques, 1 meter of growth per year is considered the norm. In the Miyawaki method, trees grow about 10 times faster. Once stabilized, the forest is left to flourish, forevermore, on its own without further interference.



It has revolutionized the concept of urban afforestation by turning backyards into mini-forests. This method includes planting trees (only native species) as close as possible in the same area which not only saves space, but the planted saplings also half support each other in growth and block sunlight reaching the ground, thereby preventing the growth of weed. The saplings become maintenance-free (self sustainable) after the first three years. The approach is supposed to ensure that plant growth is 10 times faster and the resulting plantation is 30 times denser than usual. Miyawaki method helps to create a forest in just 20 to 30 years, while through conventional methods it takes about 200 to 300 years.

The native trees of the region are identified and divided into four layers —tree species, sub species, shrubs, ground- covering herbs.

The quality of soil is analyzed and biomass which would help enhance the perforation capacity, water retention capacity, and nutrients in it, is added with it. A mound is built with the soil and the seeds are planted at a very high density — three to five sapling per square meter. The ground is covered with a thick layer of mulch.

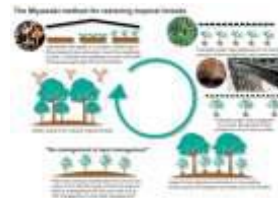


The benefits of Miyawaki Technique, a unique methodology proven to work worldwide, irrespective of soil and climate conditions. Approximately 30 times more trees planted, as compared to conventional plantation techniques. A minimum of 300% more species in the same area as compared to conventional plantation species. A substantial 3000% increase in noise and dust isolation. Up to 30 times or more carbon-dioxide absorption as compared to conventional forest. A completely maintenance free, wild and native forest after the first three years. A completely chemical-fertilizer free forest that sustains itself and supports local bio-diversity.

1.1 Why to Adopt Miyawaki Method

SMART

Selection of plant species based on soil climate and usage; plantation techniques allowing for 10x faster growth.



MODULAR

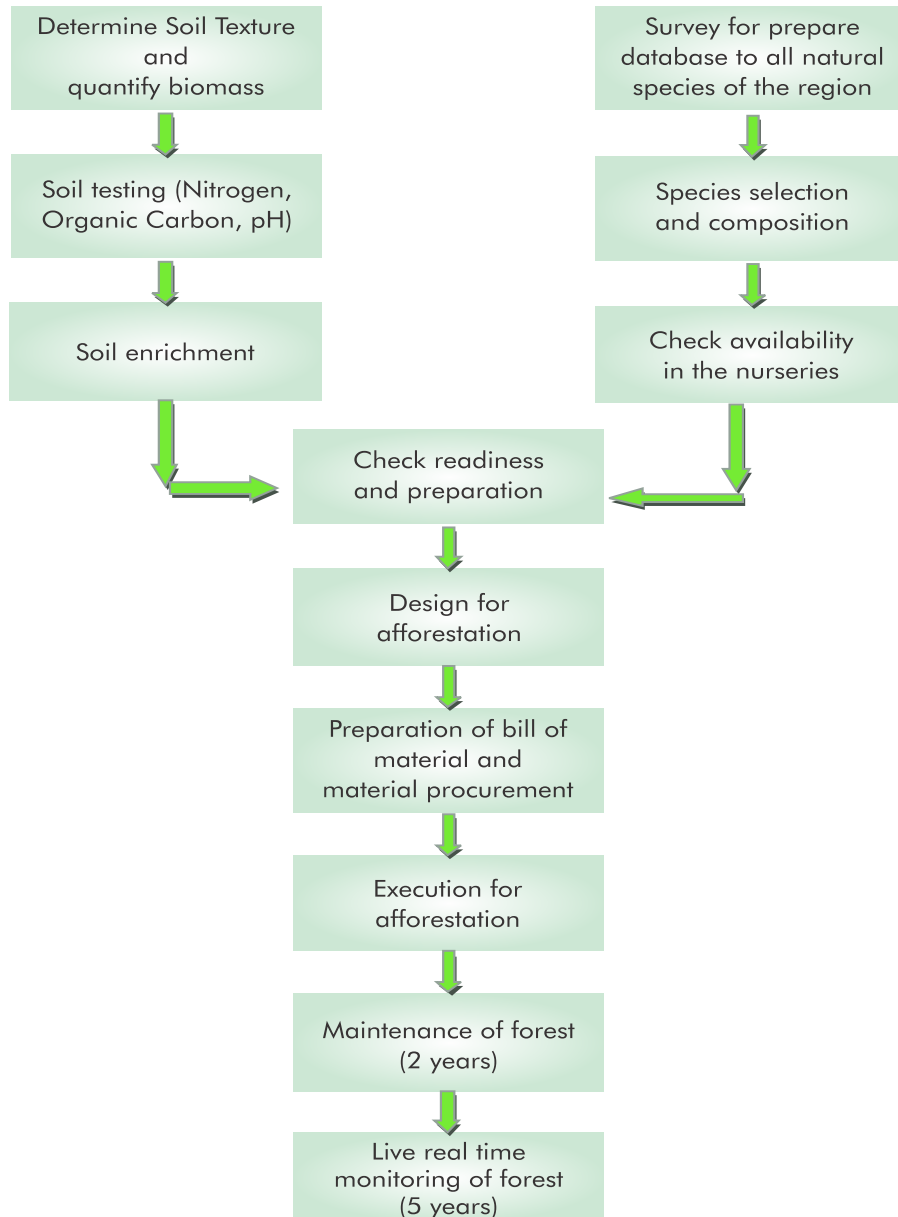
Customized modern day plantation that can be modified and inserted in everyday spaces available around us.

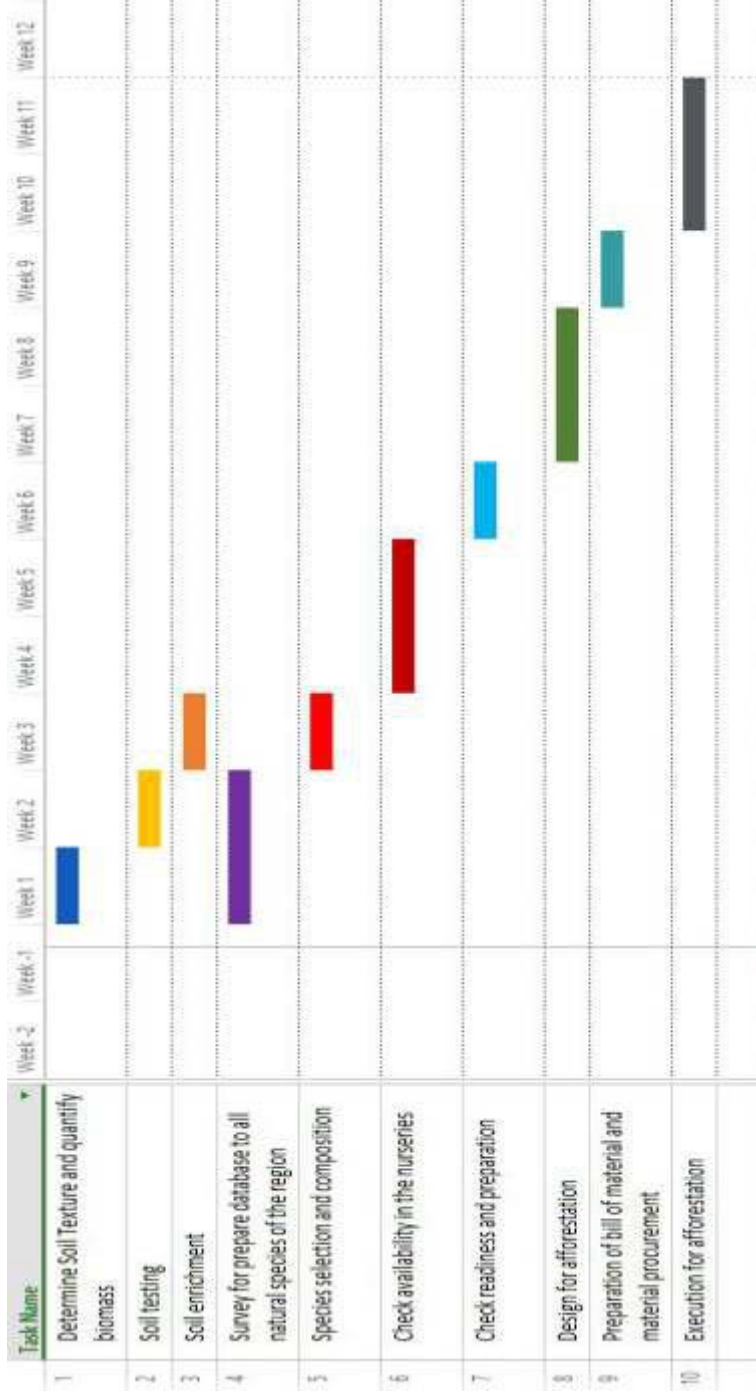
SUSTAINABLE

No maintenance required after 2 years; bio-diverse plantations enabling ecosystem of birds and butterflies.



1.2 Steps for Development of Miyawaki Forest





Gantt Chart for Miyawaki's Afforestation

CHAPTER-2

2.0 Species selection

| Species selection | |
|---|--|
| How to select species for forest creation. | |
| Step1 | Make a database of all native species in the forest in your region. Ask the elderly persons, find mention in local literature-songs etc. The People Bio-diversity Register (PBR) prepared by local bodies (urban & rural) may be referred for making the database of native species. The format for preparation of PBR is annexed as Annexure-III. |
| Items in database: | |
| Botanical Name: | The scientific name of the tree. Sometimes you may find more than one scientific name of the tree. Use the latest & most commonly used scientific name in this case. |
| Common Name in Local Language | List down what these trees are called locally. It will be most useful during procurement. |
| Other common names | List down other common and/or English names. |
| Advantage: | A tree can have various advantages - fruit, bird-attracting, flowering, wood, medicinal. |
| Height and Layer: | Find the highest recorded height of each species in the region. |
| | Assign layers: This will be a multi-layered forest. Every species will fit into one of the following layers: |
| | Shrub Layer (S): This is the layer above grasses and small herb/flowering plants. The minimum height is usually 1 to 2 meters. |



| | |
|--------------|--|
| | Small/mid/moderate sized Tree Layer (T2): Trees which are taller than humans but are still small in comparison to other more dominant trees found in the forest. |
| | Tall Tree Layer (T1): More common taller trees based on average height of trees in your geography. |
| | Canopy/Emergent Tree Layer (T1): Trees that grow into giants. These are the tallest trees in the local forest. Also known as the emergent layer. |
| | Fix the layers based on the height range of trees. |
| | For e.g., in more humid/tropical parts of India, the tallest tree grows up to 50 Meters. Shrub Layer S = 1 Meters, |
| | T2= 4-15 Meters, T1 tall= 15-35 Meters, T1 canopy/emergent = more than 35 Meters |
| Step2 | Check the native species saplings availability in the nursery on following criteria. |
| | Bag Size 6X4, 4X4, 6X6, 6X8, 8X7, 8X8, 8X7 (inches). |
| | Age of sapling 1 years - 2 years. |
| | Height of sapling 1.5 feet - 3 feet. |
| | Health Strong, sturdy, upright main stem. |

| | | |
|--|---|---|
| Step3 | Assigning Percentages to available species. | |
| | Major Species | Choose 6-7 different species to be the "major" forest species. These should be the species that you commonly find in your local forest/region. Assign 5% to 6% to each of them. This will constitute 30%-40% of the total number of trees in the forest. |
| | Supporting Species | Assign 2% to 3% to other common species of the area. These will constitute 25%- 30% of the forest. |
| | Minor Species | Assign less than 2% to other native species of the area.* |
| Percentage correction Tweaking the percentage distribution based on categorical subtotals | | |
| Layer wise distribution: | | |
| Subtotal of each layer should vary between the following range (subject to change depending on local forest conditions): | | |
| Shrub (S) : 15% to 20% | | |
| Small/mid/moderate sized (T2) : 40% to 45% | | |
| Tall/emergent (T1) : 40% to 45% | | |

| S. No. | Botanical Name | Local Name (Telugu and Sanskrit) | Some other common local names | Advantage | Layer | Availability | Percentage | Quantity |
|--------|---------------------|----------------------------------|-------------------------------|--|---------------------------------|--------------|------------|----------|
| E.g. 1 | Bauhinia racemosa | Aare, Arechettu | Apta | Hard and strong wood. Leaves sometimes used to wrap beedis. | T2 - Small/ mid/ moderate sized | Yes | 3 | 48 |
| E.g. 2 | Bombax ceiba | Buruga | Red Silk Cotton, Kate sawar | Beautiful Flowers. It attracts the large Indian rock bee Apis dorsata. | T1 - Tall/ emergent | Yes | 6 | 96 |
| E.g. 3 | Dalbergia latifolia | Iruguducettu | Malabar rosewood, Shisam | Timber: Soil enriching. | T1 - Tall/ emergent | Yes | 2 | 32 |
| E.g. 4 | Pavetta crassaulis | Papidi | Phapat | Medicinal. Lovely white flowers. | Shrub | Yes | 0.5 | 10 |

2.1 The Whispering Trees

Trees also communicate through the air, using pheromones and other scent signals. Peter Wohlleben in his book "The Hidden Life of Trees" gives his favorite example occurs on the hot, dusty savannas of sub-Saharan Africa, where the wide-crowned umbrella thorn acacia is the emblematic tree. When a giraffe starts chewing acacia leaves, the tree notices the injury and emits a distress signal in the form of ethylene gas. Upon detecting this gas, neighboring acacias start pumping tannins into their leaves. In large enough quantities these compounds can sicken or even kill large herbivores.

Giraffes are aware of this, however, having evolved with acacias, and this is why they browse into the wind, so the warning gas doesn't reach the trees ahead of them. If there's no wind, a giraffe will typically walk 100 yards- farther than ethylene gas can travel in still air-before feeding on the next acacia. Giraffes, you might say, know that the trees are talking to one another.

Trees can detect scents through their leaves, which, for Wohlleben, qualifies as a sense of smell. They also have a sense of taste. When elms and pines come under attack by leaf-eating caterpillars, for example, they detect the caterpillar saliva, and release pheromones that attract parasitic wasps. The wasps lay their eggs inside the caterpillars, and the wasp larvae eat the caterpillars from the inside out. "Very unpleasant for the caterpillars," says Wohlleben. "Very clever of the trees."

Bala Qila, a historic fort situated in the town of Alwar and built in 15th century and has been famous for its big cats including tigers and leopards along with other wild fauna.

This fort of crucial importance both politically and ecologically is situated in the one of the world's oldest folded mountain ranges.

Aravali mountain ranges extending from Gujarat to Delhi are also one the most sensitive ecological zones and home unique tropical dry land forests (Trees of Central India).



2.2 Anogeissus Pendula

It is dominant species and constitutes about 80% of the vegetation cover and found on hill slopes and valleys and maintains luxuriant growth due to better soil formation and water holding capacity. The leaves of the Dhok trees form a favorite diet for the Deer, Nilgai and Antelope. Its height is



approximately 10-15 meters. The growth of Anogeissus pendula is generally stunted on plateaus where the residual soil is poor and shallow. It is also considered as the one of the toughest wood in the country earlier used to make farm instruments and furniture. A small tree, bark is smooth grey, silver white often with shallow fissures when old. Leaves elliptic, acute and narrow at the base, silky on both surfaces. Fruit small, one seeded with two wings, and a short beak at the apex.

The Dhok is a natural mono-culture, a specialist in surviving and germinating in rocky places. Basically, they send underground runners, so you have another tree coming up a little distance away, which means you could, theoretically, have a forest of several acres. And if the leaf is nibbled when young you get a growing shoot called a meristem that grows into side-shoots. So you can get an old Dhok that is only several feet high but spreads over the rocks like a mat. Its bark yields a gum called gatti or Indian gum. The main value of the tree lies in its afforestation purposes for afforesting the semi- rocky and rocky terrains of arid regions.



2.3 Holoptelea Integrifolia



English: Indian Elm, Kanju, Jungle cork tree
Hindi: Kanju, Papri, Bandarroti, Chilbil tree

Indian Elm is a large deciduous tree, growing up to 18 m tall. It has yellowish grey bark, covered with blisters, peeling in corky scales on old trees. Alternately arranged leaves are elliptic- ovate, smooth, with entire margins, and a pointed tip. Its flat winged seeds are often seen being feasted by monkeys, hence the name Bandar roti, these are also edible for humans.

It is one the dominant species found in this part of forests. Spread across through the Asian continent. This tree has been of much importance since time immemorial. It is traditionally used in the treatment and prevention of several ailments like leprosy, inflammation, rickets, leucoderma, scabies, rheumatism, ringworm, eczema, malaria, intestinal cancer, and chronic wounds.



2.4 Balanites Aegyptica Tree

It can be found in many kinds of habitat, tolerating a wide variety of soil types, from sand to heavy clay, and climatic moisture levels, from arid to sub-humid. It is relatively tolerant of flooding, livestock activity, and wild fire.



The *Balanites aegyptiaca* tree reaches 10 m in height with a generally narrow form. The branches have long, straight green spines arranged in spirals. The dark green compound leaves grow out of the base of the spines and are made up of two leaflets which are variable in size and shape. The fluted trunk has grayish-brown, ragged bark with yellow-green patches where it is shed.

Easily adapted to variety of soil, Hingot tree remains stunted in rocky slopes but can survive in rocky terrains too. The fruit of this plant is used medicinally in India. It contains a principal closely resembling saponin. The ripe seed yield about 50 percent of a fixed oil. Fruits are feasted happily by hornbills.



2.5 Bauhiniaracemosa/Bidileaftree/Aaptatree

Bidi Leaf Tree is a small crooked tree with drooping branches, growing up to 3-5 m tall. Leaves are typical Bauhinia like, shaped like cow's hooves. It is a rare medicinal tree which can grow in poor & very harsh climatic conditions.

The deciduous tree is propagated easily from seed (In Rajasthani and Maharashtrian families it is customary to exchange leaves of the Aapta tree on the Hindu festival day of Dussehra). An act known as exchanging Gold pointing to the special significance of the plant on that particular day. This is also why the tree is often referred to as Sonpatta (literal translation: leaves of gold)



2.6 Boswellia Serrata/Indian Frankincense (Hindi: Salai)

Boswellia serrata is a plant that produces Indian frankincense, Salai, referred to in Sanskrit as shallaki and in Latin as Olibanum Indicum. The plant is native to much of India and the Punjab region.





It is a deciduous tree endemic to India and has been recorded on dry hills and slopes, on gravelly soils between an altitude range of 275-900 m. It is a medium sized tree, 3-5 m tall, with ash colored papery bark. It is used in Ayurveda since time immemorial and its gum resin is used in making several medicines.

2.7 Khair/Acaciacatechu



Senegalia catechu is a deciduous, thorny tree which grows up to 15 m (50 ft) in height. The plant is called khair in Hindi. The tree's seeds are a good source of protein. Kattha (catechu), an extract of its heartwood, is used as an ingredient to give red color and typical flavor to paan.

This tree is deciduous and has short hooked spines that reach up to the height of 9 to 12 meters. The leaves of this tree are bipinnately compounds with almost 50 pairs of leaflets which look like feathers.



The bark of the tree is grayish brown in color that exfoliates into long and narrow strips. The flowers of the plant are pale yellow in color and have cylindrical spikes. The flattened and glabrous fruit of the plant have oblong pods. The sapwood of *Acacia catechu* is whitish yellow in color.

2.8 Lanneacoromandelica/Indianashtree (Hindi: Mohin, Shemat)



A deciduous tree, growing up to 14 m tall. Branchlets are minutely covered with starry hairs and flowers from January to March.

The bark has astringent properties and is used to cure sprains, bruises, skin problems, dysentery, etc in traditional medicine. A gum called Jingani gum comes from the bark. It is known as moya in English and mohin in Hindi.



CHAPTER-3

3.0 Determine Soil Texture and Quantify Biomass

WHAT

Soil Texture is the composition of soil in relation to Sand, Silt and Clay, with sand being the coarsest fraction and clay being the finest.

WHY

The soil texture will help us determine the following properties of the soil:

- ◆ Water holding capacity
- ◆ Water infiltration
- ◆ Root perforation capacity
- ◆ Nutrient retention
- ◆ Erodibility

WHO

Forest Creators

WHEN

Pre-execution of technical work

3.1 How to Test Soil-Texture

There are two common ways to test the soil (www.upecp.in/TrainingSession.aspx):

- a) Test the sample by yourself method. Steps of testing method given below:
 - I. Hold the soil in your hand.
 - II. Push it together to break it into smaller pieces.
 - III. Anything that is more than 2 mm in size (rocks etc.) should be removed.
 - IV. Make sure you have a palm full of soil.
 - V. If the soil is dry, then add a little bit of water

VI. Work it between your hands to form a nice moist ball.

VII. Make sure that you don't make it too wet, but you need it to come together nicely.

VIII. While you form the ball, if there is sand in the soil, then you can mostly see and feel the coarse sand.

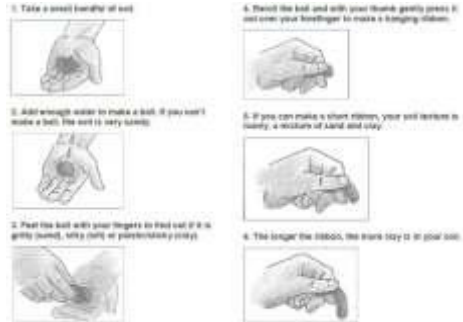
IX. If there is fine sand in it, then you can hold the ball close to your ear and hear it grinding together when you play with the ball in your hand.

X. If its clay, then it feels like plasticine, very sticky. The ball holds together nicely.

XI. If it has silt, then it stains your hand, and it feels silky.

XII. After you have a rough idea of the type, then form a ribbon.

XIII. Determine exact soil type using ribbon test chart (annexed as annexure -IV)



b) Soil Texture By Feel

I. Get a palm full of soil, make it wet and knead it thoroughly.

II. Knead the soil to break down all aggregates.

III. Try to form a ball.

IV. If you cannot form a ball then the soil is Sandy.

V. If you can form a ball then it is some other soil type.

VI. Make soil ribbons and let them break under their own weight.

VII. If you are unable to form ribbons, then the soil is Loamy Sand

VIII. If it forms ribbon - then it is some other soil type

IX. If the ribbon formed is ≤ 2.5 cm ribbon, then it some kind of Loam



- soil. To determine the type of Loam soil, here's the test:
- a. Place some soil in your palm
 - b. Make it excessively wet
 - c. Rub it thoroughly with your forefinger
 - d. Check whether it feels 'Gritty' or 'Smooth'
 - e. Does it feel Smooth like flour, Gritty like Sugar or Gritty like Sand?
 - f. Very Gritty - Sandy loam
 - g. Very Smooth - Silt Loam
 - h. Neither Gritty Nor Smooth - Loam
- X. If the ribbon formed is 2.55 cm, then it some kind of Clay Loam soil. To determine the type of Clay Loam soil, here's the test:
- a. Place some soil in your palm
 - b. Make it excessively wet
 - c. Rub it thoroughly with your forefinger
 - d. Check whether it feels 'Gritty' or 'Smooth'
 - e. Does it feel Smooth like flour, Gritty like Sugar or Gritty like Sand?
 - f. Very Gritty - Sandy Clay loam
 - g. Very Smooth - Silt Clay Loam
 - h. Neither Gritty Nor Smooth - Clay Loam
- XI. If the ribbon formed is ≥ 5 cm, then it some kind of Clay soil. To determine the type of Clay soil, here's the test:
- a. Place some soil in your palm
 - b. Make it excessively wet
 - c. Rub it thoroughly with your forefinger
 - d. Check whether it feels 'Gritty' or 'Smooth'
 - e. Does it feel Smooth like flour, Gritty like Sugar or Gritty like Sand?
 - f. Very Gritty - Sandy Clay
 - g. Very Smooth - Silty Clay
 - h. Neither Gritty Nor Smooth - Clay

3.2 What to add to the soil



Perforator materials: It help to improve perforation and allow roots to grow quickly. For this, we can use biomass that is spongy and dry in nature. Husk is a by-product and easily available at grain mills and animal feed stores. Other options include: Rice husk, wheat husk, corn husk (chipped) or groundnut shells (chipped).

Water retainer: It helps soil retain more moisture and water, as compared to its natural water retention capacity. Natural materials such as coco-peat or dry sugarcane stalk can be used. A good test is to dip the material into water for some time, and take it out and squeeze. If water oozes out during squeezing, then the material can be used as water retainer.

Nutrient materials: Organic fertilizers are required for nourishment. Different materials can be used depending on region and availability, such as cow manure, goat manure or vermi-compost. Compared to vermi-compost, manure is a slow nutrient-releasing plant fertilizer. Manure provides small amounts of nutrients over an extended period, whereas vermi-compost gives high doses of nutrition initially but very little later on.

Mulch: Mulch insulates and protects the soil. It prevents sunlight from falling directly on the soil. Direct sunlight will make soil dry and make conditions difficult for the young saplings. This is especially important in the first 6-8 months, as the plants are young. Mulch also plays a huge role in preventing water from evaporating (Options include bagasse, rice straw, wheat straw, corn stalk or barley stalk).

| Soil Type | Existing water Retention Capacity | Existing Perforation Capacity | Water Retention Material (Quantity required) Kg/Sq Mtr | Perforation material (Quantity required) Kg/Sq Mtr |
|------------------|--|--------------------------------------|---|---|
| Sandy | Low | High | 8 | 4 |
| Loamy Sand | Medium | High | 6 | 4 |
| Sandy Loam | Low | High | 8 | 4 |
| Silty Loam | Medium | Medium | 6 | 6 |
| Loam | High | High | 5 | 5 |
| Sandy Clay Loam | Medium | Medium | 6 | 7 |
| Silt Clay Loam | Low | Medium | 7 | 6 |
| Clay Loam | Low | Medium | 7 | 6 |
| Sandy Clay | Low | Low | 7.5 | 7 |
| Silty Clay | Low | Low | 8 | 8 |
| Clay | Low | Low | 9 | 10 |

| Nitrogen | Organic Carbon | Fertilizer Quantity required) Kg/Sq Mtr |
|-----------------|-----------------------|--|
| Very High | Very High | 3 |
| High | High | 4 |
| Normal | Normal | 5 |
| Less | Less | 6 |
| Very Less | Very Less | 6.5 |

3.3 Jeevamrutha

Jeevamrutha is a highly nutritious organic fertilizer. It is an excellent fertilizer in liquid form containing nitrogen, phosphorus, potassium and many other important essential nutrients. It adds organic matter to the soil which improves soil structure, aeration, soil moisture-holding capacity, and water infiltration.



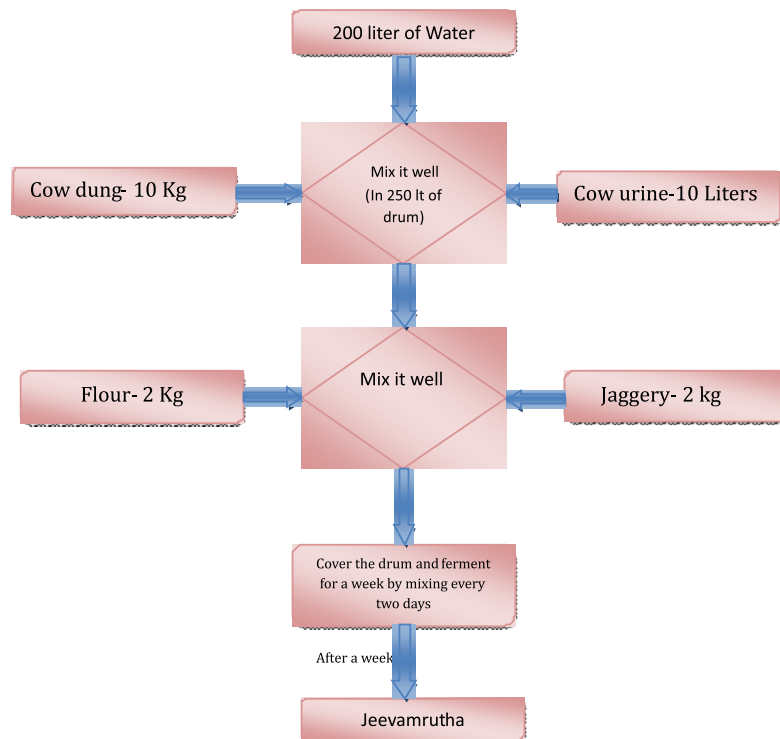
Preparation method of Jeevamrutha (For 200 liters)

Material required:

- a) Cow dung- 10 Kg
- b) Cow urine- 10 Liters
- c) Black Jaggery- 2 kg
- d) Basan (Chick Pea Flour)- 2 Kg
- e) Plastic Drum- 200 Litres Capacity

Method of preparation:

First of all take 200 litres of water in the drum & add 10 kg of cow dung, 10 liter of cow urine and mix it well then add powdered jaggery and chick pea flour, mix it well. Cover the drum with jute bag and let it ferment for a week by mixing it every two days. This mixture can be used within 2-3 days of mixing. After a week, the microbes develop in the mixture which can be used with irrigation water, sprinkler system or drip system.



Dosage of Jeevamrut:

200 Litres is applied per acre through irrigation water or direct soil application.

3.4 Example: To Determine Soil Texture and Quantify Biomass

Soil Analysis and Material Required For Soil Nourishment for Forest Creation at Alaap, Uttarakhand

Brief:

2 soil samples were collected and tested from the site where the forest is being built i.e.:

- ◆ Sample 1
- ◆ sample 2



Sample checking and collection:



Sample (Physical Texture Test):
Sample was being tested by physical texture test method

Parameters Tested

- 1) Nitrogen** - This is a key test that indicates general nutrient level in the soil. Forest creation requires a total of 43 major and micro nutrient elements. A Nitrogen test helps in assessing overall soil health since Nitrogen is a critical resource for photosynthesis and subsequent plant growth.
- 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 the acidity or alkalinity in soil. It specifically affects nutrient solubility and availability in the soil. Availability of nutrients for plant uptake will vary depending on soil pH. Healthy soil has a balanced range between the sour/acidic range and the sweet/alkaline range. Acidic soil is mostly found in places with abundant rainfall, while alkaline soil is common in regions that receive less rainfall.

Test Result:

| Sample 1 | Result |
|--------------------------|--------------------------------------|
| Available Nitrogen | Less than 140 kg/Ha i.e. "very less" |
| Available Organic Carbon | 0.4%-0.6% i.e. "medium" |
| pH | 4.5-5.0 i.e. "medium high acidic" |

| Sample 2 | Result |
|--------------------------|--------------------------------------|
| Available Nitrogen | Less than 140 kg/Ha i.e. “very less” |
| Available Organic Carbon | 0.4%-0.6% i.e. “medium” |
| pH | 5.0-5.5 i.e. “medium acidic” |

Other Important Findings and Observations

The soil pH is acidic. The optimum pH range for most plants is between 5.0 and 7.0. This is expected in regions - that receive abundant rainfall.

Steps to be taken for soil enrichment (www.upecp.in/TrainingSession.aspx):

Considering the low nitrogen and medium organic carbon levels and loamy soil texture, the following soil properties need to be considerably enhanced:

- 1) Increase Soil's capacity to retain and circulate more oxygen and water within itself by adding natural perforation and water retention materials.
- 2) Increase available nutrition in the soil using farmyard manure, and by adding other organic material such as mulch.
- 3) Increase root perforation (using husk) which otherwise might get affected due to compaction.
- 4) Treat soil acidity by increasing microbial activity or soil organisms (bacteria, fungi, nematodes, protozoa, micro arthropods, macro arthropods etc.). This will be done using soil microbiology enhancer, Jeevamrutha (cow dung+ cow urine+ pulses+ jaggery+ healthy top soil).

Materials required for soil enrichment and to achieve above mentioned goals:

For 200 square meters .i.e. area being designated for forest creation, we will require:

1. Shredded grass (1200 kg)
2. Farmyard manure (3000 kg)
3. 150 liters of Jeevamrutha
4. Mulch (1000 kg)



CHAPTER-4

4.0 SoP for Site Readiness & Preparations

4.1 Physical Project Execution Readiness Check

WHAT

A site visit is a physical inspection or survey of the prospective site being considered for forest creation.

WHY

A site visit helps in determining feasibility and scope of being able to plant a forest on the prospective site. It will help the creators of the forest assess the prospective site on key parameters that need to be fulfilled under pre project preparations.



WHO

The site should first be visited by the owners of the land. This sometimes becomes important when the owners have been living away from the site and are not aware of actual conditions on ground. For e.g. the approach road to the site might be blocked and needs to be fixed before planning afforestation. The site should then be visited by the forest

creators.

WHEN

This is the very first step.

HOW

- 1) Go to the site and take pictures of the proposed afforestation area.
- 2) Check the site for Afforestation Readiness by confirming the availability of.
 - ◆ Fencing
 - ◆ Maintenance Staff
 - ◆ Running Water
 - ◆ Sunlight
 - ◆ Underground pipelines etc.



4.2 Debris and Weeds Cleaning Of the Entire Area

WHAT

The property selected for afforestation should not have wild grass, weed etc. growing. If there is any such growth then it should be cleared

WHY

A site with wild weed and grass growing everywhere will have the following negative impacts:

- ◆ The weed/grass will spread on to the forest and jeopardize the health of the forest
- ◆ Storage and movement of material will become difficult
- ◆ People working on-site (workers and machine drivers) are prone to injuries by thorns etc.



WHO

Labor should be hired for this or the area could be voluntarily cleared. If the site is huge, then a JCB or a John Deere tractor's bucket is also effective.

WHEN

Essential part of pre execution area preparation

HOW

Clearing out should be done manually or with machine. Remember the following:

- ◆ The weeds being pulled out should be thrown away from the site or else it tends to re-grow.
- ◆ Weed growth is not greenery. Weeds take away nutrition from the soil. Soil needs a proper forest cover, for it to remain healthy and nutritious. Wild undergrowth in a forest should not be confused with wild weed growing across a property that has been left unchecked.



4.3 Watering Facility Installation

WHAT

Plumbing work for watering the forest.

WHY

To water the forest everyday for 2-3 years.

WHO

Professional Plumbers

WHEN

Immediately after the master plan is finalized.

HOW

The forest needs to be watered the old fashioned way using a hosepipe with a shower. Hence, watering has to be done manually. Do not try drip irrigation, sprinklers, flooding etc.



4.4 Physical Demarcation of Areas

WHAT

Marking of the actual afforestation area as per the master plan.

WHY

For the machinery to begin the earthwork, it needs to be given an exact area to work on.

WHO

Project Execution team.

WHEN

Before the start of earthwork.

HOW

Ensure that the area being marked matches 100% with the master plan. Ensure that you have the CAD drawings with you during the physical demarcation exercise. The CAD drawings will give the exact dimensions and mound designs.



A simple way of physically demarcating is with limestone powder. However you might want to look into options such as wooden pegs and ropes used in combination. Measurement is the key and hence having a good measuring tape is very important. Make sure every measurement taken during the demarcation exercise, matches with the AutoCAD drawings. Typically, it takes 3-4 people to measure and demarcate effectively.

Once demarcated, always double check and verify that the markings and measurements are right.

Mark all the areas drafted on afforestation Execution design.

4.5 Installing Area Identification Boards for the Site

WHAT

There are several important areas on site, apart from the one where the actual forest is being created. We must install identification and direction boards/signage for the same.

WHY

It is easy to feel lost when one is looking for a specific area on the property during forest creation. These signages will help people save time.

WHO

Signage should be made in-house by the owners. Installation should be done by the creators. Check illustration as example.



WHEN

Essential part of pre execution area preparation

HOW

Get the following signage made and installed:

- | | |
|-------------------------------------|------------------------------------|
| 1) Arrows | 7) Toilets for labour |
| 2) Sapling storage area | 8) Resting Sheds |
| 3) Biomass storage area | 9) Drinking water and refreshments |
| 4) Mulch Storage area | 10) Meeting space |
| 5) Other Consumables | 11) Forest |
| 6) Tools and equipment storage area | |

*** Please check the CAD drawings and do a physical check before installing the boards.**

4.6 Making Approach Road to and From Marked Areas

WHAT

Making roads and pathways as per the execution drawing.

WHY

To move materials, people and vehicles in and around site.

WHO

Earthmovers

WHEN

Before material procurement.

HOW

On sites that have been lying vacant for too long, path making to and from the unloading area is only about clearing out all the weed growth. Additionally, one needs to keep in mind that trucks and tractors have enough space on the paths to drive. If the path is just earth/soil, then make sure that it does not have big rock boulders and stones. This ensures safety. The path could be gravel, sand, soil, stone paved or tar.



4.7 Mound Identification Boards on Site

WHAT

As explained earlier, forest creation happens on mounds. Once the earthwork is done, what we create is a 'mound' on which the actual plantation happens. Each mound to be dug up and planted should have a serial number.

WHY

A unique serial number given to each mound will help in the following ways:

- ◆ It will give us the order in which the areas demarcated need to be dug out
- ◆ It gives us the order in which the mounds are created and planted upon. This gives the exact age of each mound. This helps in tracking growth and survival with start date indicated by the number given to the mound.

WHO

Signages should be made in-house by the owners. Installation should be done by the creators.

WHEN

Essential part of pre execution area preparation



HOW

Here's how this needs to be done:

- 1) Each mound typically is 100 square meters. Once demarcated for digging, it should have a board/signage next to it with its serial number.
- 2) This is the order that needs to be followed in earthwork and plantation.
- 3) Remember that when the earth is dug out, all the soil is dumped next to the trench. Do not start digging work in front of this trench, unless the plantation for it completes. Any digging in front will block access to the original trench. Thus, in this case, digging work for the second mound should begin only when the first one has been planted so that compaction is avoided.



CHAPTER- 5

5.0 Design For Afforestation

5.1 Master Plan

WHAT

A master plan clearly indicates the area designated for afforestation.

WHY

The total area for afforestation (in Sq. Mtrs) is to be precisely calculated in order to determine the amount of material required.

WHO

Chief Architect of the project.

WHEN

Before we start project preparation.

HOW

Provide the essential requirements of afforestation to the architect and get the area sketched on the master plan. The essential requirements are:

- 1) Ideally, the Forest should be at-least 4 meters wide for maximum impermeability.
 - ◆ The minimum width needed for Miyawaki Method of afforestation is 3 meters. However, for best results, the 'recommended' width is 4 meters.



5. 2 Watering Plan

WHAT

Water pipeline layout in order to water the forest.

WHY

For first two-three years, the forest has to be watered regularly.

WHO

Client's architect or Afforestt's recommended designer will do the pipeline design.

WHEN

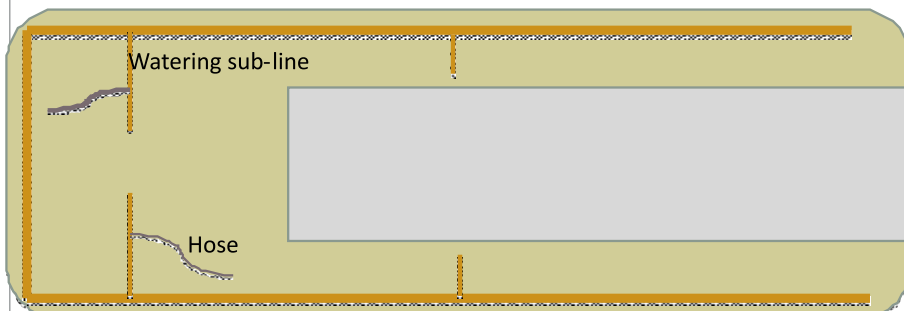
Before we start project preparation.

HOW

A main line has to be designed based on daily water requirement for the entire area, backed by bore wells and overhead tanks.

Essential requirements are:

- 1) The watering facility design has to be made with a main line with watering outlets for hoses, which can reach the entire area of the forest.
- ♦ Main line capacity has to be ' $W \times A$ ', where A is Afforestation area in sq. mtrs and W is watering requirement in liters per sq. mtrs per day.



5.3 Project Execution Planning

WHAT

Design for facilities for project execution.

WHY

To complete the execution without compromising on quality standards and for ease of operation.

WHO

Client's architect or Afforestt's recommended designer along with an Afforestt consultant.

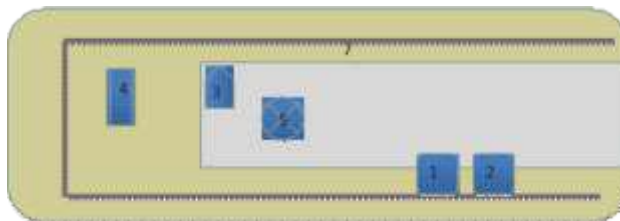
WHEN

Before we start project preparation.

HOW

Design the following spaces in AutoCAD on the master plan file:

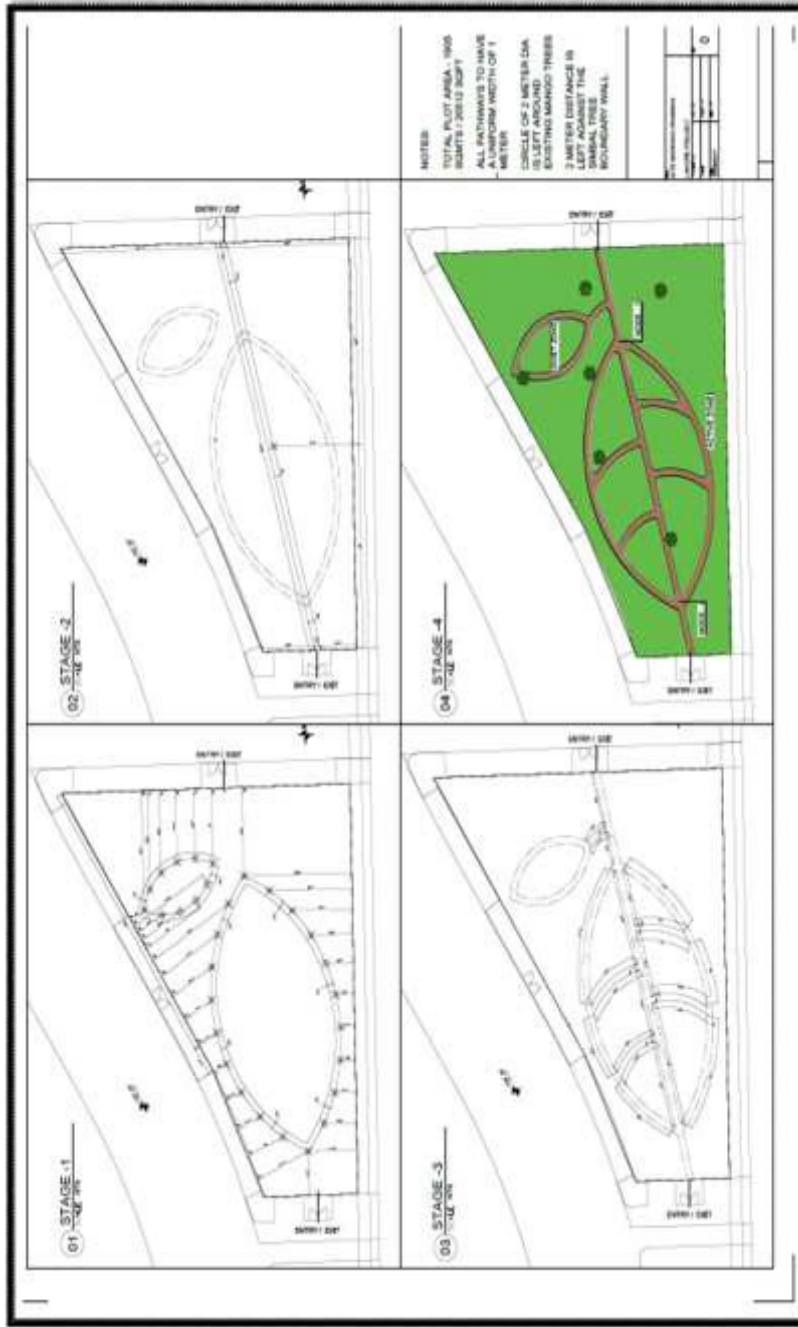
- 1) Material storage area
 - ◆ It has to be 10% of the total afforestation area. One material storage area for every 4,000 sq. mtrs of afforestation area is required.
 - ◆ Has to be within close proximity of the site.
 - ◆ Approach road from storage area to afforestation area is essential.
- 2) Saplings storage area
 - ◆ It has to be 5% of the total afforestation area. One saplings storage area for every 4,000 sq. mtrs of afforestation area is required.
 - ◆ Has to be within close proximity of the site.
 - ◆ Approach road from storage area to afforestation area is essential.
- 3) Site office
 - ◆ Should have easy access to the entire afforestation area.
 - ◆ Should have road connectivity to the entrance of the property.
- 4) Resting area for the labor
 - ◆ Covered area with drinking water facility and sitting area for meals.
 - ◆ Should have washing area and toilets.
- 5) Tools and equipment storage area
 - ◆ Protected from rain and wind.
 - ◆ access to designated personnel only.
- 6) Approach roads to the afforestation area for earthmover access
- 7) Approach roads to the material storage area and saplings storage area with truck access



Example-Project site image



Example-Project site design



Example Project site Design-



CHAPTER- 6

6.0 Sample Site- Bill of Material (B.O.M.)

(www.upecp.in/TrainingSession.aspx)

| 6.1 Site Preparations for Forest Creation | | | | | |
|---|---|------------------------|-------------------------|-------------------------|----------------------|
| Site Collaboration | Name- Nahar BMC | Forest Making Location | Nahar Group, Chandivali | GPS | 19.109303, 72.899898 |
| Area (m ²) | 20000 | No. Of Days | 20 | No of Workers | 15 |
| Sl | Item | Quantity per Meter Sq | Unit | Total quantity required | Unit Qty Per day |
| Facility-Moveable (for site cleaning, nursery set up, area preparations- sapling stocking and material stocking areas, pruning, de-weeding etc.) | | | | | |
| 1 | Earthmover (JCB) | 0.01 | Hours | 200 | 10 |
| 2 | Unskilled Manpower (with same tools and workwear as forest creator) | 0.02 | Man days | 300 | 15 |
| 3 | Vehicle for transportation (tractor with tipper trolley) | 0.01 | Hours | 200 | 10 |

| Bill of Materials Forest Creation, Nahar BMC Collaboration | | | | | | |
|--|--|----------------------------------|----------------------|-------------------------|------------------|--|
| Forest Making Location | Nahar Group, Chandivali | GPS | 19.109303, 72.899898 | No. of execution days | 100 | |
| Area (m ²) | 20000 | Density (Plants/m ²) | 3.1 | No of Workers | 30 | |
| SI | Item | Quantity per Sq Meter | Unit | Total quantity required | Unit Qty Per day | |
| Facility/Movable | | | | | | |
| 1 | Earthmover (JCB) | 0.10 | Hours | 2,000 | 20 | |
| 2 | Semi Skilled Manpower for all earthwork and forest creation activities | 0.15 | Man days | 3,000 | 30 | |
| 3 | On site Vehicle/Tractor for transportation (tractor with tipper trolley) | 0.10 | Hours | 2,000 | 20 | |
| Materials- Consumables | | | | | | |
| 1 | Soil Perforation Material (e.g. Husk) | 7.00 | Kg | 1,40,000 | 1,400 | |
| 2 | Soil Water Retention (e.g. cocopeat) | 9.00 | Kg | 1,80,000 | 1,800 | |
| 3 | Nutrition and Soil Microbiology Medium (e.g. FYM) | 10.00 | Kg | 2,00,000 | 2,000 | |
| 4 | Soil Microbiology Enhancer 1 - Jeevamrit (Liquid concentrated) | 0.60 | Liters | 12,000 | 120 | |
| 5 | Soil Microbiology Enhancer 2 - Ghan Jeevamrit | 0.50 | Kg | 10,000 | 100 | |
| 6 | Mulching Material for Forest Floor (e.g. Paddy Straw) | 5.00 | Kg | 1,00,000 | 1,000 | |
| 7 | Saplings | 3.10 | No. | 62,000 | 620 | |
| 8 | Marking powder | 0.10 | Kg | 2,000 | 20 | |
| 9 | Safety poles to secure mound edges (Bamboo) | 0.06 | No. | 1,200 | 12 | |
| 10 | Red Hill Earth | 0.03 | CuM | 500 | 5 | |
| 11 | Support Sticks (Bamboo) | 3.10 | No. | 62,000 | 620 | |
| 12 | Jute Strings for Support Sticks | 1.00 | Meters | 20,000 | 200 | |
| 13 | Pegs to tie down the mulch (Bamboo) | 0.40 | No. | 8,000 | 80 | |
| 14 | Coir Rope for mulch and mound securing | 2.00 | Meters | 40,000 | 400 | |
| Material-Tools | | | | | | |
| 1 | Plastic Cutter | | Numbers | 50 | | |
| 2 | Crowbar (Sabbal) | | Numbers | 50 | | |
| 3 | Shovel (Fawade) | | Numbers | 50 | | |
| 4 | Hand Trowel (Khurpe) | | Numbers | 50 | | |
| 5 | Hoe (Kudaaal) | | Numbers | 50 | | |
| 6 | Rake (Fork/Punja) | | Number | 50 | | |

| | | | | |
|----------------------------|--|--|---------|----|
| 7 | Measuring tape | | Number | 4 |
| 8 | Line Dori for marking | | Number | 4 |
| Material-Equipments | | | | |
| 1 | Area and Materials Identification Boards | | Numbers | 40 |
| 2 | Sticks for identification board | | Numbers | 40 |
| 3 | Buckets | | Numbers | 50 |
| 4 | Mugs | | Numbers | 50 |
| 5 | Watering jug with shower | | Numbers | 10 |
| 6 | Pans (tagara) | | Numbers | 50 |
| 7 | Hose Pipes and Shower Sets (each Pipe will cover 5 mounds roughly) | | Numbers | 40 |
| 8 | Dustbins | | Numbers | 5 |
| 10 | Flags (Red and Green) | | Pairs | 3 |
| 11 | Whistle | | Number | 4 |
| 12 | First Aid Kit | | Number | 2 |
| 13 | Empty drums (250 Litre) | | Number | 8 |
| 14 | Sieve for Jeevamrit | | Number | 5 |
| 15 | Drinking Water Tumblr | | Number | 5 |
| 16 | Tarpaulin Sheets to protect biomass and mounds (Large) | | Number | 30 |
| 17 | Wheelbarrows | | Number | 10 |
| Workwear | | | | |
| 1 | Personnel Protective Equipment PPE Sets (Helmets, Safety Shoes, Dust Masks, Gloves, Safety/Reflective Jacket, Safety Goggles) - 1 set per worker | | Sets | 40 |

6.2 Watering and Maintenance Requirements

Maintenance of Forest Created Using Miyawaki method - Maintenance activities include watering, de-weeding, keeping the plants free from physical stress, keeping the plants straight, keeping the forest floor mulched, application of jeevamrit, checking and controlling any water logging, keep the forest free from plastic/paper/inorganic waste, keeping the forest free and undisturbed from pesticides/herbicides/fungicides/artificial fertilisers, changing support sticks when needed, save the forest from any cutting/pruning, and protecting the forest. Refer enclosed SOP. Maintenance rates proposed to BMC for basic Unit 1500 sq m per year. These have been calculated proportionately for 20,000 sq m

| Item | Unit | Quantity | Basic rate | Total Amount | GST% | GST Amount |
|---|----------|----------|------------|--------------|------|------------|
| Semi Skilled Labour for all above described tasks and maintenance guidelines provided as per Miyawaki Method @ 1 worker for every 750 sq m i.e. (365 days X 27 workers) | Man days | 9855 | 491 | 48,38,805 | 18 | 8,70,984.9 |
| Cost of watering by supply of tanker . 216 Tanker trips for every 1500 sq m i.e. $216/1500 = 0.144$ Tanker trips per sq m. Thus, $0.144 * 20,000 = 2,880$ Tanker Trips for 20,000 sq m. Assuming each Tanker is 5000 L, Per Sq m water per trip will be $5000/1500 = 3.33$ L per sq m per trip. | No | 2,880 | 1,250 | 36,00,000 | 18 | 6,48,000 |
| Tools and Equipments | | | | | | |
| 2 sets of Basic Tools and Equipments (Pans, buckets, mugs, hand trowels, hoes, shovels, rakes, Personnel Protective Equipment) required for every 1500 sq m. Thus for entire site, no. of sets required = $2*(20,000/1500) = 27$ | Sets | 27 | 10,000 | 2,70,000 | | |
| 2 sets of Hose Pipes and Showers (replacement stock) required for every 1500 sq m. Thus for entire site, no of sets required = $2*(20,000/1500) = 27$ | Sets | 27 | 2,750 | 74,250 | | |
| Temporary Tank and Pump Set up (1 set up for every 1500 sq m) | No | 14 | 50,000 | 7,00,000 | | |
| Materials- Consumables | | | | | | |
| 1st round of remulching | Kg | 60000 | 22 | 13,20,000 | | |
| 1st round of jeevamrit application | Liter | 5000 | 110 | 5,50,000 | | |

| | | | | | | |
|------------------------------------|-------|-------|---|---------------|-----|-------------|
| 2nd round of remulching | Kg | 40000 | 22 | 8,80,000 | | |
| 2nd round of jeevamrit application | Liter | 5000 | 110 | 5,50,000 | | |
| Replacement of support sticks | No. | 20667 | 23 | 4,75,341 | | |
| | | | Total | 1,32,58,396 | GST | 15,18,984.9 |
| | | | Contingency (10%) | 13,25,840 | | |
| | | | GST Amount | 15,18,984.9 | | |
| | | | Grand Total | 1,61,03,220.9 | | |
| | | | Per Square Meter Per Month Cost for Maintenance of forest created using Miyawaki method | 68 | | |



| 6.3 Nursery Setup for Forest Creation, Nahar BMC Collaboration | | | | | |
|--|---|--|------------------------------|--|--------------|
| Forest Making Location | | Nahar Group, Chandivali | GPS | 19.109303, 72.899898 | |
| Area Required for Nursery (m ²) @ roughly 37.5 saplings per sq m with maintenance pathways | | 1600 | <u>Essential requirement</u> | Infrastructure and set up for watering | |
| Nursery set up | | | | | |
| Sl | Item | Total quantity required (with contingency) | Unit | Quantity on Site | Status (O/X) |
| 1 | Shade Net to cut out 60 percent sunlight. 20 m X 80 m X 3.5 m. Surface area = $(80*20)+(3.5*20)+(80*3.5*2) = 2230$ sq m | 2500 | Sq m | | |
| 2 | Iron poles (Roughly 50 for every 400 sq m) | 200 | No. | | |
| 3 | Tying material (actuals) | | | | |



| 6.4 Bill of Materials- Site Office | | | | |
|--|---|-------------------------|------|--------------|
| Purpose: Readiness and Execution assessment and monitoring, for internal use and visitors. | | | | |
| Facilities- Office | | | | |
| Sl | Items | Total quantity required | Unit | Status (O/X) |
| 1 | Blank A4 Sheets | | | |
| 2 | White board | | | |
| 3 | White board markers | | | |
| 6 | White board dusters | | | |
| 7 | Metal Magnet Boards and magnets | | | |
| 9 | Audio Speakers | | | |
| 10 | Microphone | | | |
| 11 | LED/LCD Projector | | | |
| 12 | Wire Extensions | | | |
| 13 | Writing pads | | | |
| 14 | Scale (ruler) | | | |
| 15 | Pencils, Pens, Sketch Pens etc. | | | |
| 18 | Folders | | | |
| 16 | Umbrellas | | | |
| Facilities- Site | | | | |
| 1 | Megaphone | | | |
| 2 | Display board on site | | | |
| 3 | Sample of all the materials on site with display boards | | | |



CHAPTER-7

7.0 EXECUTION FOR AFFORESTATION

7.1 MATERIAL MIXING

WHAT

The materials (perforator, water retainer, nourishment material and biomass) have to be thoroughly mixed.

WHY

The 3/4 materials must be uniformly mixed into the soil. For this, the materials should be first mixed separately with each other.

WHO

You will require an earthmover (JCB/Hitachi etc.) along with laborers to do the material mixing

WHEN

Project Execution Stage

HOW

- ◆ Ensure that the materials are mixed in the exact same ratios as what has been fixed initially i.e. for every 100 square meter of forest:

Example:

| Plant density (no. of saplings per-square meter) | Water retention material (Kg) | Perforation material(Kg) | Nourishment material(Kg) |
|---|----------------------------------|-----------------------------|-----------------------------|
| 3 | 700 | 700 | 600 |

- ◆ Mixing should be done to achieve consistency and uniformity i.e. if you fill up a small bowl with the mixed material, you should be able to see all the 3 materials.
- ◆ We should make sure that the material does not have clumps.



7.2 Earth Work and Mound Making

WHAT

We need to prepare mounds on which the plantation will happen. Mound making happens after preparing the earth for plantation.

WHY

Plantation done in the Miyawaki method is very different from conventional plantations. Unlike conventional plantations where individual pits are dug up for each sapling to be planted, in the Miyawaki method, one massive mound is created for all the saplings to be planted together on it.

WHO

You will require an earthmover or excavator such as a JCB / Hitachi / Deere, along with labourers.

WHEN

Project Execution

HOW

Follow the steps given below:

- Step 1 - Using an earthmoving machine, dig out all the earth up to a depth of 1 meter. Work on 100 square meters of forest at a time.
- Step 2- Using the machinery; put half the earth/soil back into the pit/trench created. Ensure that once it is put back into the pit, the soil is spread out uniformly.
(Above two steps ensure that the soil becomes soft and loose)
- Step 3 - From the biomass mixture, put half the quantity into the pit created
- Step 4 - Manually spread out the biomass on top of the soil
- Step 5 - Thoroughly mix the biomass with the soil beneath using the machine
- Step 6 - Using the machine, put the remaining soil back into the pit. Ensure that once it is put back into the pit, the soil is spread out uniformly.
- Step 7 - Put the remaining biomass on top of this soil
- Step 8 - Manually spread out the biomass.
- Step 9 - Thoroughly mix the biomass with the soil beneath using the machine
- Step 10-Once thoroughly mixed, give it the shape of a mound. Mound making will be fairly simple because during this entire process, the soil becomes very loose. Thus it occupies more space in its loose form has added ingredients and mound making becomes easier.



Above: Excavation or 1 meter trench digging, dumping back half the soil, spreading half of the biomass, then followed by mixing



Above: Dumping remaining half of the soil into the pit and spreading the remaining biomass on top of the soil



Above: Final round of mixing, leveling and mound making



7.3 Plantation

WHAT

Mound making is immediately followed by plantation

WHY

Key aspect of forest creation

WHO

Volunteers/Laborers

WHEN

Execution stage

HOW

The following steps need to be followed:

Step 1: Place the plants on the mound so as to create a multi layered forest. For this, try to group plants belonging to different layers in each square meter.

For e.g.

- ◆ Sub Tree, Shrub, Tree
- ◆ Tree, Shrub, Canopy
- ◆ Sub tree, Shrub, Canopy,
- ◆ Sub Tree, Tree, Canopy
- ◆ Tree, Sub Tree, Tree
- ◆ Sub Tree, Canopy, Sub Tree

Note:

- ◆ Try as far as possible not to place 2 trees of the same kind next to each other.
- ◆ The combinations or groups are completely dependent on species that have been selected and the number of trees allocated to each layer.
- ◆ Do not follow a pattern when placing trees on the mound. Let the trees follow a random zigzag pattern.
- ◆ This is a natural forest where some species will dominate the others. It is healthy competition. Hence, it is absolutely fine if you are unable to have trees belonging to 3 different layers in each group. After a point you will run out of certain species and will end up having 2 species belonging to the same layer close to each other, or for that matter even the same species next to each other. Tree positioning on the mound can only be controlled to a certain extent. Nonetheless it is an important exercise.





Above: Sapling arrangement on the mound

Step 2: Use a trowel or a hoe to dig a small pit on the mound. The pit should be only slightly bigger than bag size of the plant. Put the plant in the pit to check if the root bag sits comfortably in it.

Step 3: Dip the root bag in a bucket of water. Allow the air bubbles to come out of the bag, wait till entire air is drained out.

Step 4: Cut the cover of the root bag/pouch. Only cut the cover, do not cut into the soil

Step 5: Place one hand under the root ball while holding the stem with the other. Place the plant into the pit without removing your hand from the bottom. Fill the pit with the soil outside. The soil should be leveled gently around the stem of the plant. Hold the plant from the stem and gently remove your hand from the bottom of the plant. Once leveled, do not press the soil. In other words, we need to ensure that the soil is not compacted by hand and is left loose around the plant.

NOTE: Ensure that at any given point in time, there are no more than 8-10 people on the mound. The idea is to plant on loose soil. Mixing and mound making are important to aerate the soil. Minimum footprint on the mound will ensure minimum compaction.

7.4 Supporting the Plants with Sticks

WHAT

Several newly planted saplings will need support during the initial months

WHY

Once planted, the saplings should not droop or bend. In order to keep them upright while their roots get a hold on the soil, we need support sticks and strings to tie the plants.

WHO

Volunteers/Labourers

WHEN

Post plantation

HOW

The plant roots should not get damaged while inserting the sticks into the soil. Maintain a very small yet safe distance between the plant stem and the stick. Sticks being inserted should match with the height of the sapling i.e.

- ◆ For small (1 foot - 1 meter) plants, insert 1 meter long bamboo sticks.
- ◆ For taller plants (> 1 meter), insert 2-2.5 meter long bamboo sticks. These should be slightly thicker

- 1) Use only bamboo sticks and jute strings. Everything used inside the forest should be natural and biodegradable (For every 100 square meters i.e. 300 saplings we should have at least 150 sticks. In other words you will end up putting support sticks with every alternate plant).
- 2) Ensure you have thin jute strings to tie the support sticks to the stems. You will roughly need 2 kgs for every 100 square meter.



7.5 Mulching

WHAT

Mulching is the process of covering the soil with a suitable material. This is to be done as soon as the plantation completes.

WHY

The mulch insulates and protects the soil. It prevents sunlight from falling directly on the soil. This is especially important for the first 6-8 months, as the plants are young. Direct sunlight on the soil will make it dry and make the conditions difficult for the young saplings. It also plays a huge role in preventing the water from evaporating.

WHO

Volunteers/Labourers

WHEN

Post plantation

HOW

- ◆ The mulch should be evenly laid out
- ◆ The mulching material should not fall on the saplings. It should only cover the soil
- ◆ The layer of mulch should be thick (5-7 inches)
- ◆ Once the mulching material has been laid out, it should be tied down to the ground using a rope. Here's how:-
- ◆ Nail bamboo pegs around the forest, at the periphery.
- ◆ Use a rope to tie the pegs to each other, pressing down upon the mulch and keeping it intact. This will prevent the mulch from flying around
- ◆ Hammer 30 pegs around every 100 square meter mound. These should be 1.5-2 feet in length and pointed at one end so that they can be hammered into the ground.
- ◆ For every mound you will require 3-4 kg of jute rope for tying



7.6 First Watering

WHAT

Once the forest has been created, the forest needs to be watered well enough.

WHY

Water is an essential requirement. The moment a forest gets created, the saplings need to be watered abundantly.

WHO

Labourers/volunteers or the maintenance staff

WHEN

Post forest creation and mulching

HOW

As mentioned earlier, the plants need to be watered using a hosepipe with a shower. The first time, the forest needs to be watered for 1 hour. The minimum water requirement is 5 liters per square meter i.e. 500 liters per 100 square meters of forest per day.



7.7 SoP - Sapling Arrangement

In the Miyawaki method of forest creation, there are no pre-planned planting positions. The goal is to achieve the following:

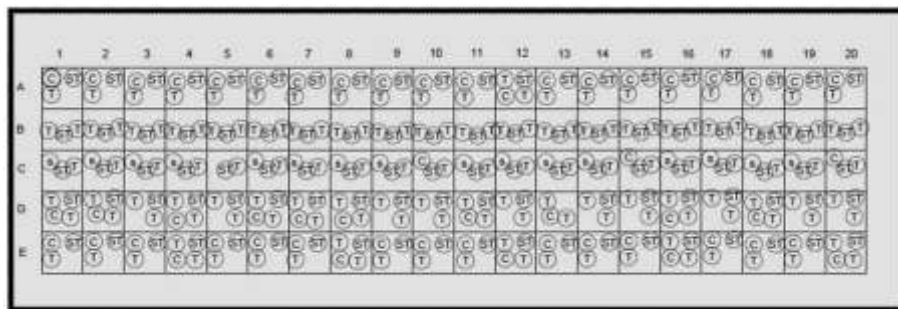
- 1) Selection of the right species.
- 2) Fixing the correct ratio for each species, carefully balancing the different forest layers and ensuring that our forest has all the desired qualities of a natural forest.
- 3) Mix up the species and plant them "randomly" so as to create a dense multi layered forest.

The random sapling arrangement is important to ensure that a "forest" gets created in the truest sense. This ensures natural competition, cooperation and selection.

The simplest definition of the Miyawaki Method, by the book, is - random and dense plantation of native tree species.

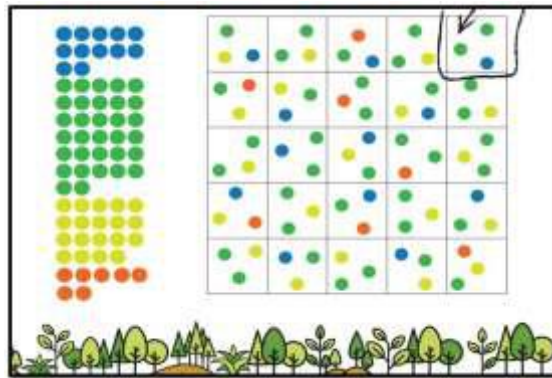
The forest is created in units of 100 square meters. Each 100 square meter patch is referred to as a mound. Every new mound has all the species selected, according to the ratios fixed. However, the arrangement needs to keep changing. Thus, if Mango (*Mangifera Indica*) is one of the species, and 6 individual mango saplings are to be planted per mound, then the position of Mango on every new mound should be different.

Once the soil is prepared, the saplings are mixed and randomly arranged to ensure that all the forest layers get distributed throughout the mound. Thus, a good distribution of layers will look something like this:



In the image above, T refers to Tree, ST refers to Sub Tree, C refers to Canopy and S refers to Shrub

For the sake of being more visual, it looks like this:



In the graphic above, every distinct colored dot denotes a different forest layer

As thumb rules:

- 1) We maintain a distance of 60 cm between saplings, for as long as possible. As the mound starts getting filled up, at many places the distance will be less:
- 2) The sapling arrangement should look more zig-zag than linear.



- 3) We should try not to place two saplings of the same type next to each other. e.g. Neem (*Azadirachta indica*) next to a Neem. However, sometimes such situations are not avoidable, since the density is high. In such situations, one of the Neems will naturally dominate the other.

4) At many places on the mound, two saplings of the same layer might fall next to each other. Such clashes are natural, since we are only working with 4 layers. Let's not forget that the layers are not equal in proportion. For e.g. percentage-wise in most places, Tree>Sub Tree>Canopy>Shrubs

Before plantation, sapling spreading on every mound looks like this:



Thus, when the forest grows, it looks as wild and dense as any natural forest.
Here are some photographs of our grown forests



CHAPTER- 8

8.0 Maintenance Instructions

1. Regular watering and de-weeding: This is absolutely essential to ensure forest health and survival. De-weeding simply involves not allowing anything else to grow in the forest, apart from what we have planted. Thus, grass and weeds need to be kept out.

Only water the forest using a shower at the end of the pipe. Strong water force could be detrimental to plant health and soil stability.

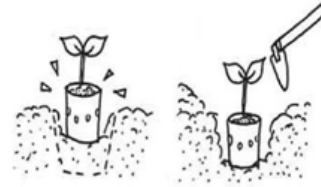
The frequency of watering should be as per soil condition. This will slowly be reduced as the forest grows.

2. If the forest is watered excessively (accidentally or otherwise) , then it should be given 1-2 days to dry before the next watering.
3. Ensure plants are not under any stress: They should not get buried under the mulch and they should be kept straight with the help of their respective support sticks.
4. Plant stems should only be loosely tied to their support sticks else they get choked.
5. Keep the forest clean: No litter of any form (plastic, paper etc.)
6. Drainage: Water should not get accumulated anywhere in the forest. Thus, one should check for any possible water pipeline leakages etc.
7. Do not disturb the plantation in any way: Some plants will show initial signs of shock, such as leaves and stems drying out. No re-planting or intervention is required at this stage. Mortality rate will be checked after at least 3-4 months. Usual mortality rate is anywhere between 2-10 percent. Since a lot of the planted species are deciduous, they will shed their leaves and it is not a cause for concern.
8. Do not use any chemicals such as pesticides, herbicides or inorganic fertilizers: The forest is well equipped to take care of itself. If you notice any pests, they too should be left undisturbed. The forest will slowly build its own mechanism to keep itself healthy.
9. Always keep the forest floor covered with a thick layer of mulch: The mulching done during forest creation needs to be maintained now.



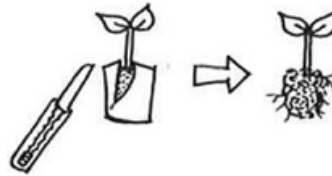
7.8 SoP Tree Planting Instructions

1. Check that the root ball or root bag of your plant sits comfortably in the pit. Use the small garden hole to deepen or widen the pit if necessary.



2. Dip the root ball or root bag in the bucket of water. Allow air bubbles to come out of the bag and wait until air is completely drained out.

3. If root ball is still wrapped, cut the cover and remove the wrapper but take care to not cut into the soil.



4. Carefully place one hand under the root ball while gently holding the stem with the other. Place the plant into the pit without removing your hand from the bottom. Fill the pit with the soil around the stem. The soil should be leveled gently around the stem of the plant. Steady the plant by holding on to the stem and slowly remove your

hand from the bottom of the plant. Once leveled, do not press or compact the soil.

5. Water your plant and take a photo!



To ensure minimal compaction of the soil, please refrain from stepping on the mound unless necessary.



CHAPTER- 9

9.0 Monitoring

WHAT

Once a forest has been created, monitoring it is an important exercise that helps in assessing the actual results.

WHY

The exercise of monitoring helps in finding out the actual growth and survival data. This helps us assess the success or failure of a forest. It also helps in determining if the result targeted has been achieved. Subsequently, this data will be used in deliberating upon changes required to improve the results of forests to be created in the future.

WHO

The caretakers of the forest, the owners or volunteers

WHEN

The frequency of monitoring can be:

- ◆ Once a month or
- ◆ Once every two months

The exercise should be conducted for the first 8 to 12 months.

HOW

Survival – This involves counting the number of saplings that survive. A sapling might shed all or some of its leaves. However this does not mean that it's dead. A dead 'looking' sapling might be very much alive. The best way to check for survival is by conducting the scratch/scrape test:

- ◆ With a small knife or your thumbnail, gently scratch the outer/bark layer of the plant a few inches above the soil.
- ◆ If you find wet tissue beneath the bark layer, with a slight greenish hue, then this is a living tissue and indicates survival.
- ◆ If the layer beneath is dry, brittle and brown, then it indicates that the tree has failed to live.
- ◆ Refer to the following images:



Living Tissue

Dead Tissue

Once the number of trees surviving per patch (per 100 square meters) has been counted, the consolidated data or species wise data can be recorded.

Growth- In order to measure the overall growth of the forest, selected species need to be marked and measured on the date fixed (monthly or bi-monthly). Usually, one sapling each from 50% of the species planted is marked for measurement. We can use different methods to mark the selected species. One of the methods is to use a round plastic pipe with a number, name of species and plantation date. For e.g.:



Measure up to the highest "point" or the highest tip, which could either, be stalk or leaf. Please refer to these images for reference:

Tree Height (This is for big trees. We are only concerned with the image here and not the formula)



1) Photos Section

1.a) Cricket Ground (ref. Quality Bids)



1.b) Cricket Ground (ref. Gate #1)



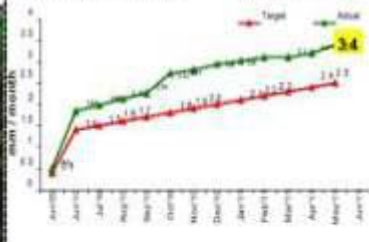
1.c) Near TTTI (ref. Eucalyptus tree)



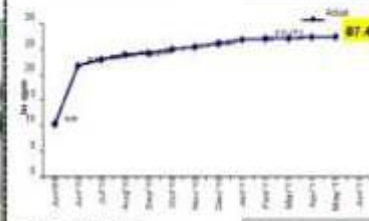
Legend: ○ - Good, X - Needs Improvement

2) KPI's Section

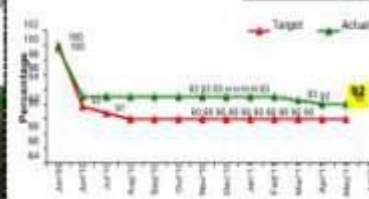
2.a) Height of Saplings



2.b) Size of Saplings



2.c) Survival Rate



Key Observations:

Plants are blooming due to the effect of early south-west monsoon showers.

*Values shown above indicates the average of measurements from 5 sample records

A growth monitoring sheet looks like the following:

| MONTHLY GROWTH MONITORING CHART (WARGAL FARM) | | | |
|---|--|-------|-------|
| Height in ft. | | | |
| Sr. No. | Botanical Name | 2-Oct | 2-Nov |
| 1 | Psidium guajava | 2 | 2 |
| 2 | Thespesia populnea | 4.3 | 4.4 |
| 3 | Artocarpus heterophyllus | 2.3 | 2.7 |
| 4 | Ficus religiosa | 3.3 | 4.2 |
| 5 | Tectona grandis | 2.1 | 2.3 |
| 6 | Azadirachta indica | 3.6 | 3.7 |
| 7 | Syzygium cumini | 3.2 | 3.2 |
| 8 | Dalbergia sissoo | 5.8 | 5.8 |
| 9 | Millingtonia hortensis | 2.1 | 2.7 |
| 10 | Sterculia foetida | 6.2 | 6.5 |
| 11 | Alstonia scholaris | 3.7 | 3.9 |
| 12 | Areca catechu | 2.3 | 2.5 |
| 13 | Lagerstroemia Indica | 2.3 | 2.3 |
| 14 | Pongamia pinnata (P. Glabra) | 4 | 4 |
| 15 | Butea Monosperma | 1 | 1 |
| 16 | Terminalia catappa | 1.1 | 2.4 |
| 17 | Nerium oleander | 2.9 | 3.8 |
| 18 | Phyllanthus Emblica | 4 | 4.4 |
| 19 | Ficus benghalensis | 1.1 | 2.5 |
| 20 | Ficus Carica | 3.3 | 3.4 |
| 21 | Saraca indica, Saraca asoca | 2.8 | 2.9 |
| 22 | Murraya koenigii | 1.1 | 1.2 |
| 23 | Cassia javanica | 3.1 | 4.9 |
| 24 | Anthocephalus cadamba, Anthocephalus indicus | 3 | 3.7 |
| 25 | Nyctanthes arbor-tristis | 1 | 1.8 |
| 26 | Punica granatum | 1.7 | 2.3 |
| 27 | Calophyllum inophyllum | 2.7 | 2.9 |
| 28 | Terminalia arjuna | 5.7 | 5.8 |

| | | | | | | | | |
|----|---------------------------|-------------------|---|---------------------------|-----|-----|-----|-----|
| 55 | Ranjal | Bakul, Maulsri | T | Mimusops elengi | 1.5 | 1.7 | 2 | 2.3 |
| 56 | Jamun | Jamun | T | Syzygium cumini | 3 | 3.2 | 3.8 | 4.1 |
| 57 | Bilvapatre | Bel | U | Aegle marmelos | 3 | 3 | 3.7 | 4.3 |
| 58 | Punnaga/ Surangi | Sultan Champa | T | Calophyllum inophyllum | 3.6 | 4 | 4.2 | 4.7 |
| 59 | Kari, kari- bevinagida | Curry leaf | S | Murraya koenigii | 1.1 | 1.2 | 1.7 | 2 |
| 60 | Pongam | Indian beech | T | Pongamia pinnata | 4.7 | 5.7 | 6 | 6.4 |



| Sample Girth in mm | | | | | | | | |
|--------------------|------------------|---------------------|-------|-------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| Sr. No. | Common Script | Common Name | Layer | Latin Name | OCT 18 Sample 1 Girth HEIGHT in mm | NOV 18 Sample 1 Girth HEIGHT in mm | DEC 18 Sample 1 Girth HEIGHT in mm | JAN 19 Sample 1 Girth HEIGHT in mm |
| 1 | Baenga mara | Indian Malabar Kino | T | Pterocarpus marsupium | 16.9 | 17.3 | 17.5 | 17.7 |
| 2 | Nallarojanamu | Dhup incense tree | T | Canarium strictum | 11.9 | 11.9 | 12.2 | 12.5 |
| 3 | Kaval | Wild guava kumhi | T | Careya arborea | 10.7 | 10.7 | 11 | 11.3 |
| 4 | Muragala | Kokam | T | Garcinia indica | 6.5 | 6.5 | 6.8 | 6.8 |
| 5 | Gulamaavu | Large flower bay | T | Persea macrantha | 11.3 | 11.5 | 11.7 | 11.9 |
| 6 | Tundu, tun | Toon tree | T | Toona ciliata | 10 | 10.8 | 11 | 11.2 |
| 7 | Red Silk | Red Silk Cotton | T | Bombax insigne | 6.8 | 7 | 7.4 | 7.7 |
| 8 | Lakoocha | Wild Jackfruit | T | Artocarpus lakoocha | 15.5 | 15.9 | 16.2 | 16.5 |
| 9 | Halivana, Pangar | Indian Coral | T | Erythrina stricta | 11 | 11.4 | 11.9 | 12.2 |
| 10 | Ane golaganji | Red bead tree | T | Adenanthera pavonina | 6 | 6.6 | 6.6 | 6.7 |
| 11 | Guggul dhup | Maharukh | T | Ailanthus triphysa | 11.9 | 12 | 12.7 | 12.8 |
| 12 | Mullumuttaga | Pithraj | T | Aphanamixis polystachya | 21.2 | 21.2 | 21.6 | 21.7 |

| | | | | | | | | |
|----|-------------------|-----------------------|---|-------------------------|------|------|------|------|
| 13 | Shivan | white teak | T | Gmelina arborea | 19.7 | 20.1 | 22.2 | 22.4 |
| 14 | Kaladri nilavahi | Indian Elm | T | Holoptelea integrifolia | 14.4 | 14.4 | 14.6 | 14.8 |
| 15 | Amtalakaayi Ritha | Southl Indian Soapnut | T | Sapindus laurifolius | 15.1 | 15.3 | 15.5 | 15.6 |
| 16 | Goni-mara | Mysore Fig | T | Ficus mysorensis | 14.5 | 14.6 | 14.9 | 15 |
| 17 | Atti, Rumadi | Cluster fig | T | Ficus racemosa | 13 | 13 | 13.6 | 13.7 |
| 18 | Tattuna | Indian Trumpet Flower | U | Oroxylum indicum | 17.1 | 17.3 | 17.6 | 17.6 |
| 19 | Krishna siris | Siris | U | Albizzia amara | 1.2 | 1.2 | 1.8 | 1.8 |
| 20 | Konda-mavu | Hill mango | U | Commiphora caudata | 18 | 18.4 | 18.9 | 19.2 |
| 21 | Banni | Safed khair | U | Acacia ferruginea | 10.4 | 10.5 | 10.9 | 11 |
| 22 | Ankolamara | Ankol | U | Alangium salvifolium | 8.4 | 8.6 | 8.9 | 8.9 |
| 23 | Manda huli | Malabar tamarind | U | Garcinia gummi-gutta | 15.6 | 15.8 | 16 | 16 |
| 24 | Jarol | Common crape myrtle | U | Lagerstroemia indica | 9 | 9.3 | 9.6 | 9.7 |
| 25 | Chandan | Indian sandalwood | U | Santalum album | 7.8 | 8 | 8.3 | 8.3 |
| 26 | Devajarige | Mysore Gamboge | U | Garcinia xanthochymus | 14 | 14 | 14.4 | 14.5 |
| 27 | Putramjiva | Putranjeeva | U | Drypetes roxburghii | 9 | 9.5 | 9.7 | 9.7 |

| Sample Girth in mm | | | | | | | | |
|--------------------|------------------|---------------------|-------|-------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| Sr. No. | Common Script | Common Name | Layer | Latin Name | OCT 18 Sample 1 Girth HEIGHT in mm | NOV 18 Sample 1 Girth HEIGHT in mm | DEC 18 Sample 1 Girth HEIGHT in mm | JAN 19 Sample 1 Girth HEIGHT in mm |
| 1 | Baenga mara | Indian Malabar Kino | T | Pterocarpus marsupium | 16.9 | 17.3 | 17.5 | 17.7 |
| 2 | Nallarojanamu | Dhup incense tree | T | Canarium strictum | 11.9 | 11.9 | 12.2 | 12.5 |
| 3 | Kaval | Wild guava kumhi | T | Careya arborea | 10.7 | 10.7 | 11 | 11.3 |
| 4 | Muragala | Kokam | T | Garcinia indica | 6.5 | 6.5 | 6.8 | 6.8 |
| 5 | Gulamaavu | Large flower bay | T | Persea macrantha | 11.3 | 11.5 | 11.7 | 11.9 |
| 6 | Tundu, tun | Toon tree | T | Toona ciliata | 10 | 10.8 | 11 | 11.2 |
| 7 | Red Silk | Red Silk Cotton | T | Bombax insigne | 6.8 | 7 | 7.4 | 7.7 |
| 8 | Lakoocha | Wild Jackfruit | T | Artocarpus lakoocha | 15.5 | 15.9 | 16.2 | 16.5 |
| 9 | Halivana, Pangar | Indian Coral | T | Erythrina stricta | 11 | 11.4 | 11.9 | 12.2 |
| 10 | Ane golaganji | Red bead tree | T | Adenanthera pavonina | 6 | 6.6 | 6.6 | 6.7 |
| 11 | Guggul dhup | Maharukh | T | Ailanthus triphysa | 11.9 | 12 | 12.7 | 12.8 |
| 12 | Mullumuttaga | Pithraj | T | Aphanamixis polystachya | 21.2 | 21.2 | 21.6 | 21.7 |

| | | | |
|----|-------------------------------------|-----|-----|
| 29 | Aegle marmelos | 2.1 | 2.3 |
| 30 | Caryota Urens | 3.9 | 4.6 |
| 31 | Mangifera Indica | 4.1 | 4.5 |
| 32 | Santalum album | 2.4 | 2.6 |
| 33 | Feronia elephantum, Feronia limonia | .5 | 1 |
| 34 | Madhuca longifolia var. longifolia | 5.9 | 6.2 |

MONITORING SAMPLE

| Sr. No. | Common Script | Common Name | Layer | Latin Name | OCT 18 Sample 1 HEIGHT in FT | NOV 18 Sample 1 HEIGHT in FT | DEC 18 Sample 1 HEIGHT in FT | JAN 19 Sample 1 HEIGHT in FT |
|---------|------------------|---------------------|-------|-----------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 1 | Baenga mara | Indian Malabar Kino | T | Pterocarpus marsupium | 5 | 5.4 | 5.7 | 6.1 |
| 2 | Nallarojanamu | Dhup incense tree | T | Canarium strictum | 2.9 | 2.9 | 3.2 | 3.5 |
| 3 | Kaval | Wild guava kumhi | T | Careya arborea | 3.6 | 3.7 | 4 | 4.2 |
| 4 | Muragala | Kokam | T | Garcinia indica | 3.5 | 4 | 4.3 | 4.7 |
| 5 | Gulamaavu | Large flower bay | T | Persea macrantha | 1.4 | 1.7 | 2 | 2.2 |
| 6 | Tundu, tun | Toon tree | T | Toona ciliata | 2.6 | 2.8 | 2.9 | 3 |
| 7 | Red Silk | Red Silk Cotton | T | Bombax insigne | 0.6 | 0.8 | 1.1 | 1.8 |
| 8 | Lakoocha | Wild Jackfruit | T | Artocarpus lakoocha | 3.8 | 3.9 | 4.2 | 4.4 |
| 9 | Halivana, Pangar | Indian Coral | T | Erythrina stricta | 3.5 | 3.9 | 4.2 | 4.7 |

| | | | | | | | | |
|----|-------------------|----------------------|---|-------------------------|-----|-----|-----|-----|
| 10 | Ane golaganji | Red bead tree | T | Adenanthera pavonina | 1.3 | 1.8 | 2.3 | 2.5 |
| 11 | Guggul dhup | Maharukh | T | Ailanthus triphysa | 2.9 | 3.1 | 3.6 | 4 |
| 12 | Mullumuttaga | Pithraj | T | Aphanamixis polystachya | 3.9 | 4 | 4.6 | 4.8 |
| 13 | Shivan | white teak | T | Gmelina arborea | 3.8 | 4.5 | 4.9 | 5.2 |
| 14 | Kaladri nilavahi | Indian Elm | T | Holoptelea integrifolia | 3.6 | 4.2 | 4.6 | 4.9 |
| 15 | Amtalakaayi Ritha | South Indian Soapnut | T | Sapindus laurifolius | 3.8 | 4 | 4.6 | 5 |
| 16 | Goni-mara | Mysore Fig | T | Ficus mysorensis | 3.2 | 3.7 | 3.9 | 4.3 |
| 17 | Atti, Rumadi | Cluster fig | T | Ficus racemosa | 4.3 | 4.9 | 5.3 | 5.7 |
| 18 | Tattuna | Indian Trumpe Flower | U | Oroxylum indicum | 2 | 2.6 | 2.9 | 3.4 |
| 19 | Krishna siris | Siris | U | Albizzia amara | 2.9 | 3 | 3.4 | 3.8 |
| 20 | Konda-mavu | Hill mango | U | Commiphora caudata | 4 | 4.5 | 4.8 | 5.3 |
| 21 | Banni | Safed khair | U | Acacia ferruginea | 2.3 | 2.7 | 2.9 | 3.3 |
| 22 | Ankolamara | Ankol | U | Alangium salvifolium | 2.6 | 3 | 3.4 | 3.7 |
| 23 | Manda huli | Malabar tamarind | U | Garcinia gummi-gutta | 3.3 | 3.5 | 3.8 | 4 |
| 24 | Jarol | Common crape myrtle | U | Lagerstroe mia-indica | 2.7 | 3 | 3.4 | 3.8 |

| | | | | | | | | |
|----|------------------|------------------------|---|------------------------------|------|-----|-----|-----|
| 25 | Chandan | Indian sandalwood | U | Santalum album | 2.4 | 2.5 | 2.7 | 3 |
| 26 | Devajarige | Mysore Gamboge | U | Garcinia xanthochymus | 4 | 4.8 | 5 | 5.3 |
| 27 | Putramjiva | Putranjeeva | U | Drypetes roxburghii | 3.6 | 4 | 4.8 | 5.3 |
| 28 | Belavu | Elephant apple | U | Limonia acidissima | 0.91 | 1.2 | 1.9 | 2 |
| 29 | aduthodagidda | Willow-Leaf Justicia | S | Gendarussa vulgaris | 2.6 | 2.8 | 3.2 | 3.4 |
| 30 | Malabar nut | Malabar nut | S | Adhatoda Zeylanica | 2.1 | 2.8 | 3 | 3.3 |
| 31 | Nirgudi | Chaste tree | S | Vitex negundo | 2.5 | 2.9 | 3 | 3.4 |
| 32 | Indian wormwood | Indian wormwood | S | Artemisia nilagirica | 4.5 | 4.9 | 5.2 | 5.6 |
| 33 | Mandaara hoo | Yellow orchid tree | S | Bauhina tomentosa | 2 | 2.7 | 3 | 3.8 |
| 34 | Buebell baeteria | Buebell baeteria | S | Barleria cristata | 3.8 | 4 | 4.3 | 4.7 |
| 35 | Araka | Crown flower | S | Calotropis gigantea | 4.4 | 4.7 | 5 | 5.3 |
| 36 | abbolige | Firecracker flower | S | Crossandra infundibuliformis | 0.4 | 4 | 1.4 | 1.9 |
| 37 | kadu malige | Malabar jasmine | S | Jasminum malabaricum | 1.1 | 1.7 | 1.7 | 1.9 |
| 38 | Vana malige | Crowded flower jasmine | S | J.calophyllum | 0,7 | 1 | 1.1 | 1.2 |
| 39 | Malige | Common jasmine | S | J. rigidum | 1.4 | 1.2 | 1.8 | 1.8 |

| | | | | | | | | |
|----|---------------------|--------------------------|---|--------------------------|-----|-----|-----|-----|
| 40 | Arabian jasmine | Arabian jasmine | S | J. sambac | 1.4 | 1 | 2 | 2.2 |
| 41 | Kurinji | Leaf enclosed coneflower | S | Strobilanthes foliosa | 3.6 | 3.7 | 4 | 4.4 |
| 42 | Fire flame bush | Fire flame bush | S | Woodfordia fruticosa | 2 | 1.7 | 2.6 | 3 |
| 43 | White dhup | White Indian Dammar | C | Vateria indica | 5 | 5.8 | 6.4 | 7.2 |
| 44 | Kolugida | Buddha coconut | C | Sterculia alata | 2.3 | 2.3 | 3 | 3.5 |
| 45 | Hebbalasu | Wild Jack | C | Artocarpus hirsutus | 3.2 | 3.5 | 3.7 | 4.3 |
| 46 | Illupa, lppa | Mahua | T | Madhuca latifolia | 3.3 | 3.8 | 4 | 4.5 |
| 47 | Amaltas | Golden shower | T | Cassia fistula | 2.8 | 3.3 | 3.4 | 3.9 |
| 48 | Arjuna | Arjun | T | Terminalia Arjuna | 1.5 | 2 | 2.7 | 3.3 |
| 49 | Parijatak Harsingar | Coral/night jasmine | U | Nyctanthes arbor-tristis | 2.6 | 3 | 3.4 | 3.9 |
| 50 | Palash Muttuga | Flame of the forest | U | Butea monosperma | 1 | 1.5 | 1.9 | 2.1 |
| 51 | Baheda | Baheda | C | Terminallia bellirica | 4 | 4.3 | 4.8 | 5.2 |
| 52 | Beete | Malabar rosewood | C | Dalbergia latifolia | 5 | 6 | 6.7 | 6.9 |
| 53 | Mango | Mango | C | Mangifera Indica | 4 | 4.7 | 5 | 5.4 |
| 54 | Nelli, Awala | Indian Gooseberry | U | Embllica officinalis | 0.9 | 1.2 | 1.6 | 2 |

| | | | | | | | | |
|----|-------------------|-----------------------|---|-------------------------|------|------|------|------|
| 13 | Shivan | white teak | T | Gmelina arborea | 19.7 | 20.1 | 22.2 | 22.4 |
| 14 | Kaladri nilavahi | Indian Elm | T | Holoptelea integrifolia | 14.4 | 14.4 | 14.6 | 14.8 |
| 15 | Amtalakaayi Ritha | Southl Indian Soapnut | T | Sapindus laurifolius | 15.1 | 15.3 | 15.5 | 15.6 |
| 16 | Goni-mara | Mysore Fig | T | Ficus mysorensis | 14.5 | 14.6 | 14.9 | 15 |
| 17 | Atti, Rumadi | Cluster fig | T | Ficus racemosa | 13 | 13 | 13.6 | 13.7 |
| 18 | Tattuna | Indian Trumpet Flower | U | Oroxylum indicum | 17.1 | 17.3 | 17.6 | 17.6 |
| 19 | Krishna siris | Siris | U | Albizzia amara | 1.2 | 1.2 | 1.8 | 1.8 |
| 20 | Konda-mavu | Hill mango | U | Commiphora caudata | 18 | 18.4 | 18.9 | 19.2 |
| 21 | Banni | Safed khair | U | Acacia ferruginea | 10.4 | 10.5 | 10.9 | 11 |
| 22 | Ankolamara | Ankol | U | Alangium salvifolium | 8.4 | 8.6 | 8.9 | 8.9 |
| 23 | Manda huli | Malabar tamarind | U | Garcinia gummi-gutta | 15.6 | 15.8 | 16 | 16 |
| 24 | Jarol | Common crape myrtle | U | Lagerstroemia indica | 9 | 9.3 | 9.6 | 9.7 |
| 25 | Chandan | Indian sandalwood | U | Santalum album | 7.8 | 8 | 8.3 | 8.3 |
| 26 | Devajarige | Mysore Gamboge | U | Garcinia xanthochymus | 14 | 14 | 14.4 | 14.5 |
| 27 | Putramjiva | Putranjeeva | U | Drypetes roxburghii | 9 | 9.5 | 9.7 | 9.7 |

| | | | | | | | | |
|----|------------------|--------------------------|---|-------------------------------------|------|------|------|------|
| 28 | Belavu | Elephant apple | U | <i>Limonia acidissima</i> | 8.4 | 8.7 | 8.9 | 8.9 |
| 29 | aduthodagidda | Willow-Leaf Justicia | S | <i>Gendarussa vulgaris</i> | 1.7 | 2 | 2.4 | 2.6 |
| 30 | Malabar nut | Malabar nut | S | <i>Adhatoda Zeylanica</i> | 4.5 | 4.9 | 5.2 | 5.3 |
| 31 | Nirgudi | Chaste tree | S | <i>Vitex negundo</i> | 15.9 | 16.5 | 16.9 | 16.9 |
| 32 | Indian wormwood | Indian wormwood | S | <i>Artemisia nilagirica</i> | 10.5 | 10.5 | 10.2 | 10.3 |
| 33 | Mandaara hoo | Yellow orchid tree | S | <i>Bauhina tomentosa</i> | 5.7 | 6 | 6.2 | 6.5 |
| 34 | Buebell baeleria | Buebell baeleria | S | <i>Barleria cristata</i> | 15.9 | 16 | 16.4 | 16.7 |
| 35 | Araka | Crown flower | S | <i>Calotropis gigantea</i> | 26.2 | 27 | 28.4 | 28.9 |
| 36 | abbolige | Firecracker flower | S | <i>Crossandra infundibuliformis</i> | 6.5 | 6.7 | 7 | 7.2 |
| 37 | kadu malige | Malabar jasmine | S | <i>Jasminum malabaricum</i> | 9.1 | 10 | 10.4 | 10.6 |
| 38 | Vana malige | Crowded flower jasmine | S | <i>J. calophyllum</i> | 6.6 | 7 | 7.7 | 7.9 |
| 39 | Malige | Common jasmine | S | <i>J. rigidum</i> | 9.6 | 10 | 10.4 | 10.6 |
| 40 | Arabian jasmine | Arabian jasmine | S | <i>J. sambac</i> | 5.5 | 5.8 | 6 | 6.4 |
| 41 | Kurinji | Leaf enclosed coneflower | S | <i>Strobilanthes foliosa</i> | 1.2 | 1.3 | 1.4 | 1.4 |
| 42 | Fire flame bush | Fire flame bush | S | <i>Woodfordia fruticosa</i> | 0.7 | 1 | 1.1 | 1.1 |

| | | | | | | | | |
|----|----------------------|---------------------|---|--------------------------|------|------|------|------|
| 43 | White dhup | White Indian Dammar | C | Vateria indica | 12 | 12 | 12.6 | 12.7 |
| 44 | Kolugida | Buddha coconut | C | Sterculia alata | 11.9 | 12 | 12.1 | 12.3 |
| 45 | Hebbalasu | Wild Jack | C | Artocarpus hirsutus | 9.9 | 10.8 | 11 | 11.1 |
| 46 | Illupa, Ippa | Mahua | T | Madhuca latifolia | 15.2 | 15.4 | 15.4 | 15.5 |
| 47 | Amaltas | Golden shower | T | Cassia fistula | 0.5 | 0.5 | 0.9 | 0.9 |
| 48 | Arjuna | Arjun | T | Terminalia Arjuna | 6.2 | 6.2 | 6.6 | 6.6 |
| 49 | Parijatak, Harsingar | Coral/night jasmine | U | Nyctanthes arbor-tristis | 9.4 | 10 | 10.2 | 10.4 |
| 50 | Palash, Muttuga | Flame of the forest | U | Butea monosperma | 8.2 | 10.5 | 10.7 | 10.9 |
| 51 | Baheda | Baheda | C | Terminallia bellirica | 1.4 | 2 | 2.3 | 2.3 |
| 52 | Beete | Malabar rosewood | C | Dalbergia latifolia | 12.9 | 13.5 | 13.8 | 13.9 |
| 53 | Mango | Mango | C | Mangifera Indica | 10 | 19.5 | 19.7 | 19.9 |
| 54 | Nelli, Awala | Indian Gooseberry | U | Emblica officinalis | 8.5 | 3.8 | 8.9 | 9.2 |
| 55 | Ranjal | Bakul, Maulsri | T | Mimusops elengi | 0.4 | 0.8 | 0.9 | 1.3 |
| 56 | Jamun | Jamun | T | Syzygium cumini | 12.8 | 13 | 13.3 | 13.6 |
| 57 | Bilvapatre | Bel | U | Aegle marmelos | 0.9 | 1.3 | 1.5 | 1.5 |

| | | | | | | | | |
|----|-----------------------|---------------|---|------------------------|------|------|------|------|
| 58 | Punnaga/Surangi | Sultan Champa | T | Calophyllum inophyllum | 1 | 1.5 | 1.6 | 2 |
| 59 | Kari, kari-bevinagida | Curry leaf | S | Murraya koenigii | 4.1 | 5.3 | 5.7 | 5.9 |
| 60 | Pongam | Indian beech | T | Pongamia pinnata | 16.6 | 21.4 | 21.6 | 21.9 |



Annexure-1 (Delhi Forest Example)

Delhi Forest Example (Ganga Vihar ,Sarai Kale Khan New Delhi)
by Miyawaki Method:

Site Selection:



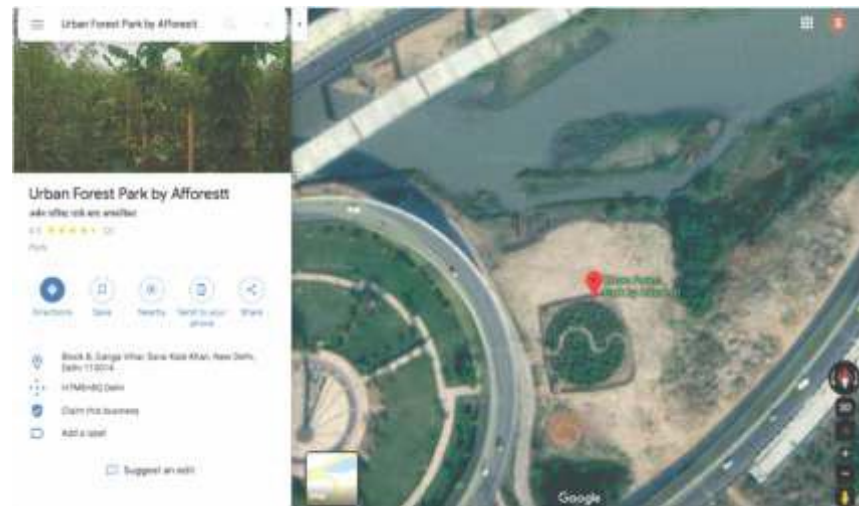
Species Selection:



Change after Miyawaki Afforestation Method:



Google image of Developed Site:



Anexure-II

कार्यालय मुख्य वन संरक्षक, सामाजिक वानिकी, उत्तर प्रदेश

संख्या जी-324/15-1 (सीलिंग दर), लखनऊ: दिनांक: 06 मार्च, 2020

कार्यालय आदेश

प्रदेश के अति प्रदूषित शहरों में वायु प्रदूषण नियंत्रण की दृष्टि से मियॉवाकी पद्धति से प्राकृतिक मूल वन स्थापना हेतु अनुसूचित दर निर्धारण करने के लिए प्रधान मुख्य वन संरक्षक, कार्ययोजना, अनुश्रवण एवं मूल्यांकन, उ०प्र०, लखनऊ की अध्यक्षता में गठित समिति द्वारा 100 वर्गमी० भूमि पर मियॉवाकी विधि से मूल वन स्थापना पर अनुमानित व्यय की अनुसूचित दरें पत्रांक-प्र० 179/36-2(वृक्षारोपण मियॉवाकी), दिनांक 03.03.2020 से प्रस्तावित की गई है। उक्त के आधार पर 100 वर्गमी० भूमि (भूमि का प्रकार मध्यम अम्लीय जिसका पी०एच० 5 से 5.50 के मध्य हो) पर मियॉवाकी पद्धति द्वारा प्रदूषित शहरों में प्राकृतिक मूल वन स्थापना पर अनुमानित व्यय की अनुसूचित दरें निम्नानुसार निर्धारित की जाती हैं:-

मियॉवाकी पद्धति से प्रदूषित शहरों में प्राकृतिक मूल वन स्थापना हेतु 100 वर्गमी० तथा 01 हे० क्षेत्र के कार्य का प्राक्कलन (भूमि का प्रकार मध्यम अम्लीय जिसका पी०एच० 5 से 5.50 के मध्य हो)

| | |
|----------------------|-----------------------|
| वृक्षारोपण क्षेत्र- | 100 वर्गमी० |
| पौधों का घनत्व- | 3.5 पौध प्रति वर्गमी० |
| कुल पौधों की संख्या- | 350 प्रति 100 वर्गमी० |

| क्र०सं० | कार्यों का विवरण | इकाई | मात्रा | दर (रु०में) | धनराशि/दरप्रति 100 वर्ग मी० (रु० में) | दर प्रति हे०(रु०में) |
|---------|-----------------------------------|------|------------|-------------|---------------------------------------|----------------------|
| 1 | सीमांकन एवं संरक्षण | 100 | वर्ग मी० | लमसम | 100.00 | 10000 |
| 1.1 | मृदा परीक्षण | 100 | वर्ग मी० | लमसम | 100.00 | 100 |
| 1.2 | लैंड स्केप पर बनाने पर व्यय | 100 | वर्ग मी० | लमसम | 5000.00 | 5000 |
| 2 अ | मिट्टी का विश्लेषण कर | | | | | |
| | मिट्टी सम्वर्धन हेतु पोषक सामग्री | | | | | |
| | कटी घास | 600 | किलो | 1.50 | 900.00 | 90000 |
| | खाद | 1500 | किलो | 2.00 | 3000.00 | 300000 |
| | पुआल | 500 | किलो | 2.00 | 1000.00 | 100000 |
| | भूसा | 200 | किलो | 5 | 1000.00 | 100000 |
| | ड्रम 200 लीटर क्षमता का | 2 | संख्या में | 500 | 1000.00 | 1000 |
| | बाल्टी | 10 | संख्या में | 300 | 3000.00 | 3000 |
| | हजारा | 4 | संख्या में | 250 | 1000.00 | 1000 |
| | स्प्रे मशीन | 1 | संख्या में | 2000 | 2000.00 | 2000 |
| ब | जीवामृत तैयार करने हेतु सामग्री | | | | | |
| | | 10 | लीटर | 1.00 | 10.00 | 1000 |



| क्र०सं० | कार्यों का विवरण | इकाई | मात्रा | दर (रु०में) | घनराशि/दरप्रति 100 वर्ग मी० (रु० में) | दर प्रति हे०(रु०में) |
|---------|--|------|------------|-------------|---------------------------------------|----------------------|
| | गाय का गोबर | 10 | किलो | 1.00 | 10.00 | 1000 |
| | दाल का आटा-बेसन | 1 | किलो | 50.00 | 50.00 | 5000 |
| | गुड़ | 1 | किलो | 40.00 | 40.00 | 4000 |
| | पीपल पेड़ के जल के पास की मिट्टी | 0.5 | किलो | 1.00 | 0.50 | 50 |
| 3 | फेंसिंग सामग्री | | | | | |
| | एंगिल आयरन 35x35x5 MM 6 फीट लम्बा तथा बीच में 5 सुराख | 10 | संख्या में | 400 | 4000.00 | 32000 |
| | प्लास्टिक की जाली 5 फिट ऊंची 40 लीटर | 100 | वर्ग फीट | 200 | 20000.00 | 80000 |
| | लम्बाई में कुल क्षेत्र लगभग 8.10 वर्गफीट पौधे को सहारा देने हेतु सहायक छड़ी 5 फीट लम्बाई मजबूत और और आकार की | 350 | संख्या में | 5 | 1750.00 | 175000 |
| 4 | जूट के धागे | 4 | किलो | 50 | 200.00 | 500 |
| 5 | जे०सी०बी० मशीन से भूमि पर 1 मीटर गहरा खुदान कार्य (वर्ग मी०) | 6 | घण्टा | 900 | 5400.00 | 540000 |
| 6 | यांत्रिक विधि से खोदी गई आधी मिट्टी को वापस ट्रेंच में डाला तथा मिट्टी का समान रूप से फैलाना | | | | | |
| 7 | बायोमास मिश्रण का आधा भाग ट्रेंच में तथा आधा भाग मिट्टी के टिले पर समान रूप से फैलाना | 3 | श्रमिक | 175.00 | 525.00 | 52500 |
| 8 | जे०सी०बी० मशीन से बायोमास का मिश्रण कार्य | 1 | घण्टा | 900 | 900.00 | 9000 |
| 9 | फोड़े से टिले पर छोटा सा गद्दा जिसमें पौध आराम से बैठ सके, गद्दा खुदान | 350 | संख्या में | 1 | 350.00 | 35000 |

| क्र०सं० | कार्यों का विवरण | इकाई | मात्रा | दर (रु०में) | घनराशि/दरप्रति 100 वर्ग मी० (रु० में) | दर प्रति हे०(रु०में) |
|---------|---|------|------------|-------------|---------------------------------------|----------------------|
| 10 | पौधे के थैली को जीवामृत मिश्रित पानी के घोल में डुबाना तथा जीवामृत का पानी सोखने के बाद थैली पौधों का जीवामृत से अलग करना | 2 | श्रमिक | 175.00 | 350.00 | 35000 |
| 11 | पौध रोपण एवं पौधा को छड़ी से सहारा देना | 350 | संख्या में | 1 | 350.00 | 35000 |
| 12 | मिट्टी के ऊपर 5 से 7 इंच मोटी पुआल बिछाना तथा 30 खूटी गाड़कर रस्सी से बांधना जिससे पुआल उड़ न सके। | 2 | श्रमिक | 175.00 | 350.00 | 35000 |
| 13 | सिंचाई कुल 48 बार | 48 | मानव दिवस | 175 | 8400.00 | 840000 |
| 14 | पौधों की कीमत 3 प्रतिशत अतिरिक्त | | | | | |
| | वृक्ष | 103 | संख्या में | 7.00 | 721.00 | 72100 |
| | सहवृक्ष | 103 | संख्या में | 7.00 | 721.00 | 72100 |
| | झाड़ी | 100 | संख्या में | 7.00 | 700.00 | 70000 |
| | पौधे (हर्ब) | 52 | संख्या में | 7.00 | 364.00 | 36400 |
| | बोंस | | | | | |
| | औषधीय पौध | | | | | |
| | शोभाकार पौध | | | | | |
| | सुरक्षा श्रमिक | 270 | प्रतिदिन | 175 | 47250.00 | 47250 |
| | सेपलिंग स्ओरेज | 1 | लमसम | 1000 | 1000.00 | 1000 |
| | योग:- | | | | 110541.50 | 2790000 |

द्वितीय वर्ष अनुरक्षण

| | | | | | | |
|---|---|-----|-----------|-----|----------|--------|
| 1 | सिंचाई अप्रैल से जून तक माह में 10 बार, अक्टूबर तथा नवम्बर माह में 05 बार, जनवरी, फरवरी माह में 04 बार, मार्च में 05 बार कुल 53 बार | 36 | मानव दिवस | 175 | 6300.00 | 630000 |
| 2 | गुड़ाई तथा मलचिंग 02 बार | 700 | पौध | 1.5 | 1050.00 | 105000 |
| 3 | सुरक्षा श्रमिक | 312 | प्रतिदिन | 175 | 54600.00 | 54600 |
| | योग:- | | | | 61950.00 | 789600 |

तृतीय वर्ष अनुरक्षण

| | | | | | | |
|---|--------------------------|-----|-----------|-----|----------|-----------|
| 1 | सिंचाई कुल 24 बार | 24 | मानव दिवस | 175 | 4200.00 | 420000 |
| 2 | गुड़ाई तथा मलचिंग 02 बार | 700 | पौध | 1.5 | 1050.00 | 105000 |
| 3 | सुरक्षा श्रमिक | 312 | प्रतिदिन | 175 | 54600.00 | 54600 |
| | योग:- | | | | 59850.00 | 579600.00 |

चतुर्थ वर्ष अनुरक्षण

| | | | | | | |
|-------|--------------------------|-----|-----------|-----|----------|-----------|
| 1 | सिंचाई कुल 12 बार | 12 | मानव दिवस | 175 | 2100.00 | 210000 |
| 2 | गुड़ाई तथा मलचिंग 02 बार | 700 | पौध | 1.5 | 1050.00 | 105000 |
| 3 | सुरक्षा श्रमिक | 312 | प्रतिदिन | 175 | 54600.00 | 54600 |
| योग:- | | | | | 57750.00 | 369600.00 |

अतिरिक्त संसाधन

| | | | | | | |
|--|------------------------|---|-----------|-------|----------|-------|
| | बोरिंग तथा प्रेसर पम्प | 1 | प्रति हे० | 80000 | 80000.00 | 80000 |
|--|------------------------|---|-----------|-------|----------|-------|

सारांश

| कार्य की मात्रा | द्वितीय वर्ष का अनुरक्षण | तृतीय वर्ष का अनुरक्षण | तृतीय वर्ष का अनुरक्षण | चतुर्थ वर्ष का अनुरक्षण | योग (रु०में) |
|--|--------------------------|------------------------|------------------------|-------------------------|--------------|
| 100 वर्ग मीटर भूमि पर मूल वन स्थापना पर अनुमानित व्यय (रु०में) | 1,10,542 | 61,950 | 59,850 | 57750 | 2,90,092 |
| 1 हे० भूमि पर मूल वन स्थापना पर अनुमानित व्यय (रु०में) | 27,90,000 | 7,89,600 | 5,79,600 | 3,69,600 | 45,28,800 |

उक्त मियॉवाकी पद्धति से प्राकृतिक मूल वन स्थापना हेतु कार्य की विधि संलग्न है।

चूंकि वित्तीय नियमों के अन्तर्गत क्षेत्रीय वन संरक्षकों को अपने वृत्त के अन्तर्गत कार्यों के अनुसूचित दरों के निर्धारण का प्राधिकार प्राविधानित है, अतः सम्बन्धित वन संरक्षक अपने वृत्त के लिए मजदूरी दर, सामाग्री दर एवं निर्गत शासनादेशों एवं नियमों का संज्ञान लेते हुए अनुसूचित दरें निर्धारित करेंगे। उक्त कार्यों पर व्यय को इस आदेश द्वारा निर्धारित सीलिंग दरों के अन्तर्गत रखा जाय।

प्रतिलिपि निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित:-

- 1- प्रधान मुख्य वन संरक्षक और विभागाध्यक्ष, उत्तर प्रदेश, लखनऊ।
- 2- प्रबन्ध निदेशक, उ०प्र० वन निगम, लखनऊ।
- 3- समस्त प्रधान मुख्य वन संरक्षक, उ०प्र०।
- 4- समस्त अपर प्रधान मुख्य वन संरक्षक, उ०प्र०।
- 5- समस्त जोनल/मण्डलीय मुख्य वन संरक्षक, (वन्यजीव सहित), उ०प्र०।
- 6- समस्त वन संरक्षक/क्षेत्रीय निदेशक, उ०प्र०।
- 7- समस्त प्रभागीय वनाधिकारी/प्रभागीय निदेशक, उ०प्र०।
- 8- गार्ड बुक।

संलग्नक:-यथोपरि।

संख्या जी- (I)/ 15-1(सीलिंग दर), दिनांकित।

प्रतिलिपि प्रमुख सचिव, पर्यावरण, वन एवं जलवायु परिवर्तन विभाग, उ०प्र० शासन, लखनऊ को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

(डा० प्रभाकर दुबे)

अपर प्रधान मुख्य वन संरक्षक
योजना एवं कृषि वानिकी
उ०प्र०, लखनऊ।



Anexure-III

जैव विविधता रजिस्टर (PBR)

उल्लेखनीय है कि जैवविविधता के संरक्षण हेतु भारत सरकार द्वारा प्रतिपादित जैवविविधता अधिनियम, 2002 की धारा 41(1) के अन्तर्गत उत्तर प्रदेश के सभी स्थानीय निकाय द्वारा जैवविविधता प्रबन्ध समिति (बी.एम.सी.) का गठन तथा जैवविविधता नियम, 2004 की धारा 22(6) के अन्तर्गत जन जैवविविधता पंजिका (पी.बी.आर.) का निर्माण कार्य किया गया है, जिसका संधारण सम्बन्धित स्थानीय निकाय द्वारा किया जाता है।

स्थानीय निकायों द्वारा तैयार किये गये जन जैवविविधता रजिस्टर में समस्त प्रकार के वनस्पतियों यथा घास, शाक, झाड़ीदार, पौधा, वृक्ष, लतायें, कन्द, मूल इत्यादि के साथ-साथ पशु-पक्षीय, कीट पतंगों एवं वन्य जीवों की जानकारी का समावेश रहता है।

उक्त के अतिरिक्त उ0प्र0 राज्य जैवविविधता बोर्ड द्वारा प्रदेश के 09 एग्रोकलाइमेटिक जोन के लगभग 325 ग्रामों का विस्तृत जन जैवविविधता रजिस्टर निर्माण कराया गया है। प्रत्येक एग्रोकलाइमेटिक जोन के मास्टर पी.बी.आर (विस्तृत जन जैवविविधता रजिस्टर) की बंददमक प्रति उ0प्र0 राज्य जैवविविधता बोर्ड की वेबसाइट: <http://www.upsbdb.org/pbr-booklet.php> पर उपलब्ध है। जन जैवविविधता रजिस्टर का उपयोग Miyawaki Plantation में प्रजाति चयन हेतु किया जा सकता है।

समस्त जैवविविधता प्रबन्ध समिति को जन जैवविविधता रजिस्टर निर्माण करने की प्रक्रिया को सुविधाजनक बनाने हेतु पी.बी.आर. बुकलेट का निर्माण किया गया जिसका प्रारूप संलग्न है। इसके अतिरिक्त Digital PBR बनाने हेतु उ0प्र0 राज्य जैवविविधता बोर्ड द्वारा निर्मित Biodiversity App को भी Google Play Store से Download किया जा सकता है।



भाभर एवं तराई जोन-

जैवविविधता प्रबन्ध समिति (बी.एम.सी.) का गठन
(Biodiversity Management Committee, BMC)
तथा
जन जैवविविधता रजिस्टर का निर्माण
(People's Biodiversity Register, PBR)

ग्राम सभा का नाम:

ब्लॉक:

तहसील:

जिला:



उ० प्र० राज्य जैवविविधता बोर्ड

(जैवविविधता अधिनियम, 2002, भारत सरकार, के अन्तर्गत गठित स्वायत्त, संवैधानिक/नियामक संस्था)
(पर्यावरण, वन एवं जलवायु परिवर्तन विभाग, उत्तर प्रदेश सरकार)
पूर्वी विंग, 'ए' ब्लॉक, तृतीय तल, पिकप भवन, विभूति खण्ड, गोमती नगर, लखनऊ
फोन नं०: 0522-4006746, फैक्स नं०: 0522-4006746

विवरणी

| क्र०सं० | विषय | पृष्ठ सं० |
|---------|----------------------------------|-----------|
| 1 | जैवविविधता प्रबन्ध समिति का गठन | 2-3 |
| 2 | जन जैवविविधता रजिस्टर का निर्माण | 4 |
| 3 | जैव संसाधनों की सूची | 5-9 |

जैवविविधता:

जैव = जीवन
विविधता = विभिन्नता

जैवविविधता में पृथ्वी के सभी प्रकार के जीवन की किस्मों को शामिल किया गया है, जो हैं स्थलीय, समुद्री और जलीय पारिस्थितिकी तंत्र। इसमें तीन स्तरों पर विविधता शामिल है : आनुवंशिक विविधता (प्रजाति के अंदर), प्रजाति विविधता (प्रजातियों के बीच) और पारिस्थितिक तंत्र विविधता)

भारत सरकार द्वारा प्रतिपादित जैवविविधता अधिनियम, 2002 के अन्तर्गत गठित जैवविविधता प्रबन्ध समिति (बी.एम.सी.)

अधिनियम की धारा 41 के अनुसार प्रत्येक स्थानीय निकाय द्वारा संरक्षित, स्थायी उपयोग जैविक विविधता के प्रलेखन को बढ़ावा देने के प्रयोजन से इसके क्षेत्र के तहत बी.एम.सी. का गठन किया जाएगा। जिसमें अधिवासों का संरक्षण, भूमि नस्लों का संरक्षण, लोक किस्मों और फसलों का संरक्षण, घरेलू भंडार और पशुओं तथा सूक्ष्म जीवों की नस्लें, जैविक विविधता से संबंधित ज्ञान का प्रसार किया जाना है।

बी.एम.सी के कार्यों में शामिल हैं :

- ◆ स्थानीय लोगों के परामर्श से जन जैवविविधता रजिस्टर (पी.बी.आर.) को तैयार करना, रखरखाव और सत्यापन।
- ◆ जैव संसाधन का संरक्षण व संवर्धन।
- ◆ जैविक संस्थानों तक पहुंच और सौंपे गए पारंपरिक ज्ञान के विवरण, लगाए गए शुल्क संग्रह का विवरण और उत्पन्न लाभों के विवरण तथा इनके बांटने की विधि के बारे में सूचना देने वाले रजिस्टर का रखरखाव।

1- जैवविविधता प्रबन्ध समिति का गठन

| दिनांक | उपस्थित सदस्यों के नाम | प्र0 स0 | कार्यवाही जो किया गया | उपस्थित सदस्यों के ह0/नि0 अ0 |
|--------|------------------------|---------|--|------------------------------|
| | | | <p>आज दिनांक को पूर्व प्रसारित सूचना के अनुसार ग्राम सभा में दिनांक समय पंचायत भवन पर ग्राम प्रधान श्री के अध्यक्षता में बैठक बुलाई गयी। बैठक में निम्नलिखित कार्यवाही की गयी।</p> <ol style="list-style-type: none"> 1 पिछली कार्यवाही सभी सदस्यों को पढ़कर सुनाई गई 2 सभी सदस्यों को आय-व्यय का विवरण पढ़कर सुनाया गया। सर्वसम्मति से उसकी पुष्टि की गयी। 3 जैवविविधता प्रबन्ध समिति का गठन एवं जन जैवविविधता रजिस्टर का निर्माण : सभी सदस्यों द्वारा जन जैवविविधता रजिस्टर निर्माण हेतु जैवविविधता प्रबन्ध समिति (बी. एम.सी.) का गठन किया गया, जिसमें निम्नलिखित सदस्यों का चयन सर्वसम्मति से किया गया है: <p>सभी सदस्यों ने बताया गया कि उपरोक्त गठित जैवविविधता प्रबन्ध समिति द्वारा जन जैवविविधता रजिस्टर तैयार किया जाएगा। इसको तैयार करने में वन विभाग के अधिकारियों/कर्मचारियों द्वारा पूर्ण सहयोग दिया जायेगा। इसी के साथ कार्यवाही को समाप्त किया जाता है।</p> <p style="text-align: center;">○</p> <p style="text-align: center;">ग्राम प्रधान/अध्यक्ष का हस्ताक्षर/मोहर</p> <p style="text-align: center;">○</p> <p style="text-align: center;">ग्राम पंचायत अधिकारी का हस्ताक्षर/मोहर</p> | |



2-जन जैवविविधता रजिस्टर का निर्माण

प्रमाण-पत्र

(जैवविविधता नियम 2004 के नियम 22(10) के अनुसार)

यह जन जैवविविधता रजिस्टर ३०५० राज्य जैवविविधता बोर्ड के समग्र पर्यवेक्षक I और ३०५० राज्य जैवविविधता बोर्ड तथा वन विभाग के अधिकारियों के मार्ग दर्शन के अधीन ग्राम पंचायत जैवविविधता प्रबन्ध समिति के संकल्प संख्या दिनांक द्वारा समर्थित है। जन जैवविविधता रजिस्टर निर्माण का प्रथम / द्वितीय / तृतीय / अन्तिम चरण है।

जैवविविधता प्रबन्ध समिति के

1. अध्यक्ष -

(हस्ताक्षर मय सील व दिनांक)

2. जैवविविधता प्रबन्ध समिति के सचिव

(हस्ताक्षर मय सील व दिनांक- यदि नियुक्त हों)

3. जन जैवविविधता रजिस्टर निर्माण में लगे संगठन के प्रतिनिधि के प्रतिहस्ताक्षर

सचिव

३०५० राज्य जैवविविधता बोर्ड
के प्रतिहस्ताक्षर मय सील व दिनांक



3- जैव संसाधनों की सूची

| *फसल वाले पौधे | | |
|----------------|----|-------------|
| 1 | 1 | भिन्डी |
| | 2 | फूल गोभी |
| | 3 | पालक |
| | 4 | लोबिया |
| | 5 | नारी का साग |
| | 6 | बाकला |
| | 7 | चौलाई |
| | 8 | सोया |
| | 9 | पेठा |
| | 10 | सौफ |
| | 11 | परवल |
| | 12 | लहसुन |
| | 13 | हल्दी |
| | 14 | बन्द गोभी |
| | 15 | मूली |
| | 16 | पुदीना |
| | 17 | लौकी |
| | 18 | कद्दू |
| | 19 | टमाटर |
| | 20 | प्याज |
| | 21 | सेम |
| | 22 | आलू |
| | 23 | शलजम |
| | 24 | बैंगन |
| | 25 | बड़ी सेम |
| | 26 | कटहल |
| | 27 | तरोई |
| | 28 | करेला |
| | 29 | घुईयां |
| | 30 | धान |
| | 31 | गेहूँ |

| | | |
|---|----|---|
| | | *फसल वाले पौधे |
| 1 | 32 | मक्का |
| | 33 | गन्ना |
| | 34 | जौ |
| | 35 | चना |
| | 36 | अरहर |
| | 37 | मटर |
| | 38 | मूँग दाल |
| | 39 | मिर्चा |
| | 40 | धनिया |
| | 41 | मेथी |
| | 42 | सरसों |
| 2 | | *फलदार पौधे |
| | 1 | शरीफा |
| | 2 | अंगुर |
| | 3 | अनार |
| | 4 | केला |
| | 5 | पपीता |
| | 6 | खीरा |
| | 7 | खरबूजा |
| | 8 | करौंदा |
| | 9 | नींबू/बड़ा नींबू |
| | 10 | कैथा |
| | 11 | तरबूजा |
| | | 'जैव संसाधनों की सूची का विस्तृत विवरण वेबसाइट: http://www.upsbdb.org/ पर उपलब्ध है। |
| 3 | | *चारा की फसलें |
| | 1 | ज्वार |
| | 2 | बरसीम |
| 4 | | *खरपतवार |
| | 1 | मकोई |
| | 2 | गोखरू |
| | 3 | गाजर घास |
| | 4 | दूब घास |
| | 5 | जल धनिया |

| | |
|----|-------------------------------|
| 6 | जंगली कुंदरू |
| 7 | रत्ती |
| 8 | केम्फेरिया |
| 9 | बथुआ |
| 10 | कृष्णीनील |
| 11 | छोटी हज डोर |
| 12 | छोटी रसभरी |
| 13 | खट्टी बूटी |
| 14 | कुल्फा |
| 15 | कंटकारी |
| 16 | अकरा अकरी |
| 17 | गोखरू |
| 5 | *फसलों के हानिकारक कीट |
| 1 | आम का फुदका |
| 2 | सूडियां |
| 3 | तना छेदक |
| 4 | फल माखी |
| 5 | दीमक पंखी |
| 6 | टिड्डा |
| 7 | मॉहू |
| 6 | *फलदार वृक्ष |
| 1 | कटहल |
| 2 | बड़हल |
| 3 | कमरख |
| 4 | आंवला |
| 5 | आम |
| 6 | शहतूत |
| 7 | खजूर |
| 8 | आडू |
| 9 | बेल |
| 10 | लीची |
| 11 | चीकू |
| 12 | अलूचा |
| 13 | अमरूद |

| | | |
|---|----|---|
| | 14 | नाशपाती |
| | 15 | जामुन |
| | 16 | बेर |
| | 17 | इमली |
| | 18 | कमरख |
| 7 | | *औषधीय पौधे |
| | 1 | नीम |
| | 2 | तुलसी |
| | 3 | मदार |
| | 4 | जरांकुश |
| | 5 | पुदीना |
| | 6 | भृंगराज |
| | 7 | पिपरमिन्ट |
| | 8 | मेंहदी |
| | 9 | कंधी |
| | | 'जैव संसाधनों की सूची का विस्तृत विवरण वेबसाईट: http://www.upsbdb.org/ पर उपलब्ध है। |
| | 10 | सतावर |
| | 11 | धीक्वार |
| | 12 | सदाबहार |
| | 13 | सर्पगंधा |
| | 14 | गुर्च / गिलोय |
| 8 | | *शोभाकार पौधे |
| | 1 | अमलतास |
| | 2 | गुडहल |
| | 3 | गुलमोहर |
| | 4 | गेंदा |
| | 5 | गुलाब |
| | 6 | कनेर |
| | 7 | गुलवकाबली |
| | 8 | साइसक |
| | 9 | सफेदा लिली |
| | 10 | छुईमुई |
| | 11 | यैलो बिगनोनिया |
| | 12 | बोगेनवेलिया |



| | | |
|----|----|--------------------------|
| | 13 | छितवन |
| | 14 | रबर |
| | 15 | अर्जुन |
| | 16 | साल |
| 9 | | *लकड़ी वाले वृक्ष |
| | 1 | शीशम |
| | 2 | पाकड़ |
| | 3 | गूलर |
| | 4 | सेमल |
| | 5 | यूकेलिप्टस |
| | 6 | कदम्ब |
| | 7 | बॉस |
| | 8 | बरगद |
| | 9 | पीपल |
| | 10 | पापुलस |
| | 11 | अशोका |
| | 12 | सागौन |
| | 13 | छितवन |
| | 14 | रबर |
| | 15 | अर्जुन |
| | 16 | साल |
| 10 | | *पालतू जानवर |
| | 1 | गाय-बैल |
| | 2 | भैंस-भैसा |
| | 3 | कुत्ता |
| | 4 | बकरी |
| | 5 | घोड़ा |
| | 6 | मुर्गा मुर्गी |
| | 7 | सुअर |
| | 8 | गधा |
| | 9 | भेड़ |
| 11 | | *मछली |
| | 1 | रोहू |
| | 2 | नैन |

| | | |
|---|----|---|
| | 3 | गिरई |
| | 4 | सिंधी |
| | 5 | कत्ला कत्ला |
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| 12 | | *जंगली वृक्ष, झाड़ियाँ, कंद, घास, लतायें |
| | 1 | अमरबेल |
| | 2 | मनी प्लान्ट |
| | 3 | कठ गूलर |
| | 4 | सानकस |
| | 5 | नरकुल |
| | 6 | बेहया |
| | 7 | मूँज |
| | 8 | कुश |
| | 9 | कॉस |
| | 10 | खस |
| 13 | | *महत्वपूर्ण वन्य प्रजातियाँ |
| | 1 | ढाक |
| | 2 | पीली कटीली |
| 14 | | *जलीय पौधे |
| | 1 | जलकुम्भी |
| | 2 | हाइड्रिला |
| | 3 | सिरेटोफिल्लम |
| | 4 | जूसिया |
| | 5 | लैमना |
| | 6 | मारसीलिया |
| | 7 | पिस्टिया |
| 15 | | *जंगली जलीय पौधों की महत्वपूर्ण प्रजातियाँ |
| | 1 | कमल |
| | 2 | सिंघांड़ा |
| 16 | | महत्वपूर्ण वन्य औषधीय पौधे |
| | 1 | लटजीरा |
| | 2 | पीली कटीली |
| | 3 | धतूरा |
| | 4 | दूधी |

| | | |
|----|---|---|
| | 5 | अर डी |
| | 6 | अडूस |
| 17 | | * फसलों के जंगली सम्बन्धी |
| | 1 | जई |
| | 2 | जंगली कुंदरू |
| 18 | | *जंगली शोभाकार पौधे |
| | 1 | सना |
| | 2 | नागफनी |
| | 3 | ककरोना |
| | 4 | चकवड़ |
| | 5 | फुलानी |
| | 6 | लेन्टाना |
| | 7 | लाल तहानी |
| 19 | | *चबाने व धुआँ करने वाले पौधे |
| | 1 | भोंग |
| 20 | | *अन्य जंगली पौधे |
| | 1 | नागफनी |
| | 2 | नरकुल |
| | 3 | पोलीगोनम |
| | 4 | बेहया |
| 21 | | *वन्य जन्तु की प्रजाति |
| | | स्तनधारी, चिड़िया, सरीसृप, उभयचर, कीट व अन्य |
| | 1 | केचुआ |
| | 2 | दीमक |
| | | 'जैव संसाधनों की सूची का विस्तृत विवरण वेबसाइट: http://www.upsbdb.org/ पर उपलब्ध है। |
| | 1 | टिड़डा |
| | 2 | चींटा |
| | 3 | छिपकली |
| | 4 | गिरगिट |
| | 5 | बगुला |
| | 6 | टिटहरी |
| | 7 | रॉबिन |
| | 8 | कौआ |
| | 9 | तोता |

| | |
|----|---------------|
| 10 | कोयल |
| 11 | बिल्ली |
| 12 | खरगोश |
| 13 | चूहा |
| 14 | बन्दर / लंगूर |
| 15 | मधुमक्खी |
| 16 | कबूतर |
| 17 | गिलहरी |
| 18 | चींटी |
| 19 | तितली |

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जैवविविधता हमारी बहुमूल्य धरोहर है !
आइये हम इसे बचाने में अपना योगदान दें।

अधिक जानकारी हेतु सम्पर्क करें:



उ० प्र० राज्य जैवविविधता बोर्ड

(जैवविविधता अधिनियम, 2002, भारत सरकार, के अन्तर्गत गठित स्वायत्त, संवैधानिक/नियामक संस्था)

(पर्यावरण, वन एवं जलवायु परिवर्तन विभाग, उत्तर प्रदेश सरकार)

पूर्वी विंग, 'ए' ब्लॉक, तृतीय तल, पिकप भवन, विभूति खण्ड, गोमती नगर, लखनऊ

फोन नं०: 0522-4006746, फैक्स नं०: 0522-4006746



Annexure-IV

(Determining soil texture using the ribboning technique)

Soil texture refers to how coarse or fine a soil is: that is how much sand, silt and clay it contains. Texture has a major influence on how much water a soil can hold. Generally, the smaller and finer the soil particles (the more silt and clay), the more water a soil can hold (but this water may not all be available to the crop). Soil texture can be estimated by hand, using the ribboning technique, but it takes practice to produce a consistent result.

Assessing soil texture

Carry out this ribbon test on a sample from each layer identified in the soil profile.

1. Take a small handful of soil.



2. Add enough water to make a ball. If you can't make a ball, the soil is very sandy.



3. Feel the ball with your fingers to find out if it is gritty (sand), silky (silt) or plastic/sticky (clay).



4. Roll the ball and with your thumb gently press it out over your forefinger to make a hanging ribbon.



5. If you can make a short ribbon, your soil texture is loamy, a mixture of sand and clay.



6. The longer the ribbon, the more clay is in your soil.



Table: Soils textures using the ribboning technique

SAND

Coherence nil to very slight, cannot be moulded; single grains adhere to fingers ; nil to slight turbidity when puddled.

LOAMY SAND

Will form a ribbon to 5 mm. Slight coherence; definite turbidity when puddled in palm of hand.

CLAYEY SAND

Will form a ribbon 5 to 15 mm. Slight coherence, sticky when wet, many sand grains stick to fingers, discolours fingers with clay stain.

SANDY LOAM

Will form a ribbon of 15 to 20 mm. Bolus just coherent and very sandy to touch; sand grains visible.

LIGHT SANDY CLAY LOAM

Will form a ribbon of 20 to 25 mm. Bolus moderately coherent but sandy to touch; sand grains easily visible.

LOAM

Will form a ribbon of about 25 mm. Bolus coherent and spongy; smooth feel and no obvious sandiness; may be somewhat greasy, as organic matter is usually present.

SANDY CLAY LOAM

Will form a ribbon 25 to 40 mm. Bolus strongly coherent, sandy to touch; sand grains visible.

CLAY LOAM

Will form a ribbon 40 to 50 mm. Bolus strongly coherent and plastic; smooth to manipulate

SANDY CLAY and LIGHT CLAY

Will form a ribbon 50 to 75 mm. Plastic bolus, slight resistance to shearing. sandy clay - can see, feel and hear sand grains. light clay - smooth to touch.

LIGHT MEDIUM CLAY

Will form a ribbon 75 to 85 mm. Plastic bolus smooth to touch; moderate resistance to shearing between thumb and forefinger.

MEDIUM CLAY

Will form a ribbon 85 to 100 mm. Smooth plastic bolus: handles like plasticine and can be moulded into rods, moderate resistance to ribboning.

HEAVY CLAY

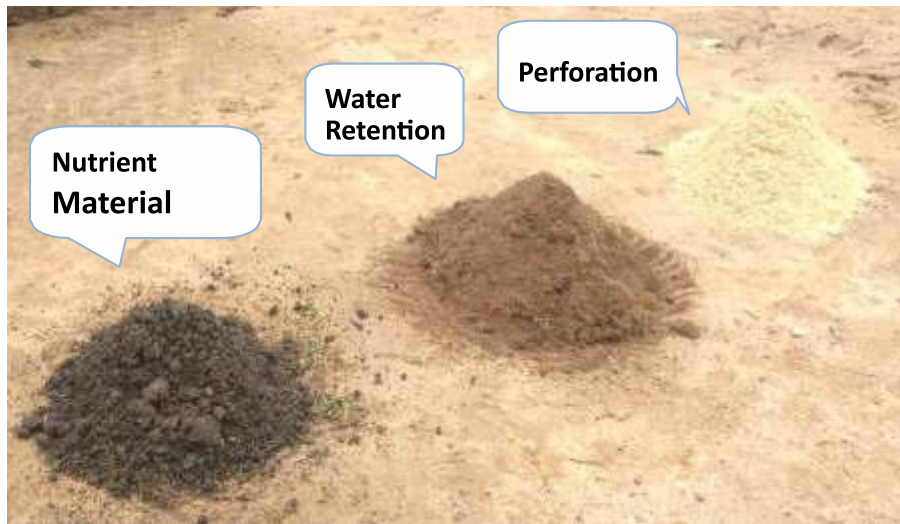
Will easily form a ribbon over 100 mm. Smooth plastic bolus; handles like stiff plasticine; can be moulded into rods without fracture; has firm resistance to ribboning shear.

Each soil texture is classified within a ribbon length range (for example, sandy clay loam ribbon length is 25 to 40 mm long). Therefore, once a consistent ribbon length is being produced, you can be reasonably sure that the correct soil texture has been identified

Annexure-V (Example for Execution of Afforestation)

EXECUTION

I. Soil Nourishment Material have to be thoroughly mixed



*It should be kept under shade

For every 100 square meters of forest, the quantity was:

- ◆ Nourishment Material: 1500 kilograms of Cow manure
- ◆ Water Retention Material: 970 kilograms of coco-peat
- ◆ Perforation Material: 730 kilograms of wheat/rice husk
- ◆ Soil Microbiology Enhancer: 100 liters

The quantity of soil nourishment material was decided on the basis of Soil Analysis Test that was done after first visit.

II. Material Mixing



The material (perforator, water retainer, nourishment material) is mixed thoroughly with the help of an earthmover (JCB/Hitachi etc.) along with labourers. Ensure that the material is mixed in the exact same ratios as what has been fixed initially i.e. for every 100 square meter of forest.



Total exact quantity of mixed material/biomass for every 100 square meters was 3200 kilograms (3.2 Ton).

III. Earth Work and Mound Making

Miyawaki method of plantation is different from conventional methods. Under Miyawaki method of plantation, mounds of 100 square meters each are created for all the saplings decided to be planted together on it. It was 325 saplings per 100 square meters.



Demarcated area of 100 square meters i.e. (5 by 20) square meter

First we have to do earth work to create mounds. Steps to be followed for earth work is mentioned below:

Step 1 -Dig out the earth up to a depth of 2 feet. Work on 100 square meters of Forest at a time.



Step 2 – 1.5 ton biomass spreaded uniformly into the pit created.



Step 3 – 30 liters concentrated jeevamrutha diluted with 300 liters of water, i.e- 10 liters of water added with 1 liter of jeevamrutha and manually spreaded over the biomass.



Spreading Jeevamrutha on lower layer

Step 4 – Using machine JCB/Hitachi mix the mixture up to depth of 1 feet.



Step 5 - Once the lower layer is mixed properly using the machine, put the remaining soil back into the pit. Ensure that once it is put back into the pit, the soil is spread out uniformly. Put the remaining biomass on top of this soil, i.e. 1.7 ton. Manually spread out the biomass and spread 40 liters of Jeevamrutha diluted with water in the same ratio.



Biomass Spreaded On Top Layer



Thoroughly mixing the biomass with the soil beneath
2 feet using the machine

Step 6 - Once thoroughly mixed, give it the shape of a mound. Mound making will be fairly simple because during this entire process, the soil becomes very loose. Thus it occupies more space in its loose form and mound making becomes easier manually.



Leveled mounds

IV. **Plantation**

Mound making is immediately followed by plantation. The following steps need to be followed:

Step 1 – Transfer plants from nursery to site.



Temporary nursery created nearby the site. Below picture shows unloading plants at the site



Unloading plants on site

Step 2 – Try to group plants belonging to different layers.



Rows arrangement

Step 3 – Place the plants on the mound so as to create a multi layered forest. For e.g.

- ◆ Tree, Shrub, Canopy
- ◆ Sub tree, Shrub, Canopy,
- ◆ Sub Tree, Tree, Canopy
- ◆ Tree, Sub Tree, Tree



Saplings arranged on mound keeping a gap of 2 feet between each sapling

Note:

- ◆ Try as far as possible not to place 2 trees of the same kind next to each other.
- ◆ The combinations or groups are completely dependent on species that have been selected and the number of trees allocated to each layer.
- ◆ Do not follow a pattern when placing trees on the mound. Let the trees follow a random zigzag pattern.

Step 4 - Final step is plantation which involves certain steps as mentioned below;

1) Check that the root ball or root bag of your plant sits comfortably in the pit. Use the small garden hole to deepen or widen the pit if necessary. Like in the picture shown below.



Cut the cover of the root bag/pouch with the help of cutter. Only cut the cover, do not cut into the soil



Carefully place one hand under the root ball while gently holding the stem with the other. Place the plant into the pit without removing your hand from the bottom.

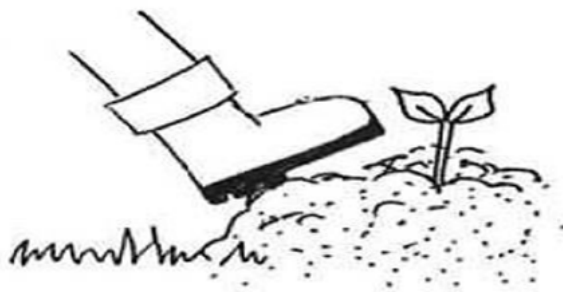


- ii) Pour jeevamrutha on the root balls of every plant. Fill the pit with the soil around. The soil should be leveled gently around the stem of the plant. Steady the plant by holding on to the stem. Once leveled, do not press or compact the soil.



30 liters was used during plantation

- ♦ *To ensure minimal compaction of the soil, please refrain from stepping on the mound unless necessary.*



V. Supporting the Plants with Sticks

Once planted, the saplings should not droop or bend. In order to keep them upright while their roots get a hold on the soil, we need support sticks and strings to tie the plants.



5 feet long and straight bamboo sticks

The plant roots should not get damaged while inserting the sticks into the soil. Maintain a very small yet safe distance between the plant stem and the stick.



Use only bamboo sticks and jute strings. Everything used inside the forest should be natural and biodegradable.



For every 100 square meters i.e. 325 saplings we should have 325 sticks. Ensure you have thin jute strings to tie the support sticks to the stems. You will roughly need 5 Kg for every 100 square meter.

VI. Mulching

Mulching is the process of covering the soil with a suitable material. Direct sunlight on the soil will make it dry and make the conditions difficult for the young saplings. It also plays a huge role in preventing the water from evaporating.



Rice/wheat straw



Evenly spreaded layer of mulch. It should be (5-7 inches) thick and should not fall on the saplings. For every 100 square meters, 500 Kg of mulch will be needed.

VII. Watering

Once the forest has been created, the forest needs to be watered well enough. The plants need to be watered using a hosepipe with a shower.



Lined writing area with 25 horizontal teal lines.



Uttar Pradesh
Pollution Control Board

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