EP NO: 23/ 2023-24 DEVELOPING A VIABLE URBAN FORESTRY MODEL FOR MITIGATING AIR AND NOISE POLLUTION - ESTABLISHING URBAN AND PERI-URBAN FORESTRY PLANTATIONS IN EDUCATIONAL INSTITUTIONS FOR THE PURPOSE OF NOISE AND AIR POLLUTION ABATEMENT

INTRODUCTION:

Urban forestry is one of those green infrastructures comprising trees which are more known for their intangible benefits than tangible benefits in an urban environment. For the establishment of a viable urban forestry model, we have proposed to establish the plantation at an educational institution available near our research centre. The main idea behind adopting this model is to provide a greener space for the students in the institution to inhale fresh air and to have a safer environment around them apart from screening of species for noise and air pollution abatement. Keeping all this in view, this project has been framed to establish a model urban and peri-urban plantation in St. Charles Arts and Science College, Eraiyur, Ulundurpet.

Species chosen for the research study is as follows.

1. *Ficus macrocarpa*
2. *Erythrina indica*
3. *Holoptelea integrifolia*
4. *Syzygiumcumini*
5. *Phyllanthus emblica*
6. *Ficus religiosa*
7. *Alstoniascholaris*
8. *Ficus benghalensis*

Reason for species selection:

(***Ficus microcarpa***) Indian laurel trees are known for its ability toabsorb carbon di oxide and produce oxygen, making as important trees for air pollution control. They are often planted along roads and in public spaces.

(***Erythrina indica*****)** Indian coral trees are known for their beautiful red flowers and are often planted along roads and in public spaces for its ornamental value, making their important trees for air pollution control.

(Holoptelae integrifolia) Indian elm trees are native to India and are known for their hardiness and ability to withstand extreme temperatures and drought. They are often planted along roads and in public spaces for their ornamental value. Making them important trees for air pollutant control.

(Syzygium cumini) Jamun trees are native to India and are known for their medicinal properties. They are also valued for their shed and ornamental value and

are often planted alongroads and in public spaces. An ability to absorb carbon dioxide and produce oxygen, making them important trees for air pollutant control.

(Phyllanthus emblica) Indian gooseberry trees are known for their delicious fruit and medicinal properties. They are often planted along roads and in public spaces for their ornamental value. An ability to absorb carbon dioxide and produce oxygen.

(Ficus religiosa) has an important place among herbal plants.Almost every part of this tree, i.e. leaves, bark, seeds and fruits are used in the preparation of herbal medicines. It is also known for its pollution abatement qualities.

(Alstoniascholaris) is an important medicinal plant in the various folk and traditional systems of medicine in Asia, Australia, and Africa. It is also known for its air pollution tolerance, thus helpful in mitigation of air pollution.

(Ficus benghalensis) commonly known as the banyan, banyan fig and Indian banyan, is a tree is also known for its large canopy and variety of medicinal properties. It is also known for its air pollution tolerance, thus helpful in mitigation of air pollution.

OBJECTIVES

1. To develop a successful urban forestry model for urban and per-urban areas.

2. To develop a model strip plantation in selected institution for institutions

3. To develop a model for the purpose of noise and air pollution abatement for institutions.

4. To screen the best species among the target species for noise and air pollution abatement.

MATERIALS AND METHODS

The nursery was established at Edaikkal Modern Nursery Centre of Kallakurichi Modern Nursery Range and eight targeted species, with 100 seedlings of each species (Seeds collected from identified CPT's) successfully raised in a nursery, resulting in a total of 800 seedlings in 16 x 30 cm Polybags were filled with the potting mixture consisted of red earth, sand, and farmyard manure (FYM) in a 1:1:1 ratio, supplemented with vermicompost (30 g/bag), VAM (15 g/bag), Azospirillum (6 g/bag), and Phosphobacteria (6 g/bag).. Soil testing has been done initially to evaluate nutrient availability. The plantation area identified at St. Charles Arts and Science College, Eraiyur, area of 1 hectare. Seedlings were

planted species-wise, at an Espacement of 4m x 3 m with pit size of 45 $cm^3$and pits filled with farmyard manure (1 m^3/50 plants), tank silt (1 m^3/50 plants), vermicompost (0.5 kg/pit), VAM (25 g/pit), Azospirillum (10 g/pit), and Phosphobacteria (10 g/pit). Casuarina poles were used to safeguard the plants from strong winds. Observations on plant growth were recorded periodically.

The Nursery

Planting Site – Immediately after planting

OBSERVATIONS TO BE RECORDED:

1. Soil will be done before planting and proper nutritional supplements will be noted.
2. Initial height of the plants will be recorded.
3. The Species wise dust retention potential of the leaves will be studied.

4. Photo will be taken frequently to study the changes in vegetation.
5. Ambient noises levels will be recorded species wise once in a year during monsoon and summer seasons.
6. Air quality and air pollutant levels will be taken at site and just outside the institution on road before planting and annually thereafter to assess if air pollution levels are reduced due to the plantation.
7. Species wise following observations has to be assessed for finding out air tolerance level of the species. A: Ascorbic acid content (Mg/gm), T: Total Chlorophyll (Mg/gm), P: PH of leaf extract, R: Relative water content of leaf (%), These four parameters in combination yiled the best index to assess the tolerance level of the trees to air pollution.
8. Tolerance index of Trees:
9. Low index plants exhibit susceptibility to air pollution are categorised as

   Sensitive (less than 12)

   Intermediate (13 to 20)

   Tolerant (more than 20)

   APTI Score (Assessing the air pollution tolerance index formation).
10. APTI : [A(T+P)+R]/10

MEASUREMENT DATA:

MORPHOMETRIC DATA - (as on December 2024 - Immediately after planting)

S.No.	Species	planted	survival	survival %	Avg. Height
		(No.)	(No.)	(%)	(m)
1	*Ficus macrocarpa*	100	100	100	0.70
2	*Erythrina indica*	100	100	100	0.46
3	*Holopteliainterifolia*	100	100	100	1.35
4	*Syzygiumcumini*	100	100	100	1.52
5	*Phyllanthus emblica*	100	100	100	0.48
6	*Ficus religiosa*	100	100	100	0.57
7	*Alstoniascholaris*	100	100	100	1.04
8	*Ficus benghalensis*	100	100	100	0.50

POLLUTION DATA - (as on December 2024 - Immediately after planting)

S.No.	Parameter	Recommended	Recorded	
			in Planting site	Nearest Roadside
		(ppm)	(ppm)	(ppm)
1	Co2	< 1000	534	650
2	So2	0.075	0.00	0.00
3	No2	0.053	0.00	0.00
4	O3	0.070	0.11	0.12

INTERIM FINDINGS:

The air quality data recorded at the planting site and the nearest roadside were compared against recommended levels for key pollutants. The planting site exhibited CO_2 levels of 534 ppm, which is below the recommended threshold of 1000 ppm. SO_2 and NO_2 levels were both recorded at 0.00 ppm, well within the recommended limits of 0.075 ppm and 0.053 ppm, respectively. However, an O3 level at the planting site is 0.11 ppm, exceeding the recommended limit of 0.070 ppm. At the nearest roadside, CO_2 levels were higher at 650 ppm but still within the recommended range. SO_2 and NO_2 levels remained at 0.00 ppm, while O_3 levels were slightly higher at 0.12 ppm, also surpassing the recommended limit. These findings indicate that while CO_2, SO_2, and NO_2 levels are within acceptable ranges, O_3 levels at both locations exceed the recommended standards. However, it is too early for a conclusion. Experiment ongoing.