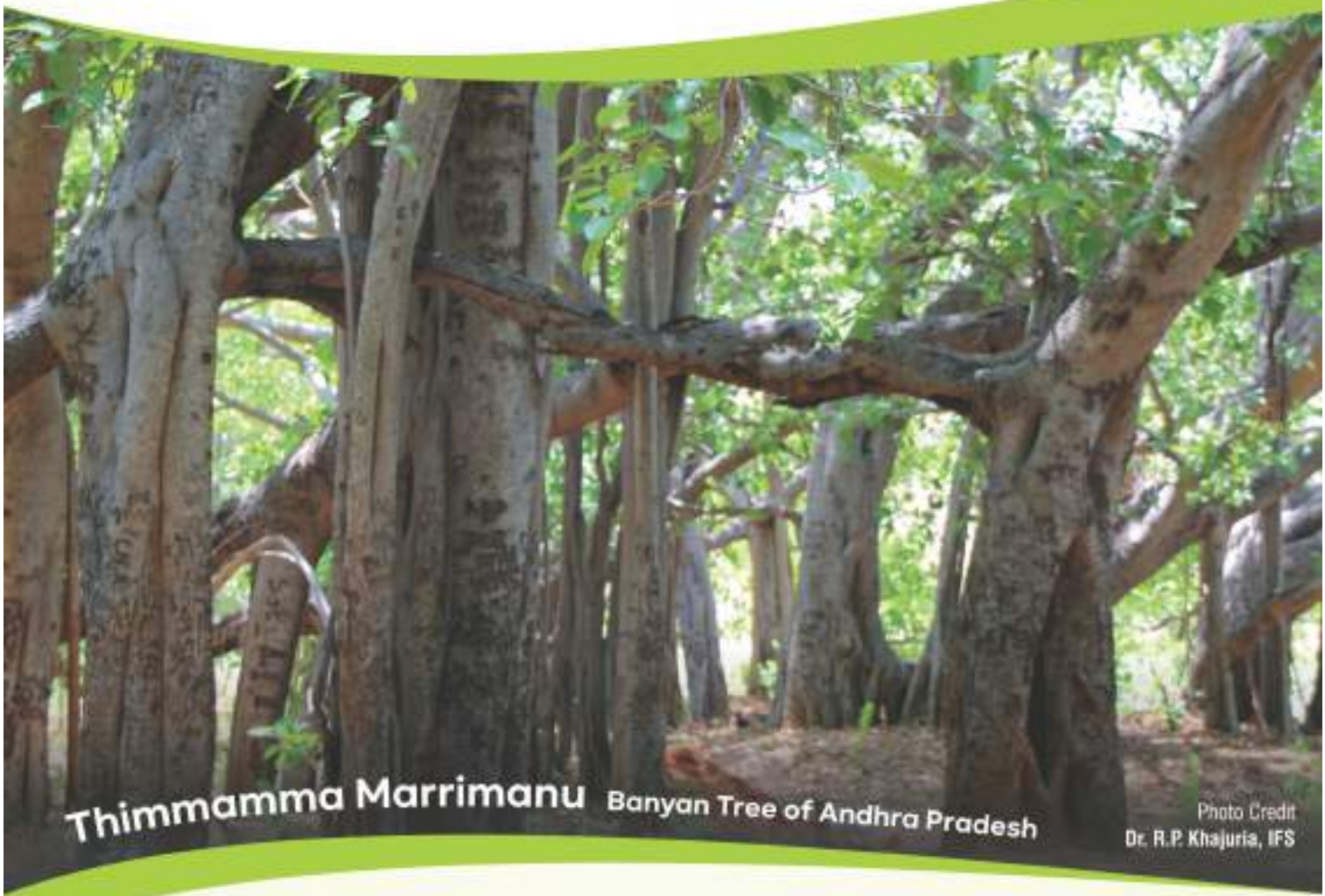
TREES OUTSIDE FORESTS

Report



Thimmamma Marrimanu Banyan Tree of Andhra Pradesh

Photo Credit
Dr. R.P. Khajuria, IFS

Andhra Pradesh Forest Department

అహొ ఏషాం వరం జన్మా సర్వ ప్రాణ్యూపజివనం
ధన్యా మహిరుహా యభ్యో నిరాశమ్ యాంతి నార్తిన్:

अहो एषां वरं जन्म सर्व प्राण्युपजीवनम् ।
धन्या महीरुहा येभ्यो निराशां यान्ति नार्थिनः ॥

**"Aho yesham varam janam sarv pranayupajivanam.
Dhanya mahirooha yebhyo nirasham yanti narthin"**

Bhagvat 10-22-33

Life of trees is the greatest because all the living beings are dependent on them. Blessed are these trees since they never disappoint anyone, whosoever asks anything from them.

PREFACE

The total geographical area of Andhra Pradesh is 1,62,968 sq.km. The State is ranked 8th in terms of the Recorded Forest Area (RFA) of 37,258 sq.km, which is 22.86 % of its geographical area. Reserved Forest, Protected Forest and Unclassed Forest constitute 31,959 sq.km, 5,069 sq.km and 230 sq.km of the RFA respectively.

Forest Cover in the State is 29,137.40 sq.km which is 17.88% of the State's geographical area. In terms of forest canopy density classes, the State has 1,994.22 sq.km under Very Dense Forest (VDF), 13,938.36 sq.km under Moderately Dense Forest (MDF) and 13,204.82 sq.km under Open Forest (OF).

Forest Survey of India (FSI) has been mapping forest cover using satellite data as well as assessing tree cover outside forests using sampling-based methodology. Forest cover accounts for tree patches of size 1 ha and more having canopy density more than 10%. However, trees occurring in patches of size less than 1 ha including scattered trees are assessed through sampling to arrive at extent of tree cover. Trees Outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. Tree cover in Andhra Pradesh has been estimated to be 3914 sq.km.

However, the TOF estimation of the FSI is done at a macro level whereas the states require the information on TOF at district level with more parameters. The state of Andhra Pradesh realizing the importance of TOF estimation, started the exercise of field inventory in the year 2007-08 itself. After the detailed field inventory for 3-4 years, the report had to be published with the analytical results. But this could not be done due to bifurcation and post-bifurcation issues.

It is heartening to know that the Forest department has given this TOF report preparation and publication due priority and getting the unfinished task completed.

The results of this report will serve as a starting point for moving from a forest-centric to holistic view on monitoring the tree cover upto the smallest administrative level. It will provide necessary inputs for better planning for afforestation as well as for proper management of natural resources. Hope this report will be useful to the Wood Based Industries, Farmers, Government Departments and other stake holders.

Yours sincerely,

Vijaya Kumar G.Srkr, IAS
Secretary to Govt. EFS&T Deptt.

What is a tree?

An oxygen maker,

a flood abater, a carbon absorber,

a climate recorder, a healthy aspect, a place to reflect,

a nest for an owl, where gruffalos growl, a climbing frame,

the fuel for a flame, a soil stabiliser, a picnic sun-visor, a provider of fruit,

winter quarters for newts, the pages of a tome, the heart of a home,

a pollutant filter, a neighbourhood gilder, a treatment for fever,

a stress reliever, an artist's spark, an ancient landmark,

a noise muffler, a bluetit's supper's supper,

a temperature reducer,

a primary producer,

a wind breaker,

a wood maker,

a natural sculpture,

just outside the front door.

Source : Internet

FOREWORD

The terminology, Trees Outside Forests (TOF) is used to refer to those tree resources that are grown outside the legally notified forest areas such as in agricultural farms, green belts along roads, along canals and other patches on private/government lands. Tree is a tree, whether it's inside a notified forest area or in other areas. The ecological, economic or social benefits it offers are similar irrespective of a tree's classification or ownership.

With the general ban by the Hon'ble Supreme Court on green felling in natural forests in India, the rural communities and Wood Based Industries (WBIs) have become increasingly dependent on TOF for timber and non-timber requirement for livelihood and commercial purposes.

Forest Survey of India (FSI) commenced estimation of TOF on a small scale in India in the year 1995 and for the entire country in 2003. However, results based on this assessment do not reflect the true picture at the district level because of low level of sampling.

Therefore, the Andhra Pradesh Forest Department decided to assess the TOF in the State using the Cartosat data of 2.5 meter resolution for stratification. The methodology formulated by the FSI has been followed while improving the stratification and increasing the sampling size. A customized web-enabled package was developed and deployed for capturing the information and analyses. The thrust of this report is on providing State and District level information on TOF resources.

This report is the culmination of several years of planning, execution and analysing the data in a very meticulous and systematic manner. Due to bifurcation of the erstwhile Andhra Pradesh, there has been delay in publishing the report. I feel immensely pleased that this report is finally published. I thank one and all involved in bringing out this report. I hope that this report will help the department in better planning for greenery as well as maintaining supply to the WBIs and be of immense value to all the stakeholders.

Yours sincerely,

N. Prateep Kumar, IFS
Principal Chief Conservator of Forests &
Head of Forest Force, Andhra Pradesh.

Photo Credit - **Dr. R.P. Khajuria, IFS**

"What we are doing to the forests of the world is but a mirror reflection of what we are doing to ourselves and to one another."

- Mahatma Gandhi

ACKNOWLEDGEMENT

This TOF report is the outcome of several years of planning, execution and field inventory and data analyses followed by drafting and publishing. The field inventory and data analyses were taken up in the erstwhile state of Andhra Pradesh before bifurcation. It has been the result of consistent efforts of several officers, staff and other personnel who have been associated with the planning, organising and executing the field inventory, assimilating and interpreting the data and finally drafting and publishing the report.

Special thanks to the Technical Advisory Committee formed by the Government of Andhra Pradesh consisting of Dr. Devender Pandey, IFS (Rtd.) Ex DG, FSI, Dr. C.S. Jha, Head of Forestry Division NRSC, Sri. Anoop Singh, IFS, APSAC, Hyderabad, Dr. Reddy, Scientist from MoEF and Dr.H.C.Mishra, IFS, APCCF (IT), A.P for constant guidance and leadership during the course of this inventory work.

The drafting and publication work was taken up post-bifurcation in the state. I thank all the officers, staff and other persons involved in this exercise.

I thank Sri. N.Prateep Kumar, IFS, PCCF & HoFF for guiding and supporting us in getting this report published, without which it would have never been possible to take up this work.

I thank Sri. Sanjay Gupta, IFS, PCCF (WP) who as Chairman of the committee got the report finalized with his valuable inputs and suggestions. I also thank other members of the committee namely Sri. S. S.Sreedhar, IFS, APCCF (Budget & CAMPA), Sri. Rahul Pandey, IFS, CCF (WL) and Smt. J.P. Sowjanya, ACF.

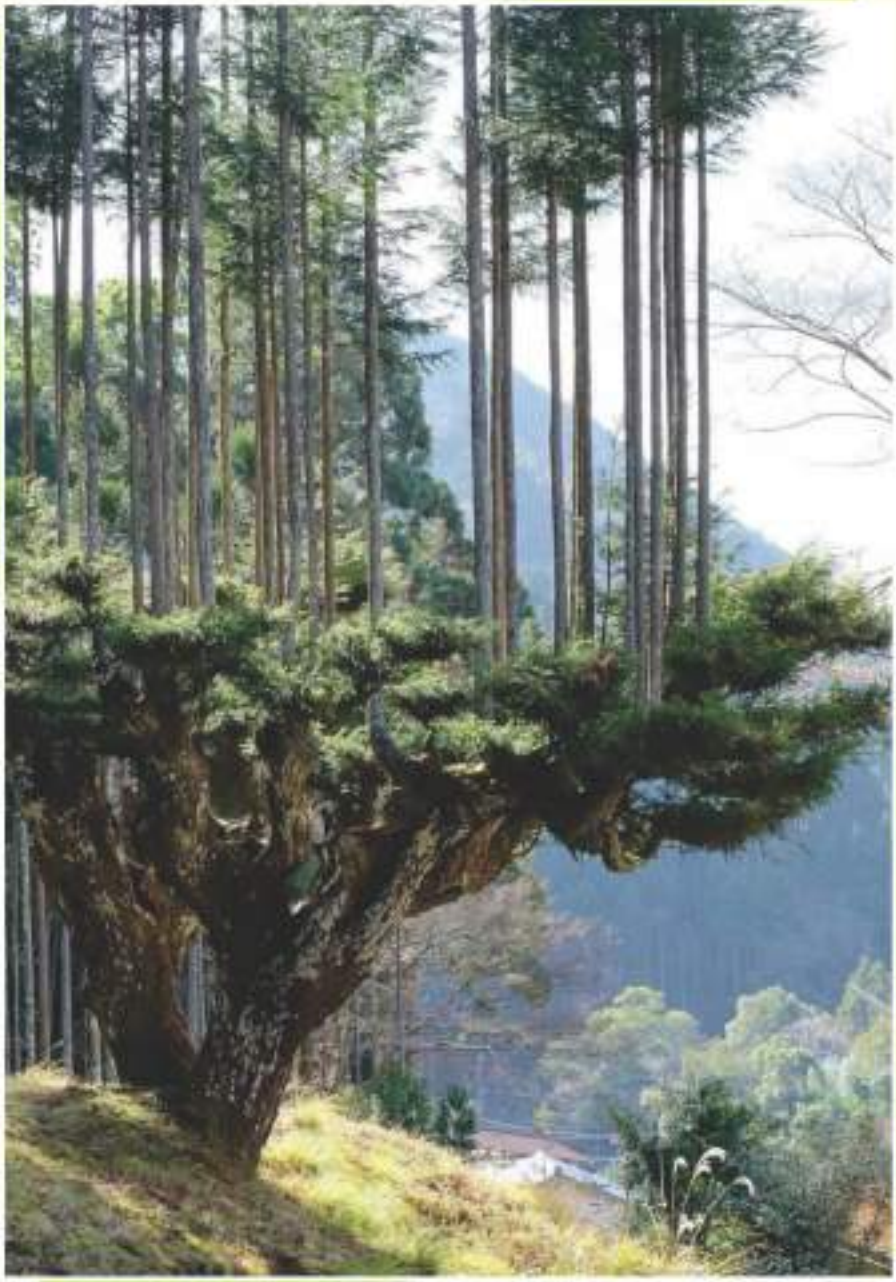
I also thank Sri Jagannath Singh IFS, DFO Ananthapur, Sri G.Narethran IFS, DFO Chittoor (East), Smt. G. Krishna Priya DCF/IT, Smt. P. Suneetha, ACF for their assistance in editing and proof reading the draft report.

The role of Project Scientists of the IT cell involved in data collection and analyses is also appreciated.

Last but not the least, special thanks to two young IFS officers namely Sri. Vineet Kumar and Sri. A. Vignesh, who were instrumental in compiling the district level chapters.

Yours sincerely,

Dr. Rajendra Prasad Khajuria, IFS
PCCF (Production & IT)



Source - **Internet**

Daisugi Technique

" Sustainable forestry: lumber without cutting down trees.
Daisugi is a Japanese forestry technique where specially planted
cedar trees are pruned heavily (think of it as giant bonsai) to produce
"shoots" that become perfectly uniform straight
and completely knot free lumber"

EXECUTIVE SUMMARY

The TOF report has been prepared after field inventory at district level, which was the primary sampling unit. The entire district was stratified into various homogeneous units using the high resolution CARTOSAT -1 PAN Imagery. The sampling size was calculated for 10% permissible error at 95% Confidence level, based on the pre -inventory data from Kurnool and Prakasam districts. A total of 6492 sampling points covering an area of 125859 sq.km in all the strata were marked and data collected after laying the sample plots. After verification and analyses of the data, estimation of growing stock, number of stems was done district-wise, division-wise under various dia-classes, as well as species-wise.

The following are the key results of this assessment:

A. GROWING STOCK

a. The Notional area estimated under TOF is 9674 sq.km, which constitutes 5.94% of the geographical area of the state.

b. The TOF contribute growing stock of 67.9 million cu m, out of which 35.4 million cu m is contributed by Block plantations, 3.9 million cu m is contributed by Linear stretches, 7.8 million cu m is contributed by Natural forests, 1.3 million cu m is contributed by Rural habitations, 19.06 million cu m is contributed by Scattered trees and 0.4 million cu m contributed by Urban areas.

c. The possible Annual yield from the total TOF in the State has been estimated to be 2.56 million cu m considering the rotation age of different species occurring.

B. NUMBER OF STEMS

a. The total number of trees estimated under TOF comes to 175.70 million. Block plantations have maximum number of trees at 100.36 million. There are 34.20 million Scattered trees. Linear and Homestead trees have been estimated at 7.4 and 3.4 million respectively.

b. The TOF areas have, on an average, 14 stems per ha. The Block plantations have 123 stems per ha followed by Linear at 131 and Natural at 119. Urban plantations have the lowest stems per ha at 3.

C. SPECIES-WISE ESTIMATIONS

a. The top 5 species based on volume are *Mangifera indica* with 10.81 million cu m; *Azadirachta indica* 9.10 million cu m ; *Cocus nucifera* 7.30 million cu m ; *Borassus flabelliformis* 6.33 million cu m; *Anacardium occidentale* 4.53 million cu m.

b. The top 5 species based on number of stems are *Mangifera indica* 48 million, *Cocus nucifera* 19 million, *Anacardium occidentale* 17 million, *Azadirachta indica* 12 million and *Borassus flabelliformis* 11 million.

D. DISTRICT-WISE ESTIMATIONS

a. Out of total Growing stock of 67.9 million cu m, East Godavari district contributes the maximum amount which is 12.95 million cu m followed by West Godavari at 8.30 million cu m. Krishna Chittoor and Prakasam also figure in top 5 with 7.22 million cu m, 7.10 million cu m and 6.25 million cu m respectively.

b. East Godavari district has a maximum of 45 stems per ha followed by Srikakulam which has 32 stems per ha. Ananthapur and Kurnool have the lowest, with 3 stems per ha.

E. CARBON POOL ESTIMATION

The estimated Carbon pool in TOF areas is 31.32 million tons.


FORESTS FOR SURVIVAL
A.P. FOREST DEPT

CONTENTS

CHAPTER 1
INTRODUCTION

"Trees are the poems that the earth writes upon the sky"

-Khalil Gibran

1.1: Background

Trees are a valuable resource. Their value can be judged by the fact that they are the biggest source of the basic needs of mankind. Trees affect the ambience in a favorable manner. The environmental services provided by trees outside forests, in rural and urban areas, include protection of soil and water resources, the conservation of biological diversity, support to agricultural productivity and sustainability, the buffering of desertification and resource degradation processes in arid and semi-arid zones, amenity and recreation and maintenance or improvement of livelihoods.

Cities and human settlements, whatever their size, face several environmental problems such as shortage of water supply, air pollution and sewage management. Deforestation and changes in land use in ever-widening circles around cities are particularly accentuated in arid and semi-arid zones. Indeed, consumption patterns and basic needs of the urban population for products such as fuel wood and construction material are important causes of forest and land degradation. This results in the degradation of soil fertility and the diminution of the tree-cover which contributes to the erosion of the diversity of the gene pool. The negative impact of forest resource degradation on the nutrition and livelihood of poor urban dwellers is often overlooked in urban development.

Trees contribute to the environment by providing oxygen, improving air quality, climate amelioration, conserving water, preserving soil, and supporting wildlife. During the process of photosynthesis, trees take in carbon dioxide and produce the oxygen we breathe. According to the U.S. Department of Agriculture, "One acre of forest absorbs six tons of carbon dioxide and puts out four tons of oxygen. This is enough to meet the annual needs of 18 people. " Trees, shrubs and turf also filter air by removing dust and absorbing other pollutants like carbon monoxide, sulfur dioxide and nitrogen dioxide. After trees intercept unhealthy particles, rain washes them to the ground.

Trees control climate by moderating the effects of the sun, rain and wind. Leaves absorb and filter the sun's radiant energy, keeping things cool in summer. Trees also preserve warmth by providing a screen from harsh wind. In addition to influencing wind speed and direction, they shield us from the downfall of rain, sleet and hail. Trees also lower the air temperature and reduce the heat intensity of the greenhouse effect by maintaining low levels of carbon dioxide.

Both above and below ground, trees are essential to the eco-systems in which they reside. Far reaching roots hold soil in place and fight erosion. Trees absorb and store rainwater which reduce runoff and sediment deposit after storms. This helps the ground water supply recharge, prevents the transport of chemicals into streams and prevents flooding. Fallen leaves make excellent compost that enriches soil.

1.2: Significance of TOFs

Extensive tree wealth exists outside notified forest areas in our country, termed as **"Trees Outside Forests"** These are in the form of small woodlots and block plantations, natural growing vegetation along streams and on community/private/government lands, trees along linear features, such as roads, canals bunds, etc. Besides providing support to rural economy, these trees are now a source of substantial forest produce. TOF is traditionally contributing to the various wood and non-wood requirements of the households and the industries. Trees save energy through cooling in the hotter months. They provide a wind break effect during windy months. This results in burning less fossil fuel to generate electricity for cooling and heating. Strategically placed shade trees-a minimum of three large trees around a home-can reduce energy costs of cooling up to 30 percent.

1.3: Biodiversity

TOFs are comprised of a variety of species. They also support related fauna like birds, insects etc.

They create wildlife and plant diversity. Trees and associated plants create local ecosystems that provide *habitat and food for birds and animals*. They offer suitable micro climates for other plants that could otherwise be absent from urban areas. Biodiversity is an important part of TOFs, which in turn contribute to urban forestry.

1.4: Property value

It is common knowledge, property that is well landscaped with trees and other plants is more desirable than property sitting on a barren landscape. Studies have shown that healthy trees can add up to 15 per cent to residential property value. Office and Industrial space in a wooded setting is in more demand and is more valuable to sell or rent out. Thus, TOF resources have economic, social/cultural and ecological significance. These are discussed in a modular fashion as follows:

1.5: Economic value

Through careful tree selection, farmers can deliberately shape tree production on their farmland and fulfil their specific needs. Trees also provide traditional medicines as well as basic food commodities, including a variety of gums, oils, proteins, fruits and drinks, which are of nutritional importance for a large number of people, especially in rural areas. Agroforestry lands are also a major source of wood and non-wood products, which provide significant household income and are important for local economy.

1.6: Social/ Cultural value

TOF resources have a considerable social and cultural significance. Specific social groups including women, the poor, immigrants and young adults tend to be particularly involved in the gathering and sometimes the processing of NTFPs, because these activities require no cash investment. The marketing of these products is also predominantly a women's activity. It tends to generate a higher proportion of income for women than for men, which may have a positive impact on the nutritional status of children. People especially the rural masses in India attach special significance to specific trees that are not cut or harvested. Such trees are grown in the form of traditionally managed *sacred groves* and within or other surrounding religious places. Certain castes trace their ancestry to certain trees, which they do not cut. These castes also have their clan names similar to that of the trees. Thus, a tree species is protected from being over exploited and is thus conserved for the posterity.

1.7: Ecological value

TOF fulfill fundamental ecological functions in soil and water conservation and environmental protection. Most of the agricultural production in India where there are settled populations has various species of TOFs. These are planted by the farmers for various purposes like food, fodder, and small timber. Besides the direct benefits, these trees perform a valuable function of serving as windbreak and shelterbelts. Therefore, the improved management of agroforestry systems has potential impact for the whole rural ecosystem.

Thus, the significance of TOFs can be briefly summarized in the following heads:

- Biomass accumulation.
- Carbon sequestration.
- Biodiversity (Ecosystem, Species, Gene).
- Watershed functions (soil and water conservation).
- Pollution control (Air, Noise).
- Windbreak/shelterbelts.

1.8: The need for TOF assessment

Any resource that is to be managed needs to be assessed in the first place. TOF is now recognized as a viable resource for meeting the demands of various stakeholders. The need for its enumeration stems from the fact that the existing forests are dwindling both qualitatively as well as quantitatively. Due to various reasons the tree resource available per capita is also shrinking. The only land that can be looked at for

meeting the ever-increasing tree needs is the TOF.

Natural resource assessments are expensive and therefore require an objective justification, which usually embraces the economic, socio-cultural and ecological role of the resource, the potential use of the information and the potential users of the information.

Considerable overlap is found between the economic and ecological functions of forest trees and of TOF. Both forest and non-forest trees provide wood and non-wood products, living space for animals and plants and thus play a role in species conservation, protection of soil and water resources, contributions to the scenic beauty of the landscape and carbon storage functions. Non-forest and Forest tree resources differ in the degree to which the different functions are present, and many ecosystem functions are specific to the forest and cannot be provided by TOF. But it is also instructive to look at TOF without making the direct comparison to forest trees. The TOF resource is often independent of the forest, forming a relevant component of non forest landscape that should be taken into account in large-area for natural resource planning, from both an ecological and an economic point of view.

In some countries (for example, Colombia and Costa Rica) as well as in several Indian states, forest legislation also extends to TOF (e.g. as regards felling permits). While there is some tradition and experience in, as well as a recognized need for, sustainable management of forests, little is known about the dynamics of the tree resource outside forests. Data is therefore important as a foundation for developing management options to help sustain tree cover.

Data assessment is also useful for planning, e.g. of wood production from TOF. In India there are certain rules governing felling and transportation which infact acts as a disincentive to tree farmers.

With changing priorities of the people and development of technology, it is essential to estimate the Growing Stock outside the forests as they reduce pressure on the natural/notified forests and also play an important role in maintaining ecological balance besides providing many economic services. These also help conserve biodiversity, control erosion and provide fuel wood, fodder, fiber and small timber etc. Hence, assessment of 'Trees Outside Forest (TOF)', in a way, will provide necessary inputs for sustainable management of the notified forests as well.

The National Forest Policy 1988 says *"the goal should be to have a minimum of one-third of the total land area of the country under forest or tree cover. In the hills and in mountainous regions, the aim is to maintain two-third of the area under such cover in order to prevent erosion and land degradation and to ensure the stability of the fragile eco-system."*

Forest Survey of India (FSI) commenced the estimation of TOF on a small scale in India in the year 1995 and for the entire country in 2003. However, the assessment of TOF by FSI suffers from the limitation of the small size of the sampling. Results based on this assessment do not reflect the true picture at the state and district levels.

Hence APFD has decided to take up assessment of TOF in the state of Andhra Pradesh using Cartosat -1 images.

CHAPTER 2

OBJECTIVES & METHODOLOGY

Photo Credit - **APFDC**

"The nation behaves well if it treats the
natural resources as assets which it must turn over
to the next generation increased and not impaired in value"

-Theodore Roosevelt

2.1: Objectives

The aim of the TOF field inventory exercise is to collect qualitative and quantitative information about the trees outside forest resources.

Briefly the objectives are

i. Estimation of the total number of trees in TOF area
ii. Estimation of volume of standing trees in TOF area.
iii. Evaluation of the role of TOF in the context of timber production.
iv. Evaluation of the role of TOF in the context of fuel wood, fodder and NTFP.
v. Estimation of contribution of TOF in tree cover.

2.2: Methodology

2.2.1: Sampling design for various classes

Sampling is the process of obtaining information by examining only a part of the population to draw conclusion about the whole. The procedure by which the samples are selected from the population is called sampling design. To achieve the objectives of our exercise, Purposive Stratified Random Sampling method is used for field data collection.

The sampling design is finalized by the Geomatics Center after approval of the Technical Advisory Committee (TAC). The maps, showing the locations were overlaid on topographical maps where the detailed inventory is to be made. For the enumeration purpose, each district is chosen as a primary sampling unit. The entire district is stratified into various homogeneous units using the high resolution CARTOSAT 1 PAN Imagery. The sampling frame (Sample Size, Number of Samples, Size of the Sampling Unit, Sampling Intensity) for each Stratum is done by intensive field visits made by the Officers of the Geomatics Center and also in consultation with Technical advisory Committee formed by Govt. of Andhra Pradesh wherein Forest Survey of India actively took part. It is decided

- To have more number of samples with smaller size than few bigger samples, since more samples cover more area and better accuracy is achieved. It also meets the criteria of optimal sample size with same resources and time.
- To adopt FSI method, as nearly as possible, for easy comparison and acceptance from other organizations.
- To collect more parameters, but as simple as possible, if time and resources permit.

Stratum	No.of Pre-Inventory points used	N required at 10% permissible error at 95% Confidence level	Remarks
Natural	1137	6994	Plot size is 0.1ha.,square
Block	77	1211	Plot size is 0.1ha., square
Linear	91	3438	Plot size is 10m x 125m
Rural	110	1247	Total habitation area enumerated in four districts considered for this computation, However segments planned for rest of the districts as desired by TAC
Urban	45	241	Segments
Scattered	109	1229	Plot size 3ha., square

Cartosat-1 data is used for mapping the TOF. The sample size N required is computed for undivided Andhra Pradesh state using the data of Adilabad, Kurnool, Prakasam & Medak districts. The committee approved the TOF assessment methodology by stratification using CARTOSAT-1 data, sampling design, N required calculated for 10% permissible error at 95% Confidence level, based on the pre inventory data from 4 districts well spread over three regions of state & opined that the methodology is more scientific and the error is also quantified well.

While considering the higher number of samples of about 3500 in linear stratum with respect to its nominal contribution for wood availability and keeping the nominal area of the stratum, TAC decided that 20% error may be permitted for that particular stratum keeping the cost factors in view. However, the overall precision of all strata is expected to be above 90%.

Referring the methodology followed by FSI, the country is classed into 14 physiographic zones and assessed zone wise. FSI could achieve above 90% precision at Zone level. However, at district level about 15% error is observed. Similarly, it was also decided that, if state inventory observations are to be used at district level, the data of that particular district is to be analysed and error be estimated and results generated but state averages would not be used for district areas for extrapolation. However, as the state is bifurcated on 02-06-2014, the inventory points scattered in the residual Andhra Pradesh are used for estimations of the residual Andhra Pradesh for all the six categories.

The methodology followed uses geo-referenced data of various features like water bodies, block plantations, possible deemed forests and possible roadside palatable areas etc. as it is useful for planning.

For calculation of the growing stock using Volume Equations, the following principle was used.

1. Adopt the Local Volume Table for the species from the working plan in the District/ locality concerned.
2. If the local volume table is not available, pre-existing volume table for the same species in similar eco-system elsewhere in the country is to be used.
3. If the above is not available in the similar eco system, adopt the General Volume Table for the species and
4. If none of the above are available for a species, look for a tree species which is photo morphologically similar to the species and adopt its volume table or utilise volume tables of "Rest of the species" provided by FSI.

The similar method was followed for the Forest Inventory of AP during 2006-2010.

As large variations are found in structure and volume between old mango orchards and recent varieties, with various espacements and the forest mango is yielding higher volume compared to orchard varieties, it is decided to go for "rest of the species" equation. As species identification was not completely possible from the CARTOSAT I data and a requirement for various species-wise estimations exists, it was decided to take the enumerated data for extrapolations species-wise also. However, to go for spp. level estimations, whole state at one go is not suggested as it requires much more sampling intensity. It is to be noted that, for major two or three spp. it can be done but based on its frequency of occurrence etc., its reliability depends.

The Stratum-wise sample design is briefed below.

2.3: Natural Forests

Since the tree cover is similar to the notified open forest areas, the regular inventory methodology used for forest areas will be adopted for this category. Two stage sampling - Pre-Inventory and Final-Inventory methods are adopted.

i. The number of sample points N required will be be estimated using probability proportionate stratified random sampling method (Probability Proportionate to area). Sampling intensity expected will be 0.01%.
ii. Initially Pre-Inventory @ 15 points randomly selected from 1 (i) for each class will be conducted. Based on variance in the population, the number of sample points N required will be estimated using t-distribution @ allowable error 20% for carrying out the final inventory.
iii. Maximum of (i) and (ii) will be considered as N required.

iv. The information collected during pre-inventory will be reused in generation of final statistics.
v. 0.1 ha., sample plot will be adopted for pre-inventory and final inventory.
vi. Utilising data of 1137 points from 4 districts of Adilabad, Kurnool, Prakasam, Medak of united AP. the N required was computed.
vii. The information has to be collected in the Plot approach /Description and Plot Enumeration forms.

2.4: Block Plantations

The crop in a block is generally uniform in nature in terms of age and species in 90% of the cases.

i. The number of sample points N required will be estimated using probability proportionate stratified random sampling method.
ii. Sampling intensity is 0.1%.
iii. Utilising the 77 points from 4 districts of Adilabad, Kurnool, Prakasam, Medak of united AP the N required was computed.
iv. The information has to be collected in the Plot Enumeration and Plot approach/Description forms.

2.5: Habitations Rural

Villages were stratified based on the geographical area.

i. Area stratification will be adopted since it is already available from imagery.
ii. The classes adopted are- Area between 5 to 3 sq.km, 3 to 1 sq.km, 1 sq.km, to 50 ha and 50 ha to 25 ha and area less than 25 ha.
iii. 6-10 samples (villages) in each class will be selected using Stratified Random Sampling Technique. Initially in the four districts total enumeration was done. Later it is decided to give few sectors as sample points in selected villages without compromising quality.
iv. 110 sample villages from 4 districts are used for the N required computation.
v. The information has to be collected in the Plot approach/Description and Plot Enumeration forms.

2.6: Habitations Urban

Area based stratification will be adopted similar to rural areas, since areas are readily available from the imagery.

i. The classes adopted are – Area more than 50 sq.km, Area between 50 to 35 sq.km, 35 to 20 sq.km, 20 to 10 sq.km, 10 to 5 sq.km. Sample frame will be generated.
ii. Habitations will be divided into segments using systematic grid based on the man-made/natural features. Segments will be selected randomly for carrying out enumeration @ 0.1% sampling intensity. Total enumeration will be done in the selected segments and extrapolated to entire area.
iii. 45 urban segments data from 4 districts was used for N required computation.
iv. The information has to be collected in the Plot approach/Description and Plot Enumeration forms.

2.7: Linear Plantations

The FSI method of using 125m length * 10m width sample plot is ideal, with 1% sampling intensity. The information has to be collected in the Tree and Plot approach forms. 91 sample points from 4 districts were used for N required computation.

2.8: Scattered Trees

Individual trees also contribute substantially towards TOF. Counting small number of trees on screen is cumbersome and may be prone to errors.

i. 60 samples plots as suggested by FSI are scattered randomly in 4 districts. The sample size to be adopted is 3 ha.
ii. 109 points data from 4 districts was used for N required computation.
iii. The information has to be collected in the Plot approach/Description and Plot Enumeration forms.

The random points generated in the above process were overlaid on the topo maps which were supplied to the field officers, along with geographic coordinates for carrying out the enumeration.

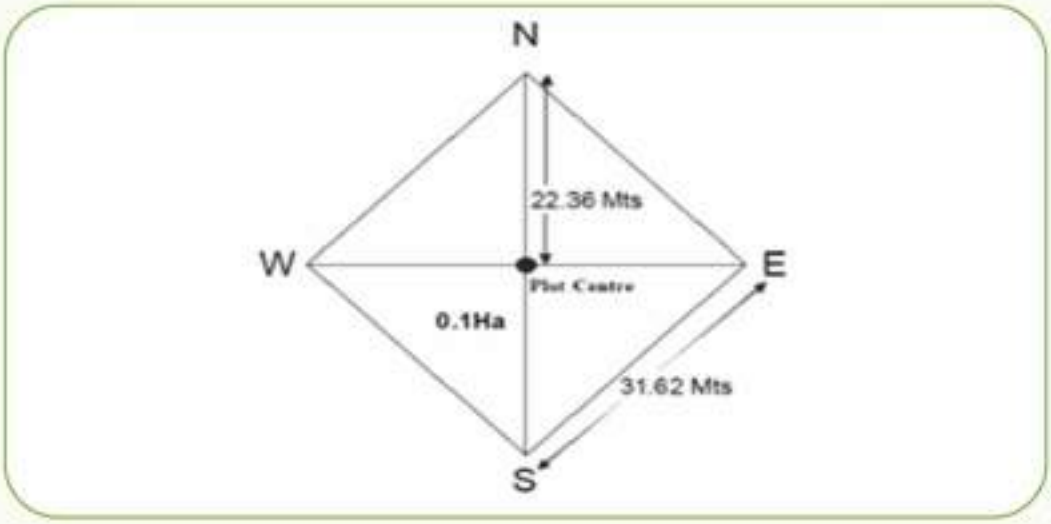
District-wise&Stratum-wise Points

S. No.	District	Block Plantation	Linear	Natural	Rural	Urban	Scattered	Total
1	Ananthapur	80	80	65	60	47	80	**412**
2	Chittoor	60	60	90	50	46	60	**366**
3	Kadapa	60	60	25	60	51	60	**316**
4	East Godavari	89	84	436	65	88	88	**850**
5	Guntur	80	80	50	60	60	80	**410**
6	Krishna	80	80	70	60	110	80	**480**
7	Kurnool	60	60	173	60	81	60	**494**
8	Nellore	80	80	70	60	41	80	**411**
9	Prakasam	90	60	400	60	62	60	**732**
10	Srikakulam	80	80	120	60	28	80	**448**
11	Visakhapatnam	80	80	252	60	46	80	**598**
12	Vizianagaram	80	80	100	60	26	80	**426**
13	West Godavari	82	86	130	63	103	85	**549**
	Total	**1001**	**970**	**1981**	**778**	**789**	**973**	**6492**

Laying of Sample plots and Methodology for enumeration

2.9: Natural Forests

The size of the sample point will be 0.1 ha., and it will be laid as per the measurements shown in the diagram.



The point is approached with the help of GPS/GNSS. After fixing the plot centre, fix the N, S, E and W corners of the plot by measuring 22.36m horizontal distance by tape/rope from center in all four directions. Stout pegs or bamboo of 1.5 m height should be fixed at each corner and a flag attached to it. Check the correctness of layout by measuring each side, which should be 31.62m. If possible ranging rods also can be used as corner posts. A red/white colour cloth may be tied at the top end of these corner posts for getting clear visibility from different spots in the plot.

2.10: Block plantations

The size of the sample point will be 0.1 ha., and to be laid as described in Natural Class.

2.11: Urban habitation

The urban areas will be delineated into five classes based on the geographical area calculated from the satellite imagery. Each urban habitation will be subdivided into various blocks based on the roads and natural features and these blocks will be randomly selected for carrying out the enumeration. Total enumeration will be done in each block.

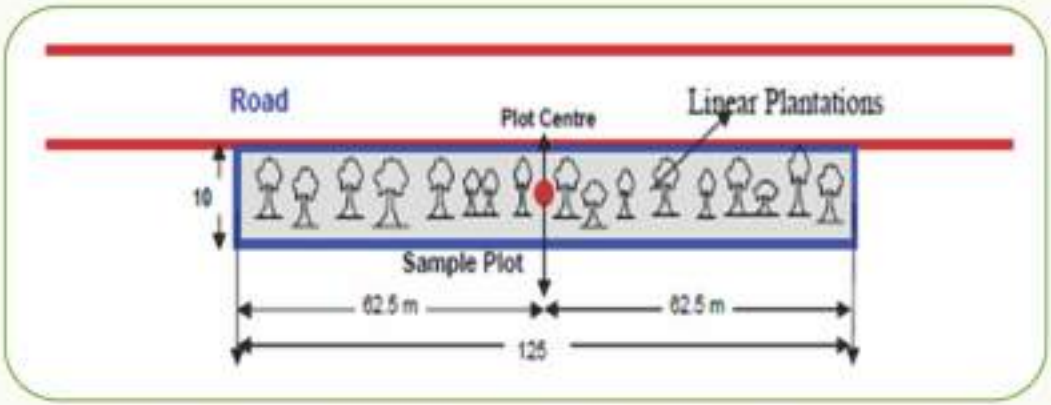
2.12: Rural habitation

The rural areas will be delineated into five classes based on the geographical area of the village calculated from the satellite imagery. In a district segment wise 6-10 sample locations in each class shall be considered for partial enumeration.

After laying out each plot, the enumeration work will be started. Enumeration will commence from Northwest corner of the plot and will proceed in clockwise direction. The information will be recorded in Plot approach/Description and Plot enumeration forms.

2.13: Linear stratum

The size of the sample plot is 10m x125m and the number of samples per district will be 60. After reaching the center of the plot at given longitude and latitude as per sample list, the plot centre is to be fixed keeping 62.5 m on both sides. Accordingly, plot along the linear strip is to be laid out and width of 10m will be taken with the help of chain/measuring tape from the starting point of the canopy of strip of trees.



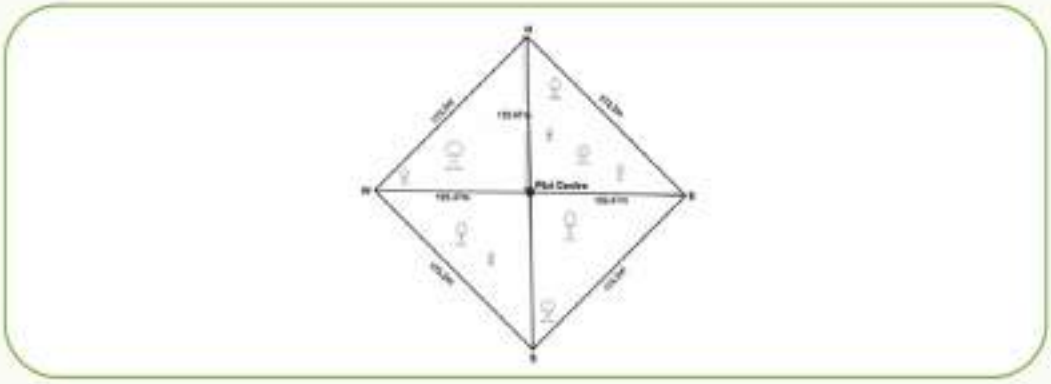
If any of the side is less than 62.5m then plot center is to be adjusted in such manner that each side of the adjusted plot is 62.5m respectively, as shown in the figure above. The actual longitude and latitude of the midpoint of the length (adjusted plot center) of laid out sample plot may be recorded in the TOF Form 1& 2 at appropriate place.

2.14: Scattered trees

In district 60-80 square plots of 3.0 ha. size will be located & enumerated. After reaching plot center at given longitude & latitude a square plot of 3.0 ha. will be laid out.

The layout of the plot shall be carried out using any method mentioned below.

a) After fixing the plot centre, fix the NE, SE, SW, NW corners of the plot by measuring 122.47m horizontal distance from the plot center, by steel tape in all four directions. These four corners should be marked by thin poles or bamboos of 5 cm diameter and 1.5 m height. If possible, ranging rods can also be used as corner posts. A red/white color cloth may be tied at the top end of these corner posts for getting clear visibility from different spots in the plot. In case, the 3.0 ha. square plot includes part of block or/and linear stratum then plot center should be adjusted suitably to exclude undesired stratum.



b) Another method of laying out of sample plot is by using GPS alone. Along with the latitude - longitude of the centre point, the other four corners latitude-longitude were provided in the map supplied by the Geomatics centre.

Check the dimensions of the plot i.e. all the sides showed individually should measure 173.20 meters of horizontal distance.

2.15: Workshops and Trainings

A series of workshops and trainings were organized for the field officers in the field regarding the use of GPS, plot layout and enumeration. The software specially developed for the TOF for online data entry and report generation in APFMIS is made available to the field officers to avoid delays.

2.16: Data collection

While the plot is being laid and data is being collected the crew leader should complete the plot approach form and plot description form. The following precautions should be taken while collecting data.

1. The forms should be filled in good legible hand writing.
2. The code number should be recorded correctly and neatly.
3. Overwriting should be avoided. If any entry is found to be wrong, it should be cut and correct entry should be made.
4. If complete data of a plot cannot be accommodated in one sheet, a second sheet of the same form may be used for marking the Page1/2, 2/2 etc.

On completion of the work in a plot, the crew leader should scrutinize the forms to check if any information is missing or doubtful. All equipments should be collected. The crew should then proceed to the next plot and repeat the work. After completing all the plots the crew shall return back to the camping site. Once again the crew leader should scrutinize the forms to ensure that no information is missing before sending it to the Designated Officer for Forest Inventory.

2.17: Data processing

The data entered into field forms at 6 divisions should be sent to IT center. There are 3 stages in Data processing.

1. Data checking or verification
2. Calculating volumes for trees and plots by using volume
3. Equations
4. Division and District-wise, generating reports by using volumes.

2.17.1: Data checking

The data submitted by field people was verified by scientists at IT center before entering in computer. If any inconsistency or recording errors found then those trees should be identified (particularly in DBH and more trees in the plot) with their scientific names and immediately it should be asked for clarification from the concerned staff and then data should be modified. The time taken for checking of each division is 2 to 3 days.

2.17.2: Calculating volumes for trees

After the completion of verification of the data, the volume of each tree should be calculated by using volume equations. Then plot volumes should also be calculated by calculating each tree volume in particular plot. The volume equations have been provided by FSI and APFD. After calculating the volume of trees and plots, the data would be ready for inventory.

2.17.3: Estimation of annual yield

Tree outside forests refer to all trees available outside notified forests having a diameter of above 10cm at breast height i.e. 1.37m from ground level. Because of this diameter limit, many young plants like *Eucalyptus*, *Casuarina* and *Subabul* are excluded, when they are below 3-4 years, even though they attend a good height of several meters.

The Annual Yield from Trees outside Forests is crucial for determining wood availability to the wood based industries. The MARCH consultancy during 2007-2008 had conducted a study from secondary source, without doing any ground inventory. It was not accepted and so the present study was undertaken using 2.5 m data of CARTOSAT - I.

The Annual Yield from the TOF was deliberated in the Technical Advisory Committee formed by Government of Andhra Pradesh consisting of Dr. Devender Pandey, IFS (Rtd.), Dr.C.S.Jha, Head of Forestry Division, NRSC; Sri Anoop Singh, IFS, APSAC, Hyderabad, Dr.Reddy, Scientist from MoEF and Dr.H.C.Mishra, IFS, APCCF (IT), A.P. The Committee elaborately discussed the Annual Yield and decided to calculate the Annual Yield by using the following formula.

$$\text{Annual Yield} = \frac{(2 \times \text{Growing Stock})}{\text{Rotation}}$$

As we do not have a proper control over the felling in the TOF areas, the Technical Committee authorised Andhra Pradesh Forest Department to decide the Rotation of each species. Accordingly, PCCF & HoFF, Andhra Pradesh formed a committee consisting of following members to decide the rotation age of Trees Outside Forests.

1. Sri B. Murali Krishna, IFS, APCCF (Vig.)
2. Sri P.K.Sarangi, IFS, APCCF (WP)
3. Dr. H.C.Mishra,IFS, APCCF (IT)

The Committee met several times and decided the Rotation of various species based on which the Annual Yield was computed. It was decided to have 2 rotations for Mango (*Mangifera indica*) i.e., 50 years for block plantation and 60 years for scattered trees. Based on the above formula, the district-wise yield is tabulated in million cu m as follows:

(Age in years)

S. No.	District	10-20	21-30	31-40	41-50	51-60	61-70	>70	Total	Annual yield
1	Ananthapur	0.225	0.252	0.319	0.186	0.240	0.355	0.603	2.180	0.066
2	Chittoor	0.795	0.758	0.868	0.725	0.810	0.621	2.528	7.107	0.269
3	East Godavari	1.111	2.931	4.034	1.486	0.689	0.457	2.239	12.945	0.426
4	Guntur	0.084	0.265	0.271	0.319	0.246	0.324	0.406	1.916	0.056
5	Kadapa	0.252	0.363	0.320	0.502	0.232	0.205	0.262	2.137	0.075
6	Krishna	0.407	0.855	0.962	0.527	0.583	0.843	3.043	7.221	0.248
7	Kurnool	0.190	0.214	0.201	0.211	0.125	0.168	0.547	1.656	0.059
8	Nellore	0.142	0.316	0.492	0.292	0.202	0.190	0.459	2.093	0.071
9	Prakasam	0.678	0.782	1.009	0.754	0.482	0.457	2.091	6.252	0.209
10	Srikakulam	0.645	1.478	0.883	0.783	0.398	0.211	0.827	5.225	0.211
11	Visakhapatnam	0.306	0.756	1.048	0.604	0.680	0.652	1.414	5.460	0.227
12	Vizianagaram	0.635	0.809	0.827	0.607	0.461	0.794	1.358	5.490	0.251
13	West Godavari	0.398	1.729	1.486	0.947	0.915	0.715	2.117	8.307	0.356
	Total	**5.868**	**11.507**	**12.721**	**7.943**	**6.063**	**5.992**	**17.894**	**68.021**	**2.561**

2.17.4: District and Division wise report generation

Using the above volumes and areas, the Stratum-wise, district wise and division wise growing stock, unit volume per ha., stems per ha., total estimated stems and annual yield were calculated.

The results were statistically analysed and district-wise / Stratum-wise / species-wise reports were generated.

2.18: Comparison between TOF by FSI and TOF by APFD

S. No	TOF by FSI	TOF by APFD
1	For assessment of TOF, whole country has been classified into 14 homogenous physiographic zones based on physiography, climate, vegetation and soil.	For assessment of TOF, the area is divided into divisions (Forest administration boundary)
2	The area is divided into 2 strata. 1.Rural 2.Urban Rural once again divided into Block, Linear and Scattered	The area divided into 6 strata. 1.Natural 2.Linear 3.Block 4.Rural 5.Urban 6.Scattered
3	PAN and LISS III data	CARTOSAT-1 data
4	The size of Scattered plot is 3ha. in non-hilly area and 0.5 ha. in hilly area.	The size of Scattered plot is 3ha. for entire area.
5	FSI takes up one/two districts in a cycle of few years in a state.	The entire state is taken in one go for inventory.

Photo Credit - Dr. R.P. Khajuria, IFS

CHAPTER 3

STATE RESULTS

Source - **Internet**

"Someone is sitting in the shade today because someone planted a tree a long time ago."

- Warren Buffett

3.1: Estimation of growing stock and number of trees

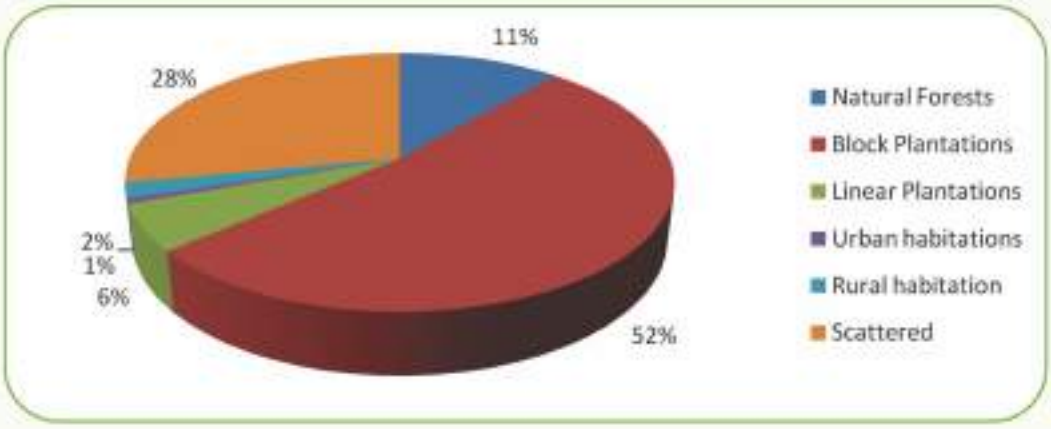
The distribution of growing stock and number of trees in different strata as derived by the Geomatics center of AP Forest Department is as follows:

Stratum-wise estimated area, growing stock and number of trees				
S. No.	Stratum	Area (ha)	Estimated growing stock (million cu m)	Estimated growing stock (million cu m)
1	Natural Forests	2540.53	7.764	30.348
2	Block Plantations	8200.84	35.488	100.363
3	Linear Plantations	564.82	3.956	7.403
4	Urban habitations	1249.62	0.410	0.831
5	Rural habitation	2995.95	1.305	2.549
6	Scattered	110307.54	19.066	34.203
Total		**125859.30**	**67.989**	**175.697**

3.2: As advised by the Technical Advisory Committee, Natural forests and Block plantation are merged as Block stratum, Urban and Rural habitations are merged as Homestead. The modified 4 strata have following growing stock and number of trees.

Stratum-wise estimated area, growing stock and number of trees				
S. No	Revised Stratum	Area (ha)	Estimated growing stock (million cu m)	Estimated number of trees (million)
1	Block	10741.37	43.252	130.711
2	Linear	564.82	3.956	7.403
3	Homestead	4245.57	1.714	3.380
4	Scattered	110307.54	19.066	34.203
Total		**125859.30**	**67.989**	**175.697**

3.3: Distribution of growing stock in different strata



3.4: District- wise growing stock (million cu m) in different strata

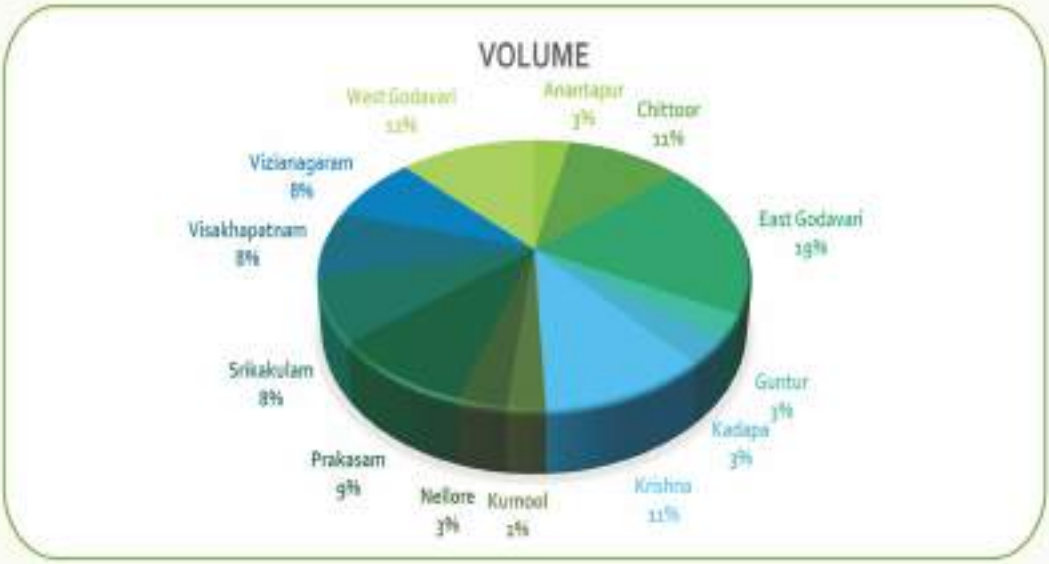
District	Block	Linear	Natural	Rural	Scattered	Urban	Total
Ananthapur	2.997	0.191	0.190	0.364	3.341	0.024	**7.107**
Chittoor	6.845	1.194	2.924	0.122	1.831	0.028	**12.945**
East Godavari	0.172	0.180	0.139	0.104	1.260	0.060	**1.916**
Guntur	0.823	0.018	0.057	0.155	1.041	0.042	**2.137**
Kadapa	5.923	0.129	0.108	0.081	0.938	0.042	**7.221**
Krishna	0.123	0.220	0.381	0.061	0.815	0.057	**1.656**
Kurnool	0.995	0.130	0.176	0.033	0.749	0.010	**2.093**
Nellore	1.348	0.204	0.462	0.065	4.107	0.065	**6.252**
Prakasam	2.881	0.293	1.035	0.053	0.953	0.010	**5.225**
Srikakulam	2.987	0.267	1.181	0.045	0.957	0.023	**5.460**
Visakhapatnam	3.718	0.397	0.451	0.044	0.872	0.009	**5.490**
Vizianagaram	6.139	0.667	0.539	0.086	0.858	0.019	**8.307**
West Godavari	2.997	0.191	0.190	0.364	3.341	0.024	**7.107**
Total	**35.488**	**3.956**	**7.764**	**1.305**	**19.066**	**0.410**	**67.989**

The above table shows that state has a growing stock of 67.9 million cu m out of which 35.4 million cu m is contributed by Block plantations, 3.9 million cu m is contributed by Linear stratum, 7.8 million cu m is contributed by Natural forests, 1.3 million cu m is contributed by Rural Habitations, 19.06 million cu m is contributed by Scattered stratum and 0.4 million cu m is contributed by Urban stratum.

3.5: As advised by Technical Advisory Committee Natural forests and Block plantations are merged as Block stratum, Urban and Rural habitations are merged as Homestead. The modified 4 strata have following Growing stock in million cu m

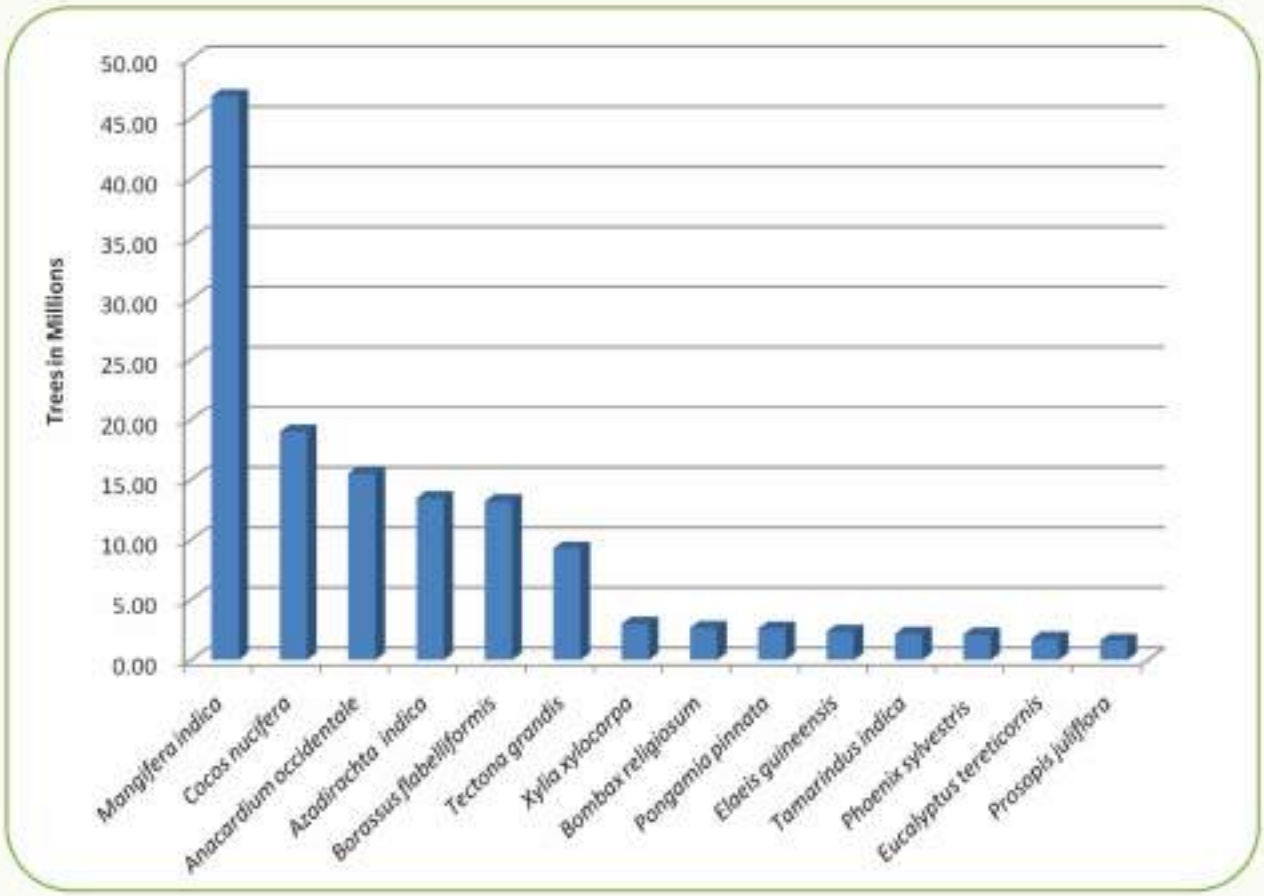
District	Block	Linear	Homestead	Scattered	Total
Ananthapur	0.657	0.065	0.115	1.344	**2.180**
Chittoor	3.187	0.191	0.388	3.341	**7.107**
East Godavari	9.769	1.194	0.150	1.831	**12.945**
Guntur	0.312	0.180	0.164	1.260	**1.916**
Kadapa	0.880	0.018	0.197	1.041	**2.137**
Krishna	6.031	0.129	0.123	0.938	**7.221**
Kurnool	0.504	0.220	0.118	0.815	**1.656**
Nellore	1.171	0.130	0.043	0.749	**2.093**
Prakasam	1.810	0.204	0.130	4.107	**6.252**
Srikakulam	3.916	0.293	0.063	0.953	**5.225**
Visakhapatnam	4.169	0.267	0.067	0.957	**5.460**
Vizianagaram	4.169	0.397	0.053	0.872	**5.490**
West Godavari	6.678	0.667	0.105	0.858	**8.307**
Total	**43.252**	**3.956**	**1.714**	**19.066**	**67.989**

3.6: District – wise growing stock distribution is shown in the following Pie diagram



3.7: Estimation of number of stems species-wise

The following bar diagram shows Top 15 Species based on the number of stems



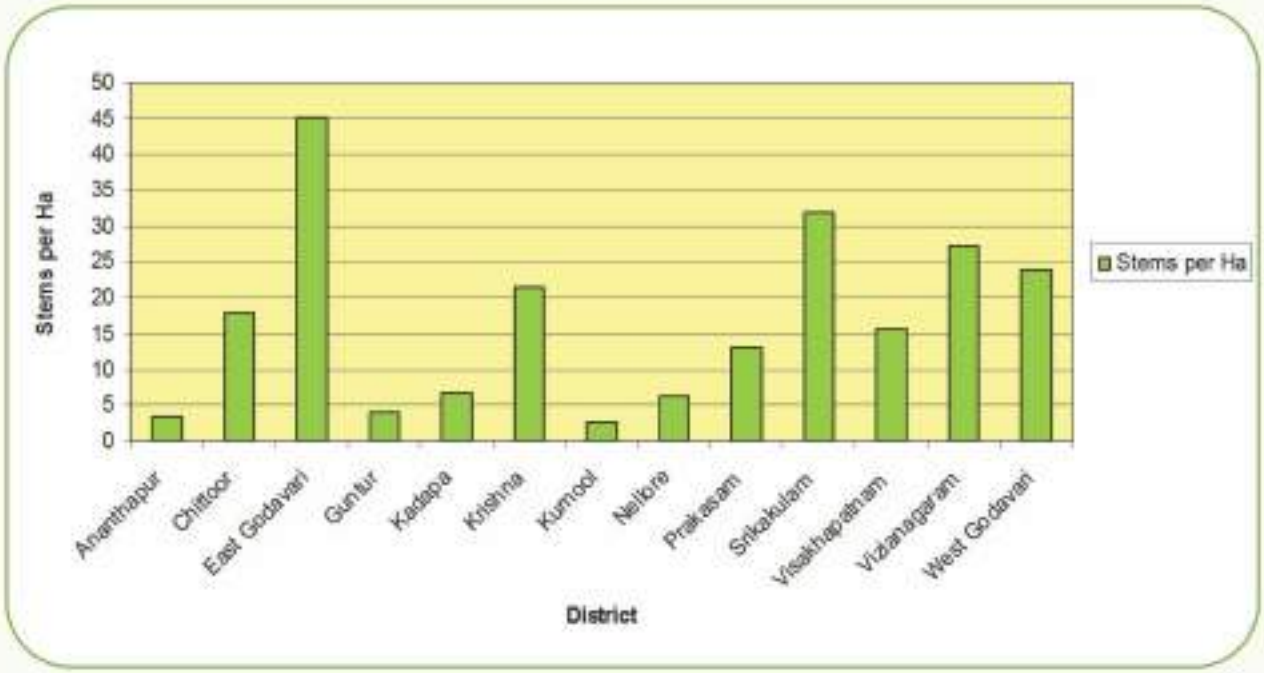
3.8: Estimation of voulme of top 15 species

S. No.	Species	Volume (million cu m)
1	*Mangifera indica*	10.810
2	*Azadirachta indica*	9.096
3	*Cocos nucifera*	7.304
4	*Borassus flabelliformis*	6.331
5	*Anacardium occidentale*	4.532
6	*Elaeis guineensis*	3.359
7	*Tamarindus indica*	2.803
8	*Tectona grandis*	2.672
9	*Pongamia pinnata*	1.386
10	*Ficus benghalensis*	0.981
11	*Bombax religiosum*	0.946
12	*Semecarpus anacardium*	0.938
13	*Artocarpus heterophyllus*	0.905
14	*Phoenix sylvestris*	0.802
15	*Ficus religiosa*	0.602

3.9: Estimation of number of stems per ha district-wise

District	Stems per ha
Ananthapur	3
Chittoor	18
East Godavari	45
Guntur	4
Kadapa	7
Krishna	21
Kurnool	3
Nellore	6
Prakasam	13
Srikakulam	32
Visakhapatnam	16
Vizianagaram	27
West Godavari	14

3.10: Graphical representation of stems per ha district-wise



The State has 14 stems per ha, East Godavari district has a maximum of 45 stems per ha followed by Sri kakulam 32 stems per ha, Ananthapur and Kurnool stands lowest at 3 stem per ha

3.11: Estimation of stems per ha district and stratum-wise

District	Block	Linear	Natural	Rural	Urban	Scattered
Ananthapur	63	115	94	6	2	4
Chittoor	164	160	55	23	5	8
East Godavari	158	222	256	9	4	6
Guntur	79	149	78	7	2	8
Kadapa	113	117	73	19	2	13
Krishna	160	104	52	6	3	4
Kurnool	161	73	27	4	2	10
Nellore	60	70	48	3	2	2
Prakasam	98	98	45	5	6	23
Srikakulam	141	156	168	7	6	4
Visakhapatnam	56	88	89	6	3	3
Vizianagaram	125	113	107	7	5	4
West Godavari	140	136	142	9	2	5
Total	**123**	**131**	**119**	**8**	**3**	**7**

From the above table it is seen that Block, Linear and Natural forest strata are having more stems per ha. With respect to rural stratum, Chittoor and Kadapa districts are having significantly higher stems i.e. 23 and 19 stems per ha respectively. Whereas in scattered stratum, Prakasam and Kadapa have significantly higher stems per ha.

3.12: As advised by the Technical Advisory Committee, Natural forests and Block plantations are merged as Block stratum, Urban and Rural habitations are merged as Homestead. The modified 4 strata have following Trees per ha.

District	Block	Linear	Homestead	Scattered
Ananthapur	79	115	4	4
Chittoor	110	160	14	8
East Godavari	207	222	7	6
Guntur	79	149	5	8
Kadapa	93	117	11	13
Krishna	106	104	5	4
Kurnool	94	73	3	10
Nellore	54	70	3	2
Prakasam	72	98	6	23
Srikakulam	155	156	7	4
Visakhapatnam	73	88	5	3
Vizianagaram	116	113	6	4
West Godavari	141	136	6	5
Total	**121**	**131**	**6**	**7**

3.13: Diameter class-wise volumes of top 15 Species in AP (million cu m)

Species	10-20	20-30	30-40	40-50	50-60	60-70	Above 70	Total
Mangifera indica	1.44	1.93	1.60	1.08	0.93	0.93	2.90	**10.81**
Azadirachta indica	0.67	1.01	1.14	1.28	1.09	1.24	2.66	**9.10**
Cocos nucifera	0.18	2.59	2.44	0.45	0.07	0.16	1.41	**7.30**
Borassus flabelliformis	0.04	0.79	2.87	1.89	0.28	0.07	0.39	**6.33**
Anacardium occidentale	0.76	1.64	0.82	0.53	0.36	0.18	0.25	**4.53**
Elaeis guineensis	0.00	0.00	0.13	0.12	0.64	0.93	1.54	**3.36**
Tamarindus indica	0.03	0.09	0.30	0.23	0.39	0.35	1.42	**2.80**
Tectona grandis	0.54	0.70	0.28	0.24	0.19	0.19	0.53	**2.67**
Pongamia pinnata	0.10	0.14	0.16	0.15	0.11	0.14	0.58	**1.39**
Ficus benghalensis	0.01	0.02	0.03	0.09	0.07	0.14	0.62	**0.98**
Bombax religiosum	0.01	0.11	0.46	0.25	0.08	0.01	0.02	**0.95**
Semecarpus anacardium	0.02	0.05	0.19	0.10	0.17	0.39	0.02	**0.94**
Artocarpus heterophyllus	0.01	0.02	0.05	0.05	0.08	0.11	0.58	**0.90**
Phoenix sylvestris	0.04	0.06	0.34	0.07	0.10	0.07	0.13	**0.80**
Ficus religiosa	0.01	0.01	0.03	0.04	0.07	0.11	0.34	**0.61**
Total							**13.39**	**53.47**

The above table shows that, *Mangifera indica and Azadirachta indica* have the higher prevalence in above 70 cm diameter class so also *Tamarindus indica*. It is noted that 25.5 % (13.39 million cu m) volume is coming from above 70 cm dia class in the top 15 Species total volume (53.47 million cu m)

3.14: Computation of notional area of TOF

As per the AP Forest Inventory 2010, the dense forest yields 59.58 cu m /ha Taking this as a standard, the present growing stock of TOF 67988863 cu m is equivalent to 1141136 ha of dense forest. (11411 sq. km). The geographical area of the state is 162760 sq.km and as such the TOF form 7.01 % of the geographical area of the state.

The AP Forest inventory Report 2010 reports that 271 trees per ha exists in dense forests, As per this standard, the estimated stems of 175697056 correspond to 648328 ha (6483.28 sq.km) which would constitute 3.9% of the geographical area of the state.

As per the Forest Survey of India report (2001) the following table gives the equivalent number of trees to make 1 ha of tree cover.

Table showing the number of trees constituting one ha. of area. (ISFR 2001)

South Deccan

Species Name	Diameter Class (in cm)				
	10-20	20-30	30-40	40-50	50+
Cocos nucifera (Coconut)	943	413	264	-	-
Azadirachta indica (Neem)	473	179	110	80	62
Pongamia pinnata (Karanji)	340	217	200	162	129
Mangifera indica (Aam)	361	161	97	66	49
Eucalyptus species (Nilgiri)	480	219	124	80	56
Tamarindus indica (Imli)	495	191	112	75	56
Butea monosperma (Palash)	589	313	213	162	130
Albizia lebbek (Kala Siris)	365	153	97	71	56
Albizia amara	2577	1532	1090	846	691
Casuarina equisetifolia	644	278	177	130	103
Acacia suma	374	143	88	64	50
Ficus benghalensis (Banyan)	178	72	45	33	26
Melia azadirachta (Bakkain)	831	512	370	289	238
Artocarpus heterophyllus	302	149	99	74	59
Other Species	448	193	123	90	71

Considering the above data of FSI for available species, the notional area comes around 967377 Ha (9674 Sq.km). This forms 5.94 % of the geographical area of the state.

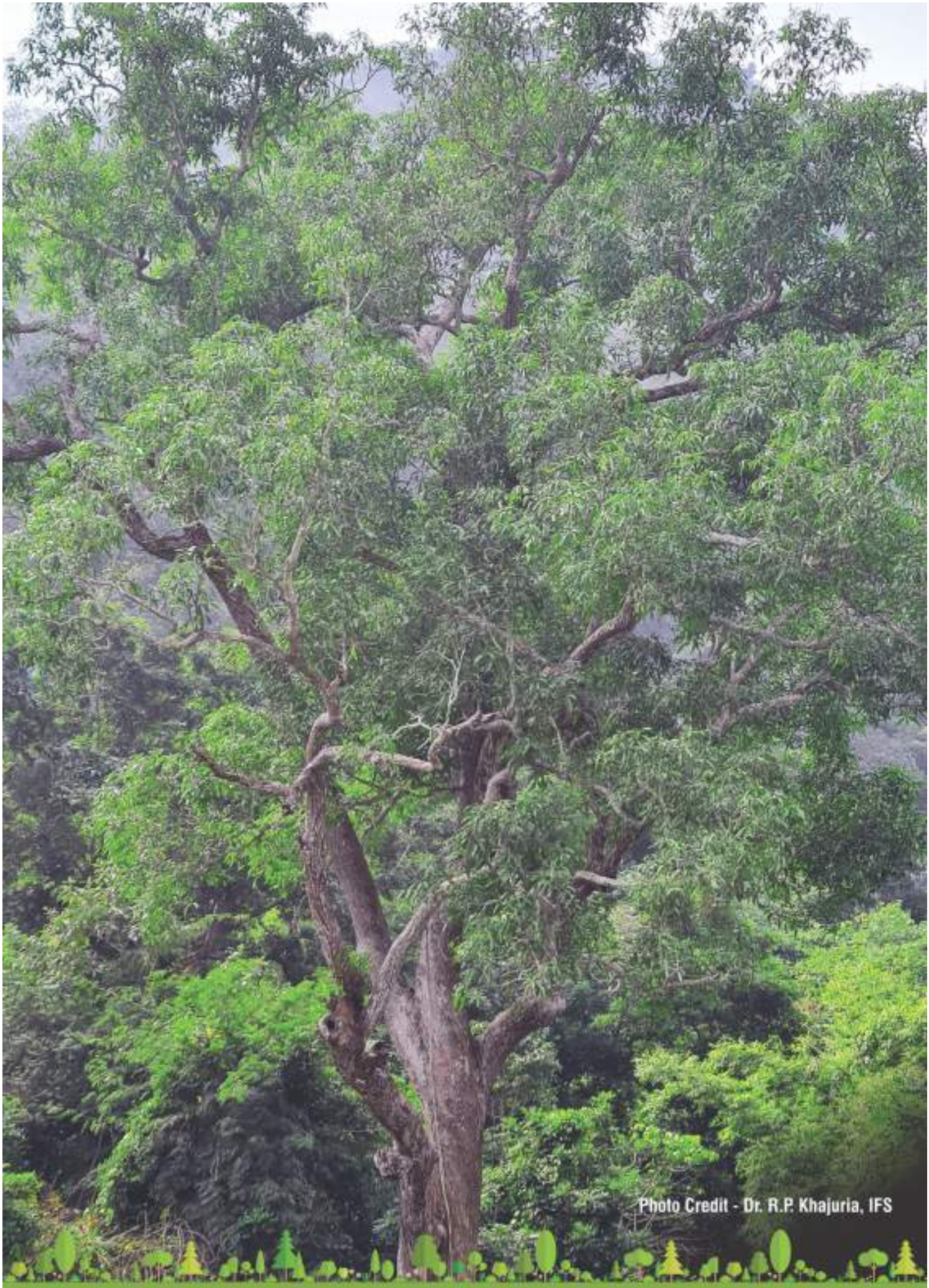


Photo Credit - Dr. R.P. Khajuria, IFS

CHAPTER 4

DISTRICT-WISE RESULTS

Photo Credit - **Dr. R.P. Khajuria, IFS**

"For in the true nature of things, if we rightly consider,
every green tree is far more glorious
than if it were made of gold and silver."

- Martin Luther

4.1: Ananthapur District

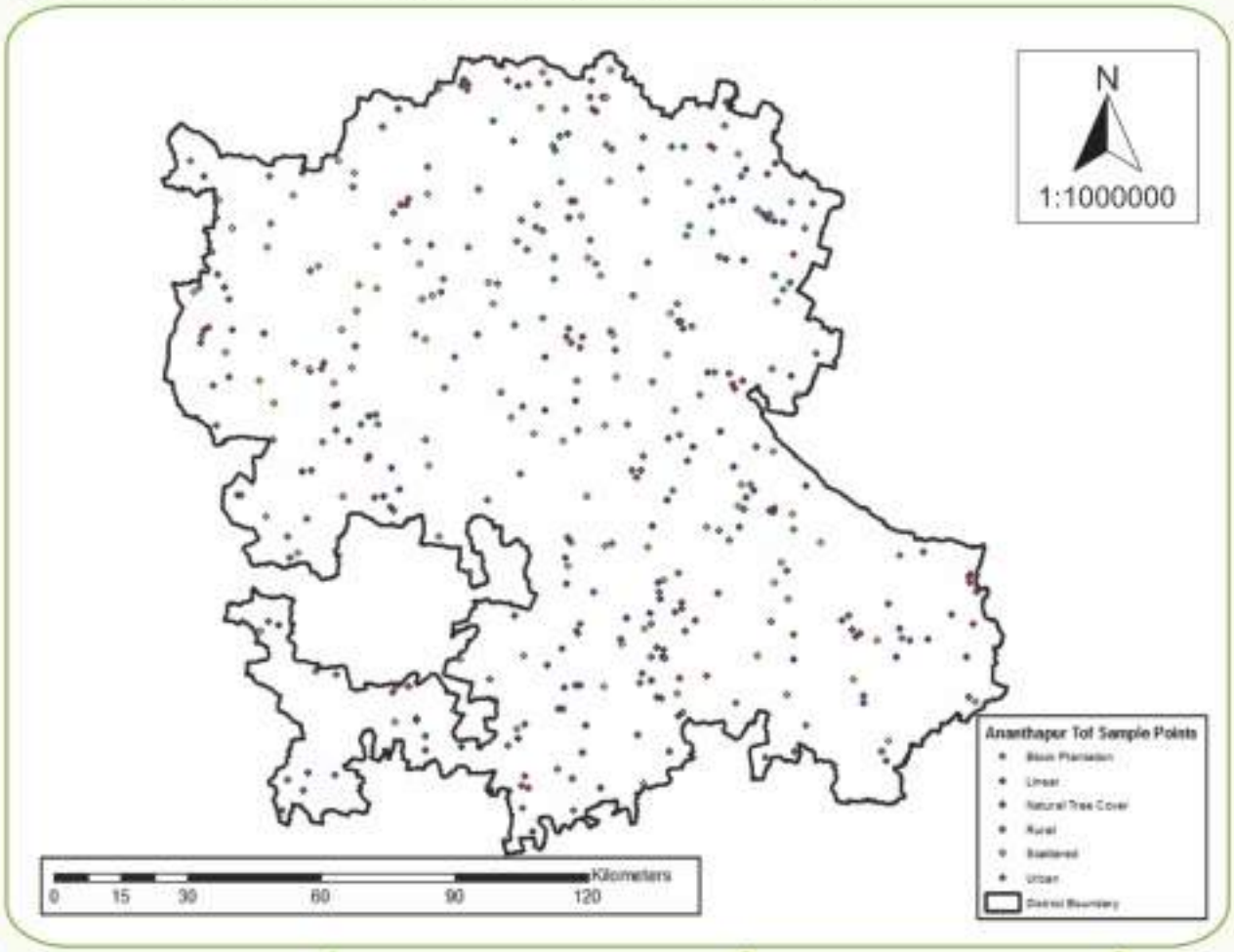
4.1.1: Ananthapur Forest Division lies in the South Western part of Andhra Pradesh. Geographical Area of the District is 19130 sq.km. Out of this, notified forest area is 1969.78 sq.km, and the remaining area of 17160.22 sq.km is divided into 6 strata. A total of 412 points are scattered in this TOF area.

4.1.2: The 5 strata wise areas were polygonised on the CARTOSAT-1 (Resolution - 2.5 Mt) images using GIS software. The remaining non polygonised area considered as scattered area, is 95% of total TOF area.

4.1.3: The Stratum-wise plots and area are shown below

S. No.	Stratum	No. of plots	Area (ha)
1	Natural Forests	65	5833
2	Block Plantations	80	33523
3	Linear Plantations	80	1290
4	Urban habitations	47	9096
5	Rural habitations	60	28120
6	Scattered	80	1640577
	Total	**412**	**1718439**

4.1.4: Map below shows distribution of inventory points in the district

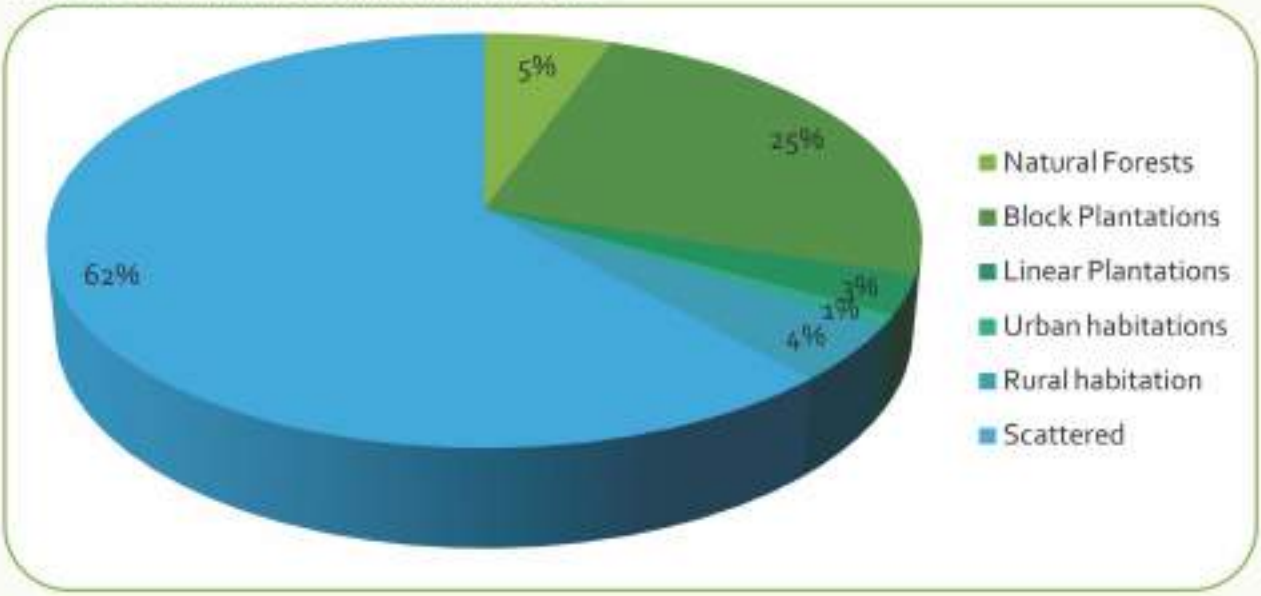


4.1.5: Results

4.1.6: Growing stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume / ha	Volume (million cu m)	Trees / ha	Trees (million)
Natural Forests	5833	21	0.12	94	0.55
Block Plantations	33523	16	0.54	63	2.10
Linear Plantations	1290	50	0.06	115	0.15
Urban habitations	9096	2	0.02	4	0.03
Rural habitations	28120	3	0.09	6	0.18
Scattered	1640577	1	1.34	2	2.87
Total	**1718439**	**-**	**2.17**	**-**	**5.88**

4.1.7: The Stratum-wise estimated volume share



4.1.8: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	0.77
2	*Tamarindus indica*	0.43
3	*Mangifera indica*	0.39
4	*Pongamia pinnata*	0.10
5	*Ficus religiosa*	0.08
6	*Acacia nilotica*	0.08
7	*Cocos nucifera*	0.05
8	*Sterculia urens*	0.05
9	*Prosopis spicigera*	0.02
10	*Phoenix loureirii*	0.02
11	*Citrus limon*	0.01
12	*Syzygium cumini*	0.01
13	*Zizyphus mauritiana*	0.01
14	*Albizia amara*	0.01
15	*Butea monosperma*	0.01

4.1.9: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	1.42
2	*Azadirachta indica*	1.20
3	*Pongamia pinnata*	0.71
4	*Acacia nilotica*	0.38
5	*Tamarindus indica*	0.36
6	*Cocos nucifera*	0.28
7	*Albizia amara*	0.22
8	*Prosopis juliflora*	0.10
9	*Citrus limon*	0.09
10	*Acacia chundra*	0.09
11	*Zizyphus mauritiana*	0.08
12	*Phoenix sylvestris*	0.05
13	*Acacia leucophloea*	0.04
14	*Butea monosperma*	0.04
15	*Holoptelea integrifolia*	0.04

4.1.10: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia (cm) class	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural	Volume (cu m)	17655	25141	15257	19187	5452	14867	22253	**119811**
	No. of trees	325775	131925	43078	29616	4487	8975	7180	**551036**
Block	Volume (cu m)	82497	76622	58986	14349	59186	113751	131493	**536884**
	No. of trees	1093690	527989	247233	20952	71237	87998	54475	**2103573**
Linear	Volume (cu m)	5700	10056	9567	11522	10862	7625	9607	**64939**
	No. of trees	70940	39855	15994	10705	5675	2838	2064	**148070**
Urban	Volume (cu m)	1297	2403	3169	2403	1699	2298	7377	**20645**
	No. of trees	15602	9403	4909	1872	749	707	999	**34241**
Rural	Volume (cu m)	4858	13262	16321	11732	7307	8061	32360	**93900**
	No. of trees	63363	56753	34665	10802	4031	2902	4192	**176708**
Scattered	Volume (cu m)	113117	124627	215869	126471	155349	208454	399733	**1343622**
	No. of trees	1585891	553695	362294	123043	88865	75193	82029	**2871010**

4.2: Chittoor district

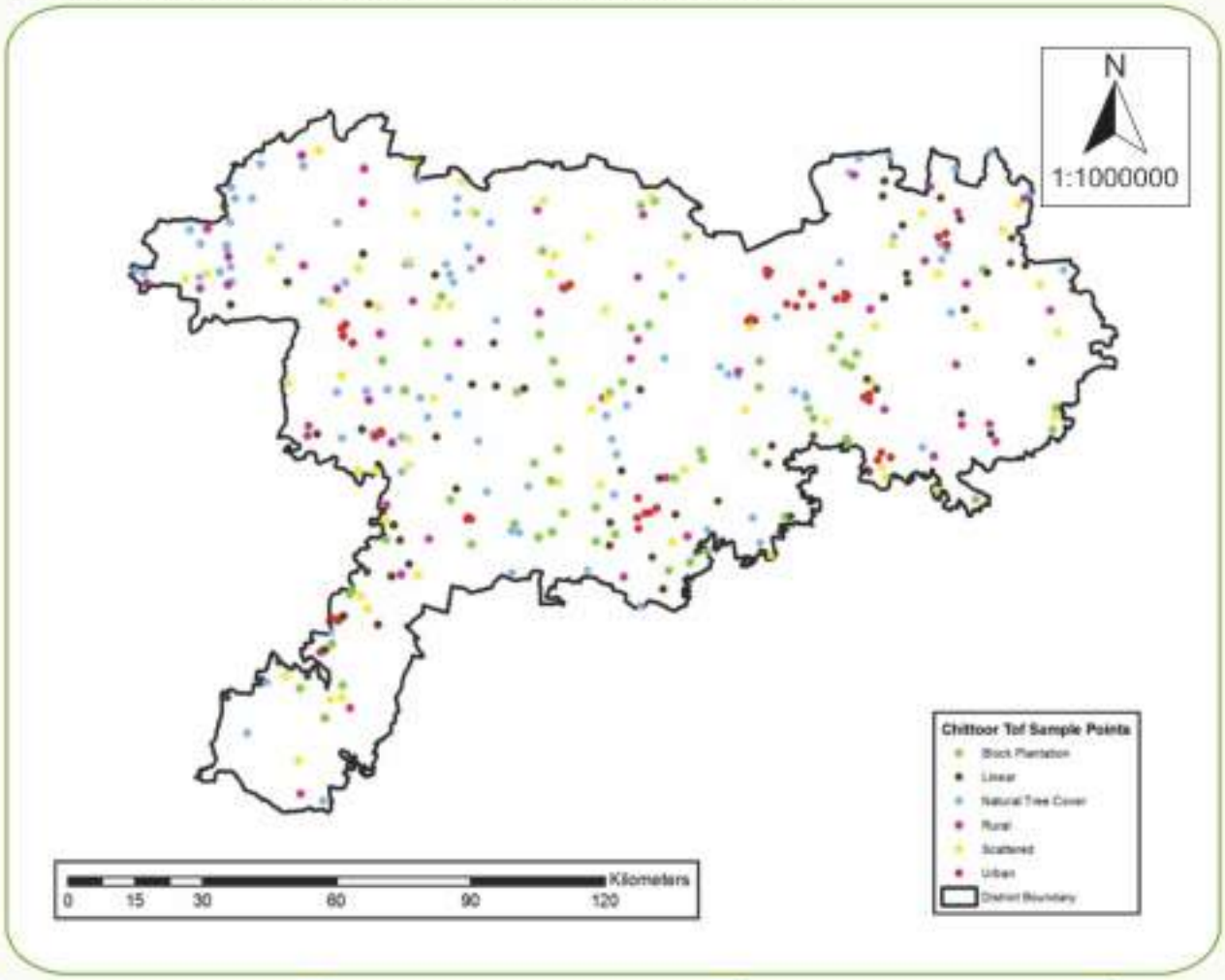
4.2.1: It is bounded on the north by Ananthapur and Kadapa districts, on the east by Nellore district and Chennai-Anna district of Tamilnadu, on the south by North Arcot Ambedkar & Dharmapuri district of Tamilnadu and on the west by Kolar District of Karnataka state. Geographical Area of the District is 15468.35 sq.Km. Out of this notified forest area is 4805.39 sq.km, the remaining area of 10662.96 sq. km is divided into 6 strata. A total of 366 points are scattered in this TOF area.

4.2.2: The 5 strata wise areas are polygonised on the CARTOSAT-1 (Resolution - 2.5Mt) images using GIS software. The remaining non polygonised area considered as scattered stratum area, is 88.81% of total TOF area.

4.2.3: The Stratum-wise points and area is shown below

S. No.	Stratum	No. of plots	Area (ha)
1	Natural Forests	90	15582
2	Block Plantations	60	74353
3	Linear Plantations	60	2249
4	Urban habitations	46	4708
5	Rural habitations	50	22383
6	Scattered	60	947021
	Total	**366**	**1066296**

4.2.4: Map below shows distribution of inventory points in district

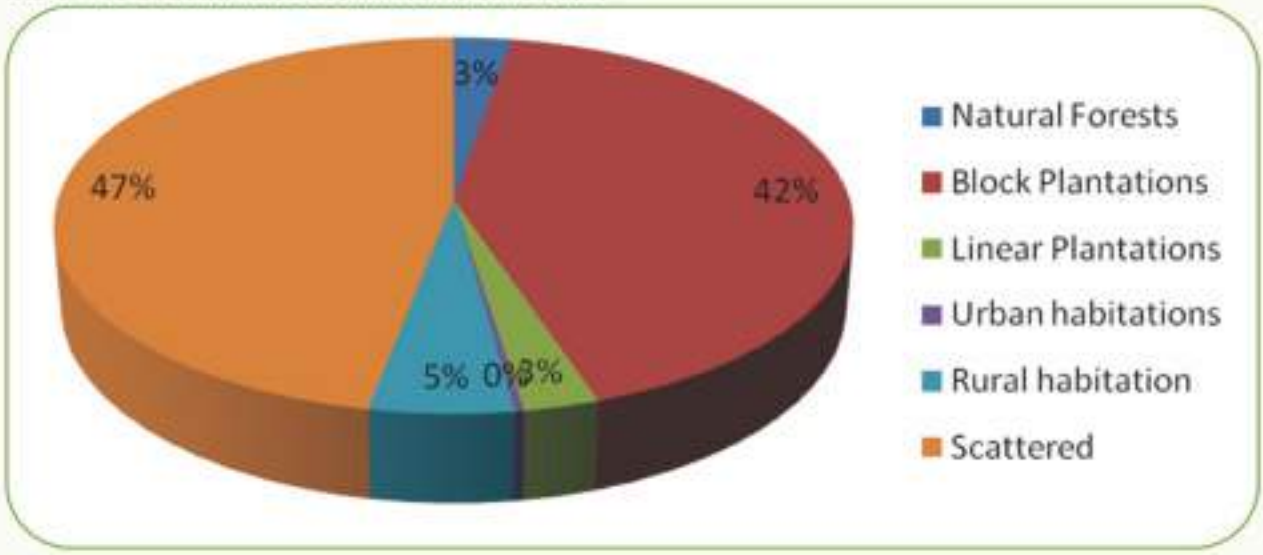


4.2.5: Results

4.2.6: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	15582	12	0.19	55	0.86
Block Plantations	74353	40	3.00	162	12.02
Linear Plantations	2249	85	0.19	161	0.36
Urban habitations	4708	5	0.02	9	0.04
Rural habitations	22383	16	0.36	25	0.56
Scattered	947021	4	3.34	5	5.02
Total	**1066296**	-	**7.1**	-	**18.86**

4.2.7: The Stratum-wise estimated volume share



4.2.8: Species-wise volume of trees for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	1.91
2	*Mangifera indica*	1.85
3	*Pongamia pinnata*	0.77
4	*Tamarindus indica*	0.43
5	*Delonix regia*	0.32
6	*Wrightia tinctoria*	0.26
7	*Borassus flabelliformis*	0.16
8	*Syzygium cumini*	0.15
9	*Tectona grandis*	0.15
10	*Pithecellobium dulce*	0.12
11	*Cocos nucifera*	0.12
12	*Strychnos nuxvomica*	0.08
13	*Ficus benghalensis*	0.07
14	*Bombax ceiba*	0.06
15	*Albizia lebbeck*	0.06

4.2.9: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	10.05
2	*Azadirachta indica*	2.35
3	*Pongamia pinnata*	0.98
4	*Tectona grandis*	0.83
5	*Wrightia tinctoria*	0.54
6	*Cocos nucifera*	0.43
7	*Tamarindus indica*	0.32
8	*Prosopis juliflora*	0.32
9	*Grewia rothii*	0.24
10	*Borassus flabelliformis*	0.20
11	*Syzygium cumini*	0.18
12	*Cassia siamea*	0.17
13	*Strychnos nuxvomica*	0.15
14	*Annona squamosa*	0.15
15	*Acacia nilotica*	0.14

4.2.10: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia (cm) class	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural	Volume (cu m)	38840	32517	36652	16387	18876	5174	41726	**190171**
	No. of trees	607697	150626	65791	19045	12119	3463	5194	**863934**
Block	Volume (cu m)	518546	384589	412408	340079	469105	258519	613985	**2997231**
	No. of trees	6357211	2614759	1573813	731141	433728	148707	161099	**12020458**
Linear	Volume (cu m)	14363	21580	29862	25691	17255	24099	58238	**191088**
	No. of trees	164920	82460	58172	26087	10495	8096	10795	**361025**
Urban	Volume (cu m)	1258	3157	4757	2761	3384	2918	5288	**23524**
	No. of trees	14517	12391	7957	2733	2004	1154	1093	**41850**
Rural	Volume (cu m)	18296	33560	48609	31481	32978	27588	171645	**364156**
	No. of trees	199863	145355	103392	44558	20765	10383	32013	**556329**
Scattered	Volume (cu m)	204111	283091	335866	308609	268833	303060	1637577	**3341146**
	No. of trees	2378074	1073290	710266	341980	147314	105225	268323	**5024471**

4.3: East Godavari District

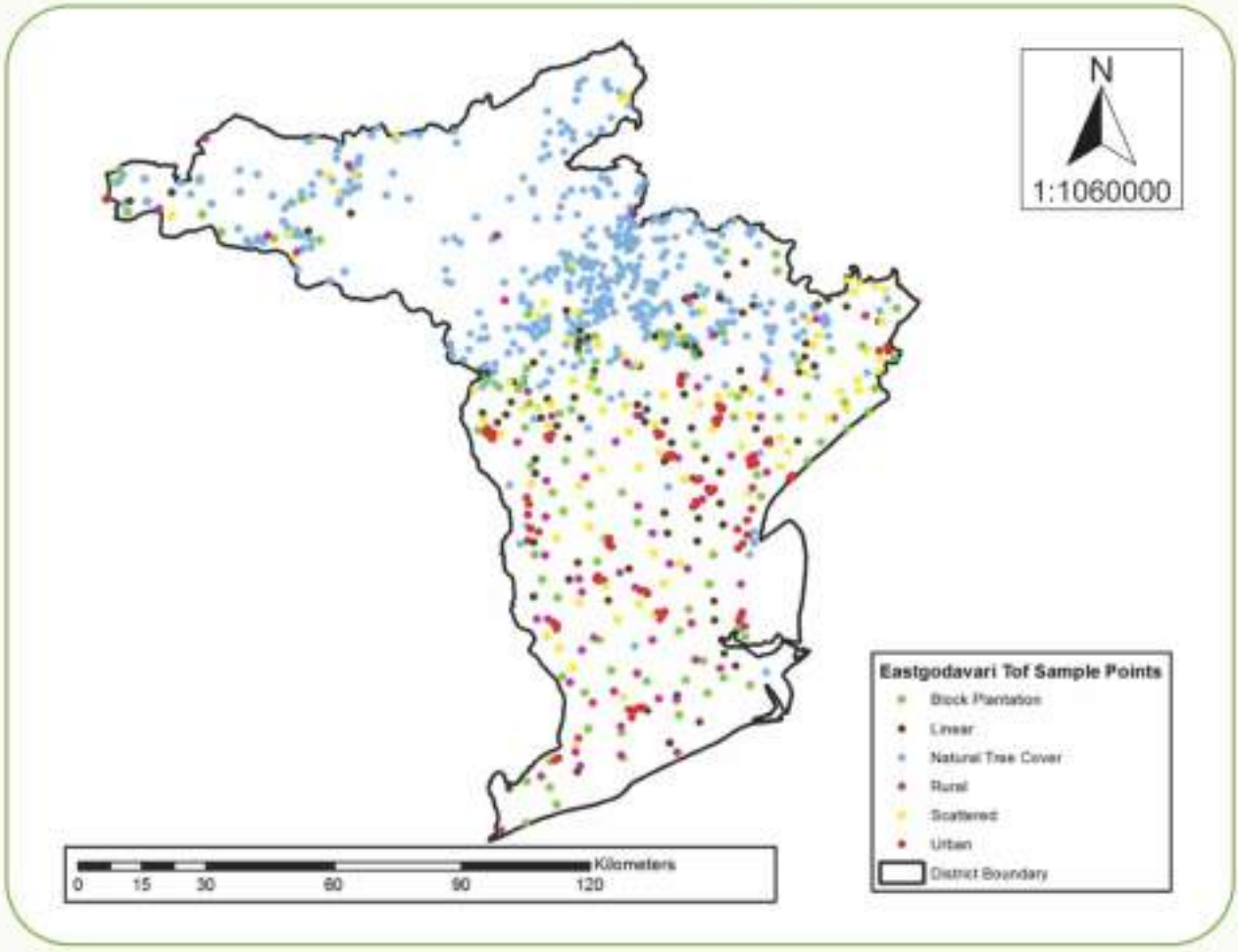
4.3.1: The boundaries of East Godavari are Bay of Bengal in the East and South, Khammam district in the West and Visakhapatnam district in the North directions. Geographical area of the district is 12896.6 sq.km. Out of this notified forest area is 4705.3 sq.km, the remaining area of 8191.26 sq.km divided into 6 strata. A total of 850 points scattered in this TOF area.

4.3.2: The 5 strata wise areas were polygonised on the CARTOSAT-1(Resolution - 2.5Mt) images using GIS software. The remaining non polygonised area is considered scattered area, is 88% of total TOF area.

4.3.3: The Stratum-wise points and area shown below

S. No.	Stratum	No. of plots	Area (ha)
1	Natural Forests	436	53990
2	Block Plantations	89	113429
3	Linear Plantations	84	10228
4	Urban habitations	88	12184
5	Rural habitations	65	32446
6	Scattered	88	596850
	Total	**850**	**819126**

4.3.4: Map below shows distribution of inventory points in the district

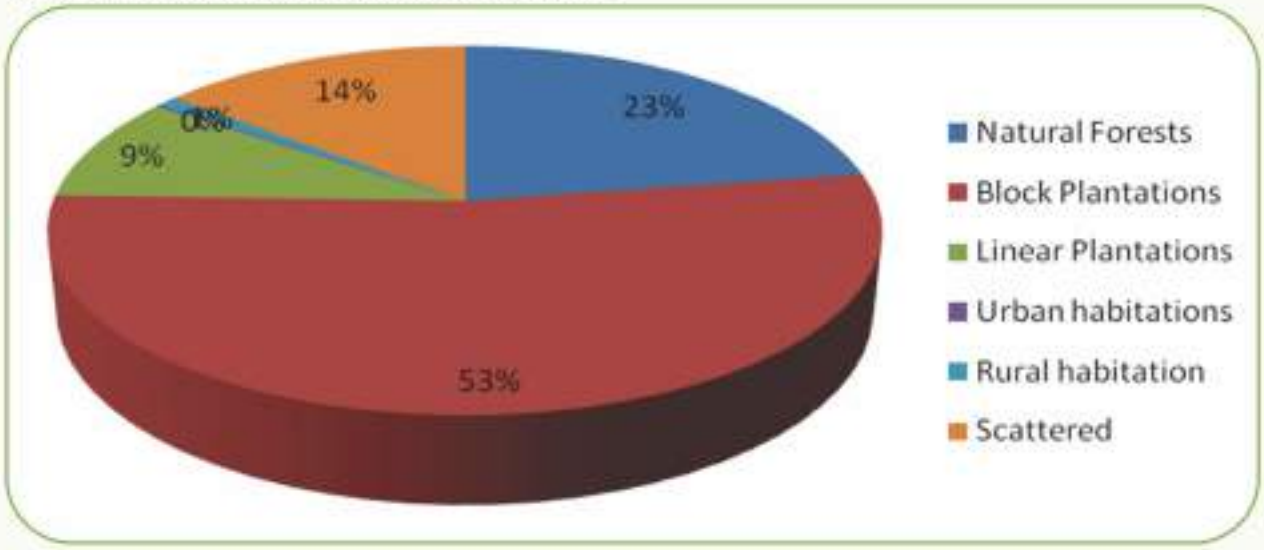


4.3.5: Results

4.3.6: Growing stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	53990	54	2.92	256	13.83
Block Plantations	113429	60	6.85	158	17.96
Linear Plantations	10228	117	1.19	222	2.27
Urban habitations	12184	2	0.03	6	0.07
Rural habitations	32446	4	0.12	9	0.30
Scattered	596850	3	1.83	4	2.59
Total	**819127**	**-**	**12.41**	**-**	**37.02**

4.3.7: The Stratum-wise estimated volume share



4.3.8: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Cocos nucifera*	3.48
2	*Borassus flabelliformis*	2.42
3	*Anacardium occidentale*	1.10
4	*Mangifera indica*	0.96
5	*Elaeis guineensis*	0.76
6	*Tamarindus indica*	0.38
7	*Xylia xylocarpa*	0.37
8	*Anogeissus latifolia*	0.29
9	*Madhuca indica*	0.28
10	*Tectona grandis*	0.22
11	*Lannea coromandelica*	0.19
12	*Terminalia tomentosa*	0.14
13	*Azadirachta indica*	0.13
14	*Dalbergia paniculata*	0.11
15	*Cleistanthus collinus*	0.10

4.3.9: Species-wise number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Cocos nucifera*	7.33
2	*Mangifera indica*	4.77
3	*Anacardium occidentale*	4.29
4	*Borassus flabelliformis*	4.05
5	*Xylia xylocarpa*	2.29
6	*Anogeissus latifolia*	1.12
7	*Tectona grandis*	0.98
8	*Cleistanthus collinus*	0.89
9	*Lannea coromandelica*	0.63
10	*Azadirachta indica*	0.57
11	*Terminalia tomentosa*	0.51
12	*Chloroxylon swietenia*	0.50
13	*Dalbergia paniculata*	0.49
14	*Palaquium ellipticum*	0.48
15	*Elaeis guineensis*	0.45

4.3.10: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia (cm) class	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural	Volume (cu m)	693481	767328	578470	315714	187728	113705	267910	**2924335**
	No. of trees	9221564	3100684	996825	300905	113923	45817	52008	**13831726**
Block	Volume (cu m)	352363	1753156	2330917	465974	350124	246877	1345708	**6845118**
	No. of trees	4282256	7086114	4766559	560772	331365	165683	764689	**17957438**
Linear	Volume (cu m)	32262	172421	512897	257030	60392	40401	118820	**1194224**
	No. of trees	372103	611730	925388	274694	34093	17534	30197	**2265739**
Urban	Volume (cu m)	1525	9099	10396	1979	505	1260	3420	**28184**
	No. of trees	18022	33321	20158	1688	310	517	586	**74602**
Rural	Volume (cu m)	7459	31826	36229	14969	5326	14076	12078	**121963**
	No. of trees	87020	117017	67562	14323	3243	5675	3783	**298624**
Scattered	Volume (cu m)	23723	196690	564621	429910	84945	40479	490854	**1831222**
	No. of trees	264513	741541	999271	413725	54259	20347	97214	**2590870**

4.4: Guntur District

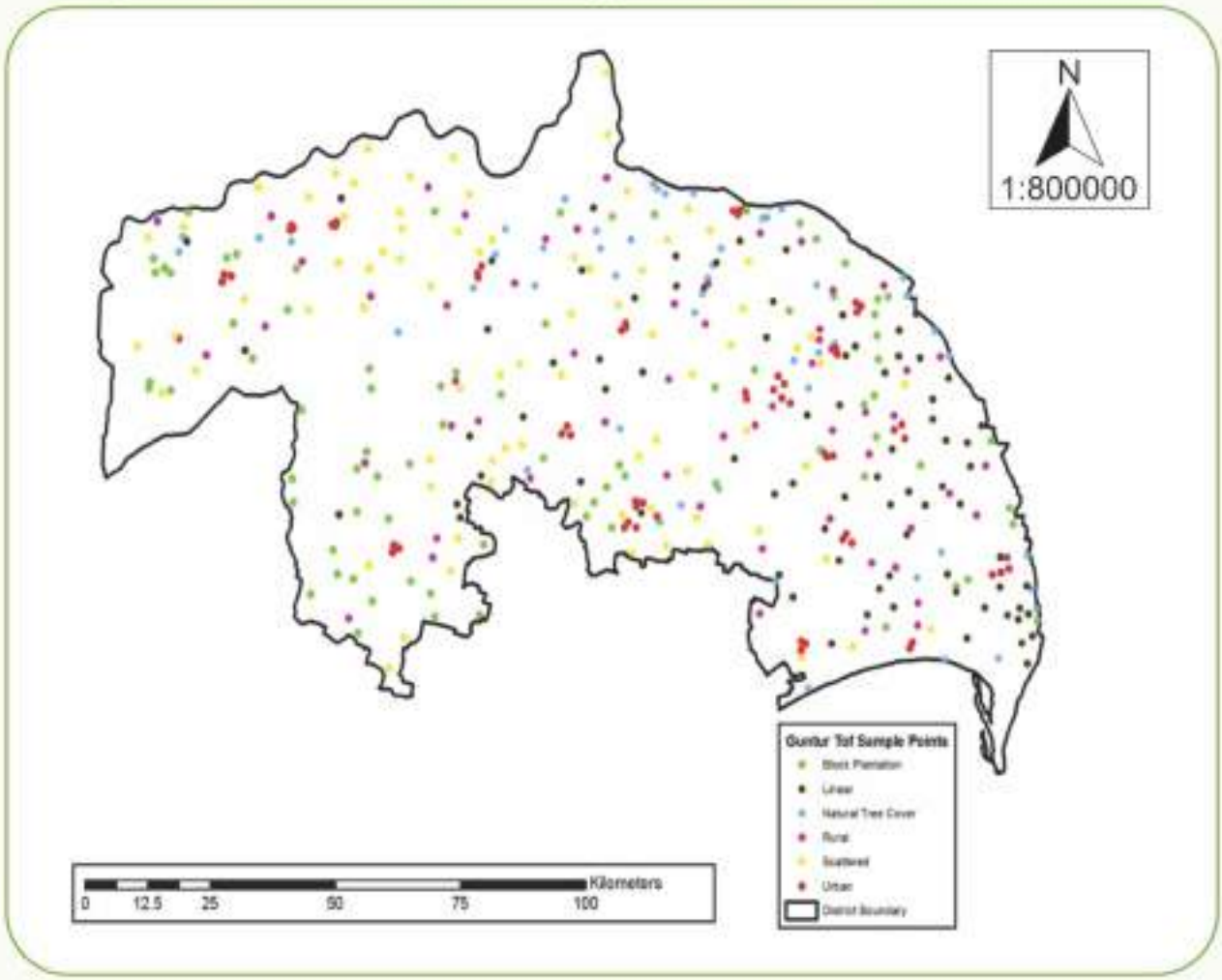
4.4.1: The district is bounded on the southeast by the Bay of Bengal, on the south by Prakasam District, on the west by Mahabubnagar District and on the Northwest by Nalgonda Districts of Telangana state. Geographical Area of the District is 11391 sq.km. Out of this, notified forest area is 1824.8 sq.km, the remaining area of 9566.20 sq.km divided into 6 strata. A total of 410 points scattered in this TOF area.

4.4.2: The 5 strata wise areas were polygonised on the CARTOSAT-1 (Resolution - 2.5Mt) images using GIS software. The remaining non polygonised area considered as scattered area, is 80% of total TOF area.

4.4.3: The Stratum-wise plots and area are shown below

S. No.	Stratum	No. of plots	Area (ha)
1	Natural Forests	50	3224
2	Block Plantations	80	12716
3	Linear Plantations	80	2477
4	Urban habitations	60	13578
5	Rural habitations	60	27908
6	Scattered	80	896717
	Total	**410**	**956620**

4.4.4: Map below shows distribution of inventory points in the district

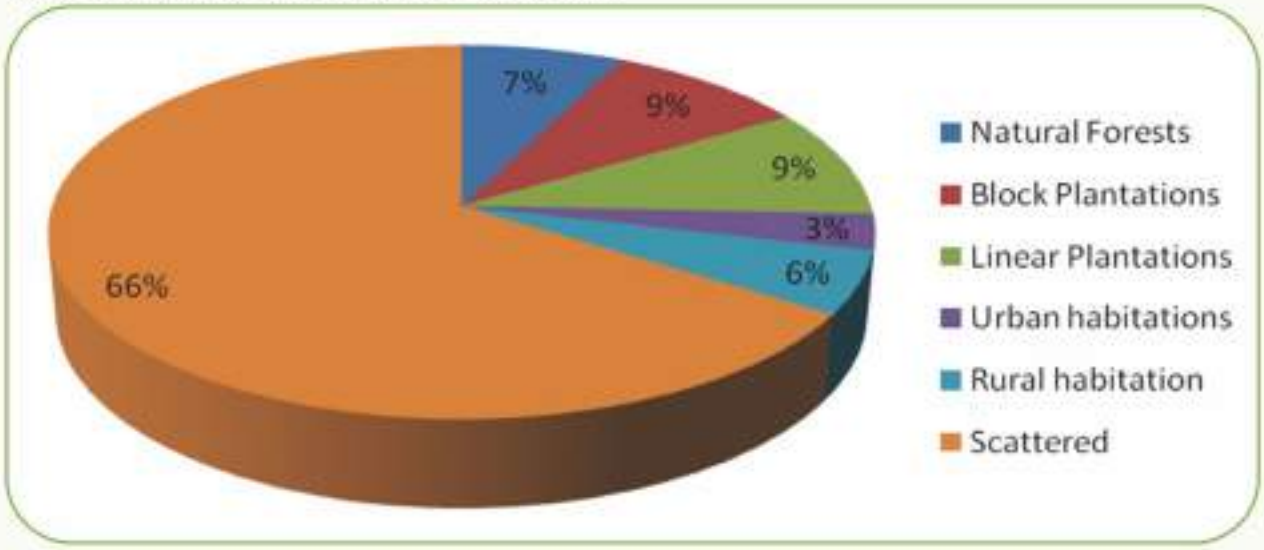


4.4.5: Results

4.4.6: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	3224	43	0.14	78	0.25
Block Plantations	12716	14	0.17	79	1.01
Linear Plantations	2477	73	0.18	149	0.37
Urban habitations	13578	4	0.06	8	0.11
Rural habitations	27908	4	0.10	7	0.19
Scattered	896717	1	1.26	2	2.00
Total	**956620**	-	**1.91**	-	**3.93**

4.4.7: The Stratum-wise estimated volume share



4.4.8: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	0.82
2	*Borassus flabelliformis*	0.34
3	*Mangifera indica*	0.09
4	*Albizia lebbeck*	0.09
5	*Tamarindus indica*	0.08
6	*Prosopis spicigera*	0.08
7	*Bombax religiosum*	0.07
8	*Ficus religiosa*	0.05
9	*Terminalia arjuna*	0.03
10	*Cocos nucifera*	0.02
11	*Tectona grandis*	0.02
12	*Citrus limon*	0.02
13	*Samanea saman*	0.02
14	*Ficus benghalensis*	0.01
15	*Mitragyna parviflora*	0.01

4.4.9: Number of trees for top 15 species

S. No.	Species name	Trees in (Million)
1	*Borassus flabelliformis*	0.89
2	*Azadirachta indica*	0.83
3	*Mangifera indica*	0.33
4	*Prosopis spicigera*	0.27
5	*Citrus limon*	0.24
6	*Bombax religiosum*	0.18
7	*Cocos nucifera*	0.14
8	*Prosopis juliflora*	0.11
9	*Manilkara hexandra*	0.08
10	*Tectona grandis*	0.07
11	*Leucaena leucocephala*	0.07
12	*Albizia lebbeck*	0.05
13	*Tamarindus indica*	0.05
14	*Mitragyna parviflora*	0.05
15	*Phoenix sylvestris*	0.04

4.4.10: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia (cm) class	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural	Volume (cu m)	5284	16410	7795	7820	5817	12483	83730	**139339**
	No. of trees	98640	83167	24499	10315	5158	5802	25143	**252724**
Block	Volume (cu m)	44508	39748	15715	35209	17698	5344	13968	**172190**
	No. of trees	619923	244790	52455	55634	23843	4769	6358	**1007772**
Linear	Volume (cu m)	4610	19305	37740	28612	8206	6067	75573	**180112**
	No. of trees	59454	111813	119153	47710	6117	2202	22754	**369203**
Urban	Volume (cu m)	2933	7679	11959	7934	5813	8032	15773	**60123**
	No. of trees	36235	32168	26067	6748	2588	2958	2773	**109537**
Rural	Volume (cu m)	4219	14841	18113	11634	12536	22943	19390	**103676**
	No. of trees	46868	72955	41562	9506	6190	6853	3537	**187471**
Scattered	Volume (cu m)	22558	167136	180080	227581	195638	269347	197761	**1260101**
	No. of trees	242861	799572	474512	235388	100881	93408	48572	**1995194**

4.5: Kadapa District

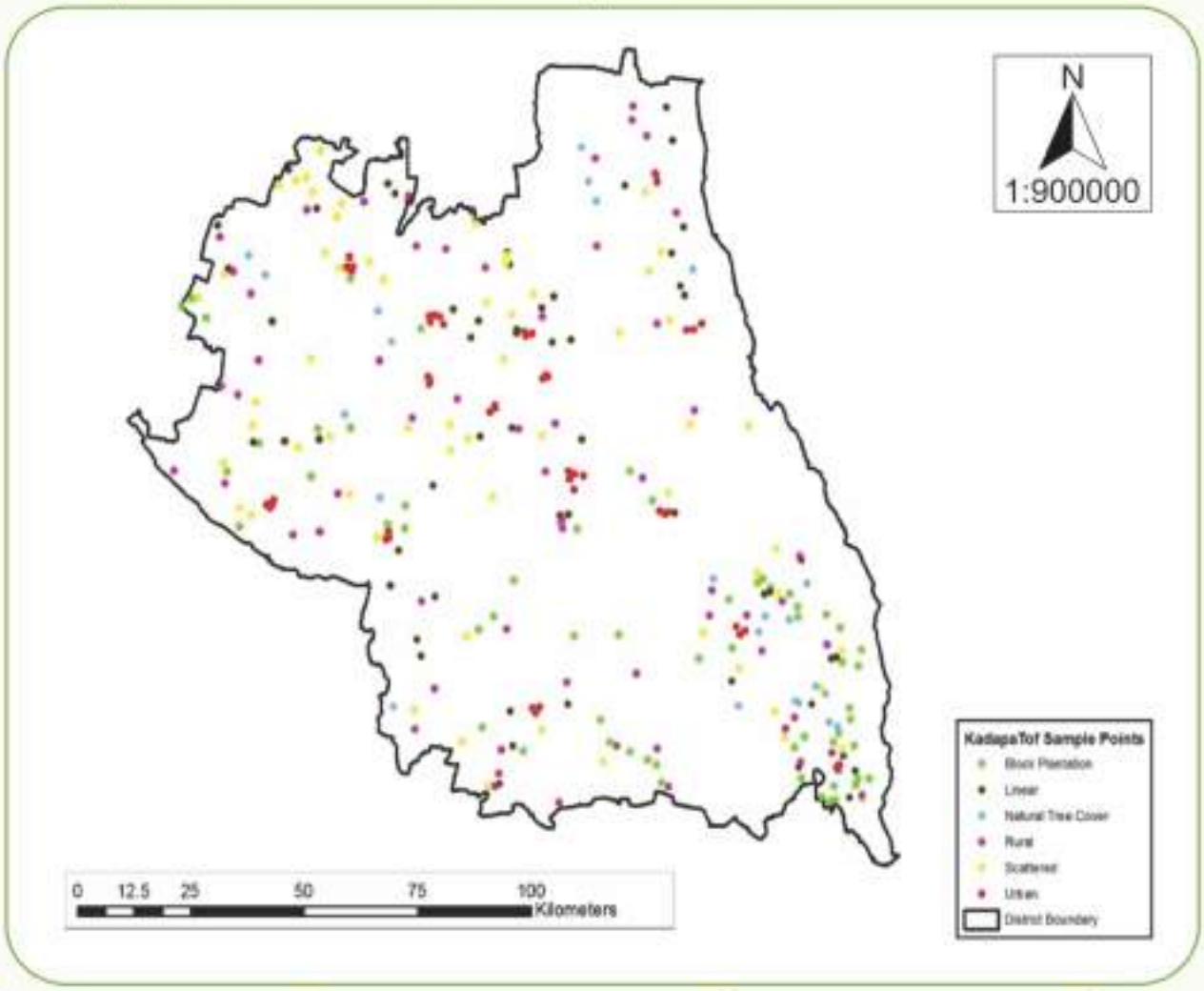
4.5.1: Dr. Y.S. Rajasekhara Reddy District (Kadapa) is situated in the south-central part of the Andhra Pradesh State. The district is bounded on the north by the Prakasam & Kurnool Districts, on the south by Chittoor District, on the east by Nellore District, and on the west by Anantapur District. Geographical Area of the District is 15072.00 sq.km. Out of this, notified forest area is 4743.60 sq.km, the remaining area of 10328.40 sq.km divided into 6 strata. A total of 316 points are scattered in this TOF area.

4.5.2: The 5 strata wise areas were polygonised on the CARTOSAT-1 (Resolution 2.5Mt) images using GIS software. The remaining non polygonised area considered as scattered area is,93.42% of total TOF area.

4.5.3: The Stratum-wise points and area are shown below

S. No.	Stratum	No. of plots	Area (ha)
1	Natural Forests	25	3374
2	Block Plantations	60	41512
3	Linear Plantations	60	266
4	Urban habitations	51	6709
5	Rural habitations	60	16080
6	Scattered	60	964900
	Total	**316**	**1032841**

4.5.4: Map below shows distribution of inventory points in the district

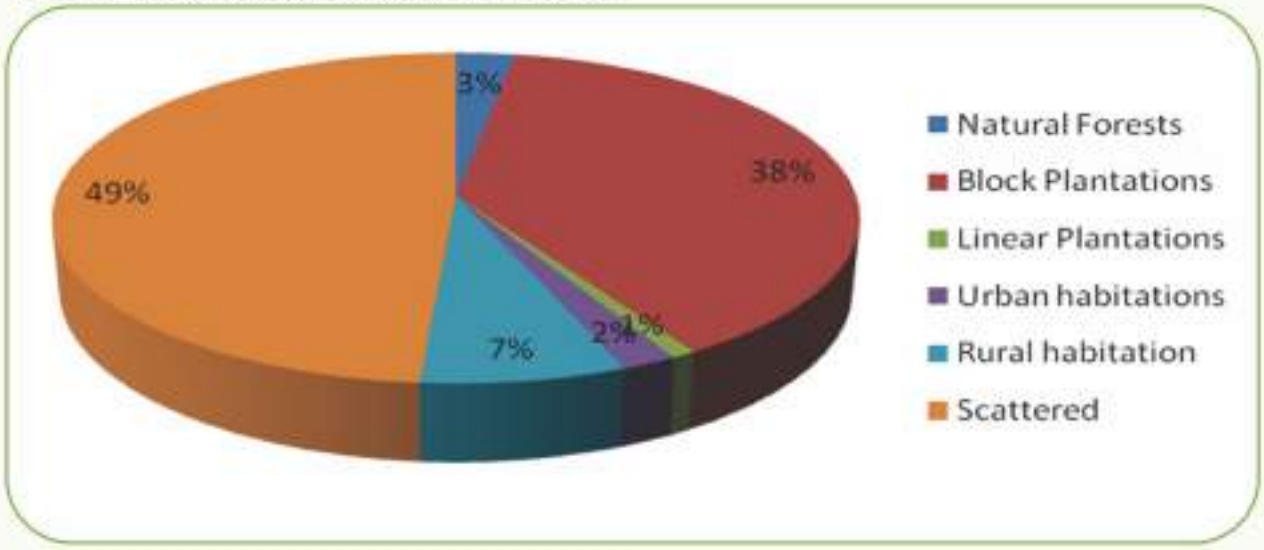


4.5.5: Results

4.5.6: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	3374	17	0.06	72	0.24
Block Plantations	41512	20	0.82	113	4.67
Linear Plantations	266	68	0.02	117	0.03
Urban habitations	6709	6	0.04	12	0.08
Rural habitations	16080	10	0.15	19	0.30
Scattered	964900	1	1.04	2	1.58
Total	**1032841**	**-**	**2.13**	**-**	**6.9**

4.5.7: The Stratum-wise estimated volume share



4.5.8: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	1.04
2	*Mangifera indica*	0.52
3	*Tectona grandis*	0.10
4	*Borassus flabelliformis*	0.07
5	*Albizia lebbeck*	0.05
6	*Ficus racemosa*	0.04
7	*Tamarindus indica*	0.04
8	*Ficus religiosa*	0.04
9	*Sterculia urens*	0.03
10	*Holarrhena antidysenterica*	0.03
11	*Leucaena leucocephala*	0.03
12	*Prosopis juliflora*	0.02
13	*Cocos nucifera*	0.02
14	*Pongamia pinnata*	0.01
15	*Pterocarpus santalinus*	0.01

4.5.9: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	3.94
2	*Azadirachta indica*	1.41
3	*Tectona grandis*	0.29
4	*Prosopis juliflora*	0.15
5	*Borassus flabelliformis*	0.15
6	*Holarrhena antidysenterica*	0.11
7	*Cocos nucifera*	0.10
8	*Leucaena leucocephala*	0.07
9	*Tamarindus indica*	0.06
10	*Ficus racemosa*	0.04
11	*Sterculia urens*	0.04
12	*Pongamia pinnata*	0.04
13	*Pterocarpus santalinus*	0.04
14	*Acacia chundra*	0.03
15	*Albizia lebbeck*	0.03

4.5.10: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia (cm) class	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural	Volume (cu m)	12689	11015	7907	10493	11968	0	3138	**57210**
	No. of trees	167334	43183	14844	9446	6747	0	1349	**242903**
Block	Volume (cu m)	185257	191099	142424	196685	58227	24408	25055	**823155**
	No. of trees	2393832	1390636	491220	318255	48430	13837	13837	**4670047**
Linear	Volume (cu m)	866	1944	4210	2823	1885	1084	5292	**18104**
	No. of trees	9028	7789	8461	3328	1133	425	779	**30943**
Urban	Volume (cu m)	2887	7185	8272	10936	5303	1557	5785	**41945**
	No. of trees	31133	26231	13244	8428	2838	688	1204	**83766**
Rural	Volume (cu m)	9210	22504	27572	26932	21168	20620	26684	**154690**
	No. of trees	111424	98462	47611	22185	9722	6730	4238	**300372**
Scattered	Volume (cu m)	41258	129538	129696	253979	133431	157472	196109	**1041483**
	No. of trees	498532	461008	251946	214422	64327	48245	42884	**1581364**

4.6: Krishna District

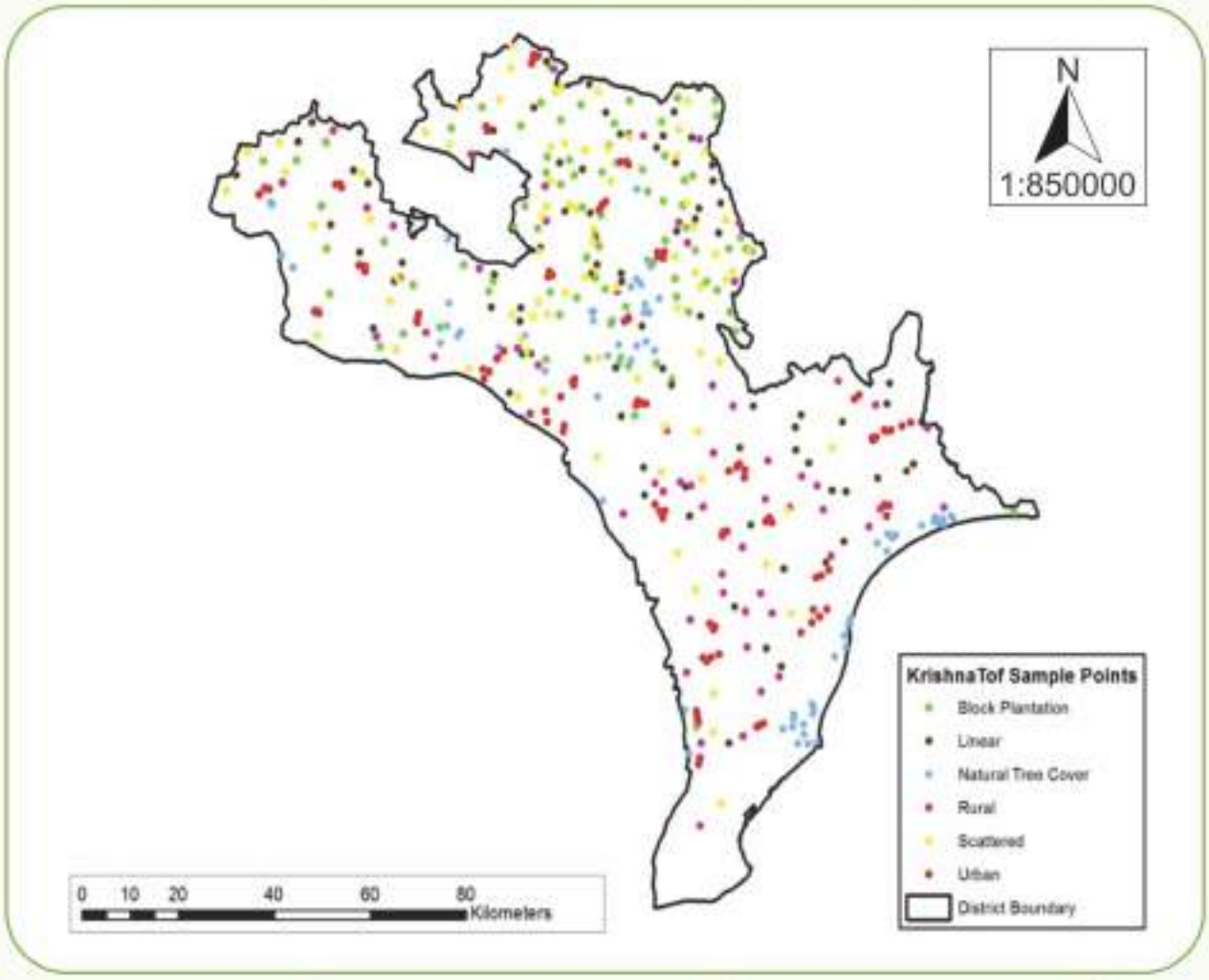
4.6.1: The Boundaries of this district are West Godavari district in the East, Bay of Bengal in the South, Guntur district and Nalgonda district (Telangana state) in the West and Khammam district (Telangana state) in the North directions. Geographical Area of the district is 8727.00 sq.km. Out of this notified forest area is 644.52 sq.km, the remaining area of 8082.48 sq.km divided into 6 strata. A total of 480 points are scattered in this TOF area.

4.6.2: The 5 strata wise areas were polygonised on the CARTOSAT-1 (Resolution - 2.5Mt) images using GIS software. The remaining non polygonised area considered as scattered area is 82.71% of total TOF area.

4.6.3: The Stratum-wise plots and area are shown below

S. No.	Stratum	No. of plots	Area (ha)
1	Natural Forests	70	7691
2	Block Plantations	80	88962
3	Linear Plantations	80	3428
4	Urban habitations	110	14856
5	Rural habitations	60	24837
6	Scattered	80	668473
	Total	**480**	**808247**

4.6.4: Map below shows distribution of inventory points in the district

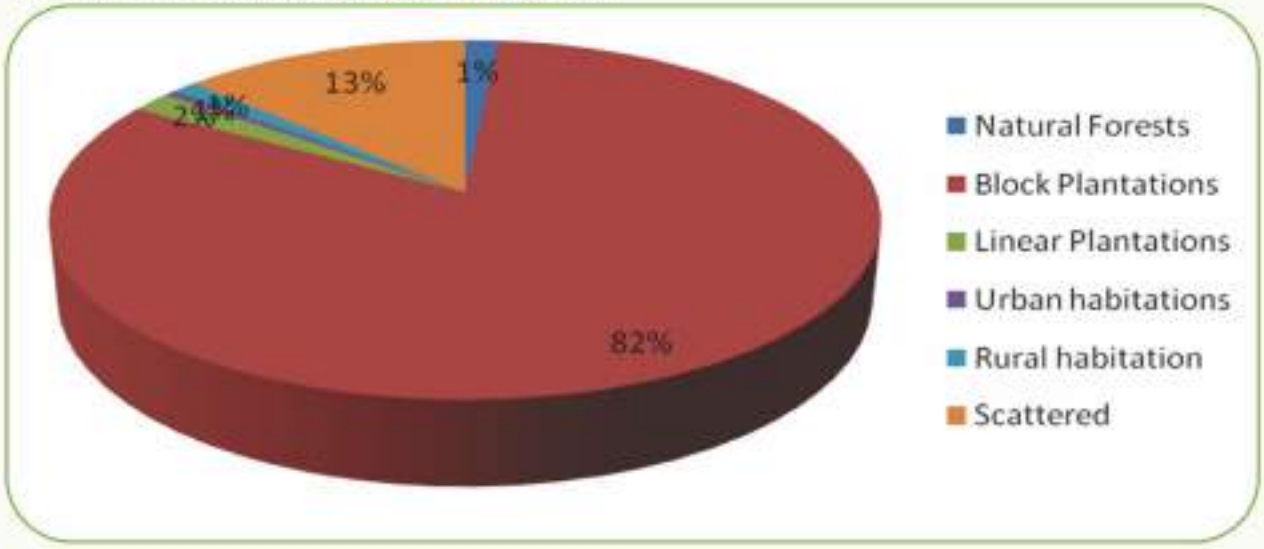


4.6.5: Results

4.6.6: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	7691	14	0.11	51	0.39
Block Plantations	88962	67	5.92	160	14.27
Linear Plantations	3428	38	0.13	104	0.35
Urban habitations	14856	3	0.04	4	0.06
Rural habitations	24837	3	0.08	6	0.16
Scattered	668473	1	0.94	3	2.11
Total	**808247**	-	**7.22**	-	**17.34**

4.6.7: The Stratum-wise estimated volume share



4.6.8:Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Mangifera indica*	4.42
2	*Azadirachta indica*	0.60
3	*Cocos nucifera*	0.54
4	*Tectona grandis*	0.47
5	*Elaeis guineensis*	0.23
6	*Borassus flabelliformis*	0.23
7	*Ficus benghalensis*	0.15
8	*Ficus religiosa*	0.07
9	*Tamarindus indica*	0.06
10	*Samanea saman*	0.04
11	*Delonix regia*	0.04
12	*Albizia odoratissima*	0.04
13	*Peltophorum pterocarpum*	0.03
14	*Dalbergia paniculata*	0.03
15	*Zizyphus mauritiana*	0.02

4.6.9: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	13.16
2	*Borassus flabelliformis*	0.88
3	*Azadirachta indica*	0.81
4	*Cocos nucifera*	0.51
5	*Tectona grandis*	0.36
6	*Elaeis guineensis*	0.22
7	*Delonix regia*	0.13
8	*Acacia nilotica*	0.09
9	*Pithecellobium dulce*	0.09
10	*Zizyphus mauritiana*	0.08
11	*Dalbergia paniculata*	0.08
12	*Tamarindus indica*	0.07
13	*Euphorbia nivulia*	0.07
14	*Terminalia arjuna*	0.07
15	*Peltophorum pterocarpum*	0.05

4.6.10: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia (cm) class	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural	Volume (cu m)	17216	6906	22086	11510	2010	31371	16724	**107823**
	No. of trees	268073	45045	48341	12085	1099	12085	5493	**392221**
Block	Volume (cu m)	317379	678435	638930	344057	468418	717026	2758751	**5922996**
	No. of trees	3958820	5215411	2468702	733938	522653	500413	867382	**14267319**
Linear	Volume (cu m)	5426	19863	41472	19659	9903	10405	22627	**129355**
	No. of trees	68227	98397	143310	32228	5486	3428	3771	**354847**
Urban	Volume (cu m)	1617	4504	8020	5441	3021	3648	16077	**42328**
	No. of trees	17064	17786	16781	5499	1446	1037	2294	**61907**
Rural	Volume (cu m)	3596	10279	22237	9695	6729	4791	23632	**80959**
	No. of trees	44257	44898	49602	10904	3421	1283	6414	**160779**
Scattered	Volume (cu m)	61824	134828	229604	137129	92654	76198	205500	**937737**
	No. of trees	615553	587699	629479	175474	44565	22282	30638	**2105690**

4.7: Kurnool District

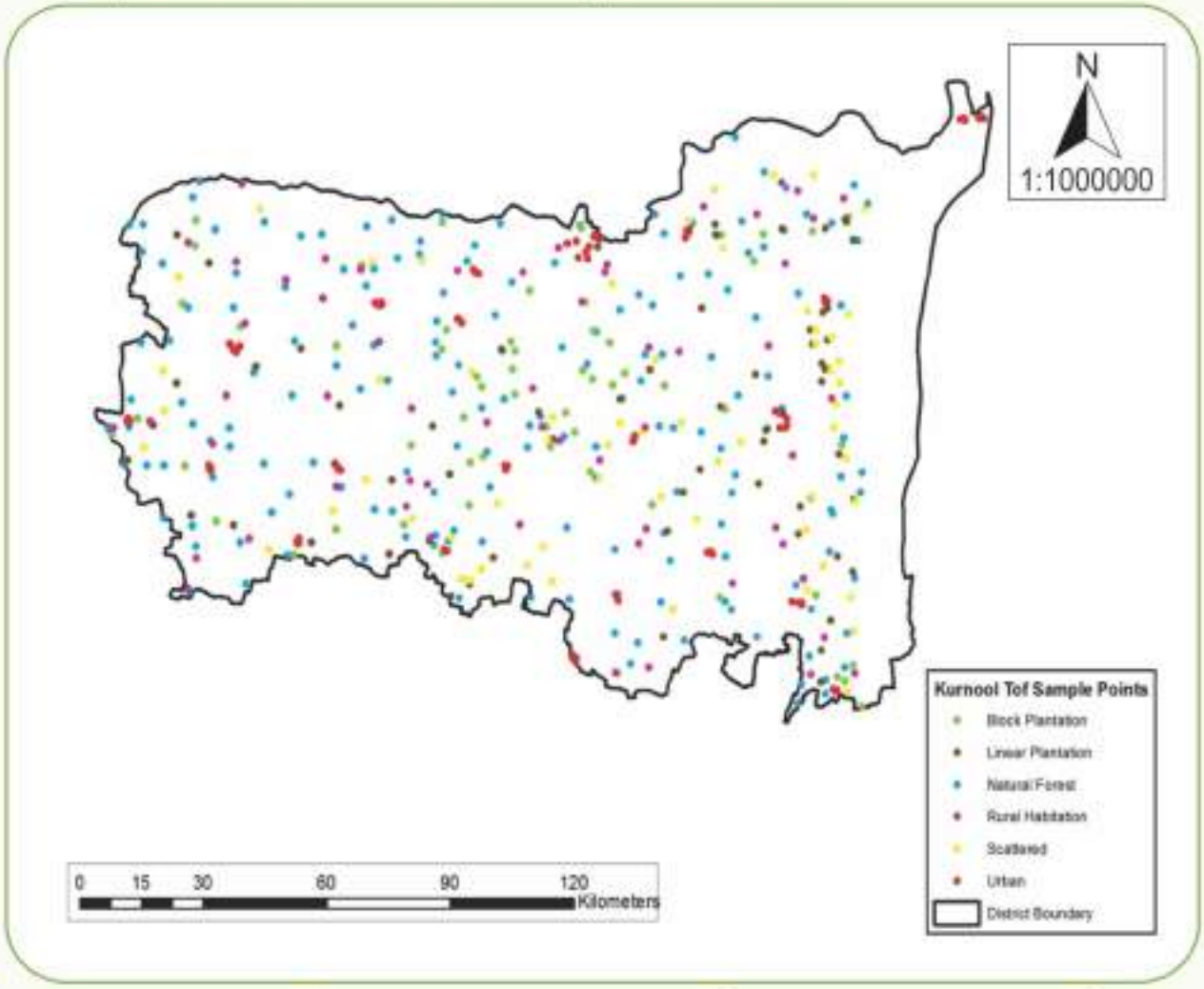
4.7.1: The Boundaries of Kurnool district are Guntur and Nellore districts in the East, Ballary district (Karnataka state) in the West, Mahaboobnagar district (Telangana state) in the North, Kadapa and Ananthapur districts in the South directions. Geographical Area of the District is 17658.00 sq.km. Out of this notified forest area is 3554.78 sq.km, the remaining area of 14103.22 sq.km divided into 6 strata. A total of 412 points scattered are in this TOF area.

4.7.2: The 5 strata wise areas were polygonised on the CARTOSAT-1 (Resolution - 2.5Mt) images using GIS software. The remaining non polygonised area considered as scattered area, is 95.79% of total TOF area.

4.7.3: The Stratum-wise plots and area are shown below

S. No.	Stratum	No. of plots	Area (ha)
1	Natural Forests	173	17294
2	Block Plantations	60	5387
3	Linear Plantations	60	3574
4	Urban habitations	81	9213
5	Rural habitations	60	23876
6	Scattered	60	1350978
	Total	**494**	**1410322**

4.7.4: Map below shows distribution of inventory points in the district

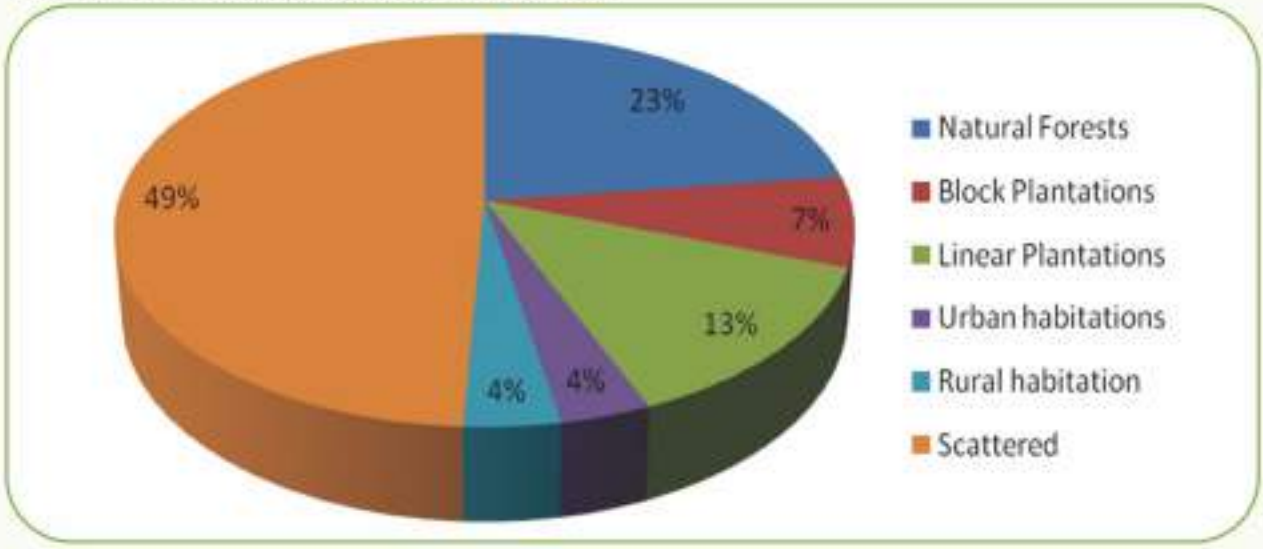


4.7.5: Results

4.7.6: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	17294	22	0.38	35	0.61
Block Plantations	5387	23	0.12	165	0.89
Linear Plantations	3574	61	0.22	72	0.26
Urban habitations	9213	6	0.06	10	0.09
Rural habitations	23876	3	0.06	4	0.10
Scattered	1350978	1	0.81	2	2.09
Total	**1410322**	**-**	**1.65**	**-**	**4.04**

4.7.7: The Stratum-wise estimated volume share



4.7.8: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	0.55
2	*Pongamia pinnata*	0.21
3	*Tamarindus indica*	0.12
4	*Mangifera indica*	0.12
5	*Canthium parviflorum*	0.11
6	*Phoenix loureirii*	0.08
7	*Tectona grandis*	0.07
8	*Prosopis spicigera*	0.05
9	*Albizia lebbeck*	0.05
10	*Ficus benghalensis*	0.03
11	*Acacia nilotica*	0.02
12	*Zizyphus mauritiana*	0.02
13	*Borassus flabelliformis*	0.02
14	*Ficus religiosa*	0.02
15	*Hardwickia binata*	0.01

4.7.9: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Azadirachta indica*	1.13
2	*Mangifera indica*	0.78
3	*Phoenix loureirii*	0.25
4	*Pongamia pinnata*	0.23
5	*Tectona grandis*	0.14
6	*Acacia nilotica*	0.14
7	*Prosopis spicigera*	0.11
8	*Tamarindus indica*	0.09
9	*Prosopis juliflora*	0.08
10	*Hardwickia binata*	0.08
11	*Zizyphus mauritiana*	0.06
12	*Carissa carandas*	0.05
13	*Bauhinia racemosa*	0.05
14	*Pithecellobium dulce*	0.05
15	*Leucaena leucocephala*	0.05

4.7.10: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia (cm) class	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural	Volume (cu m)	32603	24011	25193	23759	30069	18651	227038	**381324**
	No. of trees	39164	25759	14106	6046	2541	1665	3767	**93048**
Block	Volume (cu m)	43129	26223	22672	10983	7492	8704	3322	**122526**
	No. of trees	577072	187183	86743	21001	7305	7305	913	**887522**
Linear	Volume (cu m)	8125	14717	20560	19049	25705	30894	100600	**219650**
	No. of trees	82923	60048	34790	22875	16680	15250	23828	**256394**
Urban	Volume (cu m)	3291	6163	6916	7084	5691	5554	22726	**57425**
	No. of trees	39164	25759	14106	6046	2541	1665	3767	**93048**
Rural	Volume (cu m)	3179	6438	7909	8406	6144	8483	20089	**60648**
	No. of trees	38073	26709	14595	7528	3259	3057	3980	**97201**
Scattered	Volume (cu m)	99665	136099	118236	142003	49663	95485	173582	**814733**
	No. of trees	1155837	525380	180130	127592	22516	37527	45033	**2094015**

4.8: Nellore District

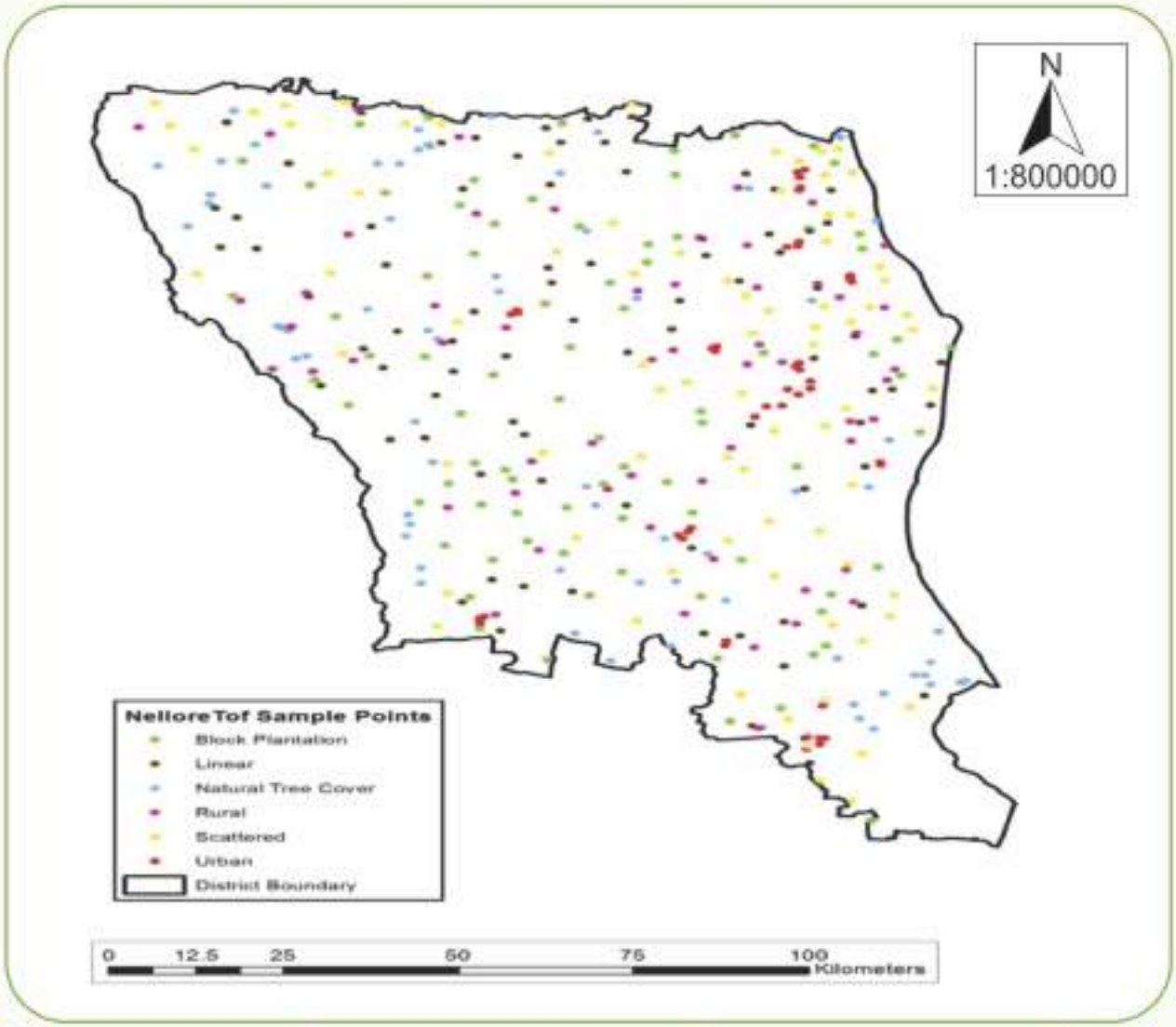
4.8.1: Sri Potti Sriramulu Nellore Forest Division lies in the South Eastern part of Andhra Pradesh. Geographical Area of the District is 12934.72 sq.km. Out of this, notified forest area is 2379.96 sq.km, and the remaining area of 10554.76 sq.km is divided into 6 strata. A total of 411 points are scattered in this TOF area.

4.8.2: The 5 strata wise areas were polygonised on the CARTOSAT-1 (Resolution - 2.5Mt) images using GIS software. The remaining non polygonised area considered as scattered area, is 90.25% of total TOF area.

4.8.3: The Stratum-wise points and the area are shown below

S. No.	Stratum	No. of plots	Area (ha)
1	Natural Forests	70	11696
2	Block Plantations	80	56056
3	Linear Plantations	80	5354
4	Urban habitations	41	7576
5	Rural habitations	60	22179
6	Scattered	80	952615
	Total	**411**	**1055476**

4.8.4: Map below shows distribution of inventory points in the district

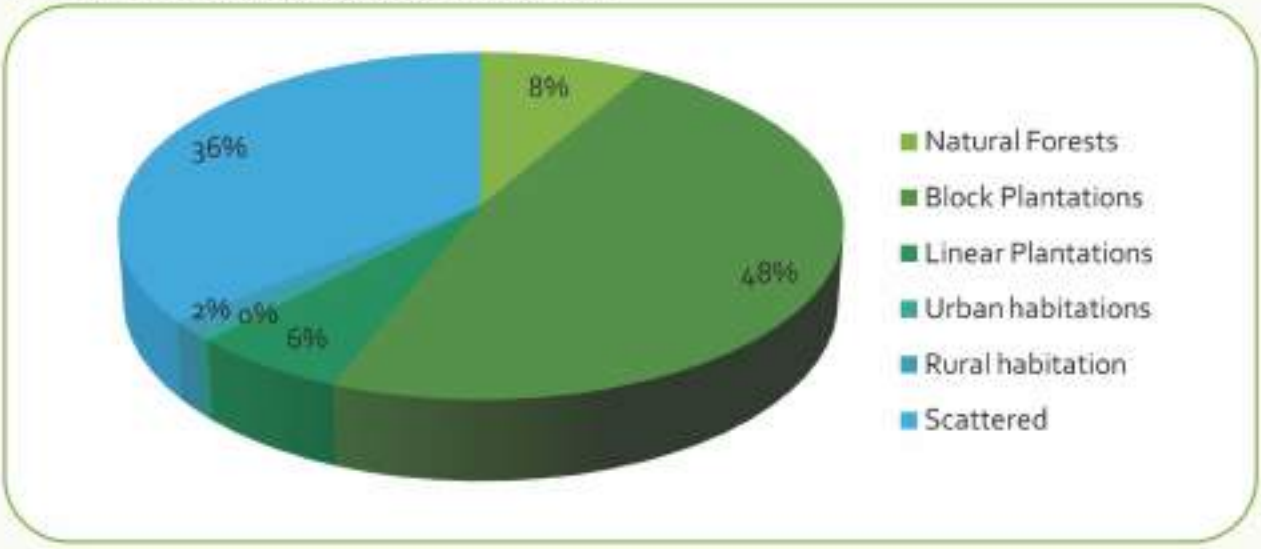


4.8.5: Results

4.8.6: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	11696	15	0.18	48	0.56
Block Plantations	56056	18	1.00	60	3.36
Linear Plantations	5354	24	0.13	70	0.37
Urban habitations	7576	1	0.01	2	0.02
Rural habitations	22179	1	0.03	3	0.07
Scattered	952615	1	0.75	2	2.24
Total	**1055476**	**-**	**2.1**	**-**	**6.62**

4.8.7: The Stratum-wise estimated volume share



4.8.8: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Mangifera indica*	0.48
2	*Borassus flabelliformis*	0.46
3	*Azadirachta indica*	0.36
4	*Tectona grandis*	0.18
5	*Limonia cenulata*	0.11
6	*Ficus benghalensis*	0.09
7	*Ficus religiosa*	0.08
8	*Elaeis guineensis*	0.04
9	*Cocos nucifera*	0.03
10	*Tamarindus indica*	0.03
11	*Dalbergia latifolia*	0.03
12	*Pithecellobium dulce*	0.02
13	*Baringtonia acutangular*	0.01
14	*Prosopis juliflora*	0.01
15	*Phoenix loureirii*	0.01

4.8.9: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	2.23
2	*Borassus flabelliformis*	1.89
3	*Azadirachta indica*	0.47
4	*Tectona grandis*	0.28
5	*Cocos nucifera*	0.19
6	*Prosopis juliflora*	0.17
7	*Eucalyptus tereticornis*	0.15
8	*Elaeis guineensis*	0.13
9	*Citrus limon*	0.08
10	*Phoenix loureirii*	0.08
11	*Acacia nilotica*	0.07
12	*Limonia cenulata*	0.07
13	*Limonia alata*	0.07
14	*Ficus benghalensis*	0.07
15	*Dalbergia latifolia*	0.06

4.8.10: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia (cm) class	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural	Volume (cu m)	14832	26323	50159	27141	33775	11385	12536	**176151**
	No. of trees	253973	135341	106936	36759	16709	6683	3342	**559743**
Block	Volume (cu m)	83428	152147	167547	83339	70394	105850	332476	**995181**
	No. of trees	1261259	1044042	602602	189189	84084	63063	112112	**3356351**
Linear	Volume (cu m)	9066	22534	32682	21797	8615	8527	27199	**130420**
	No. of trees	108685	139737	76026	31053	6960	3212	8566	**374239**
Urban	Volume (cu m)	862	1274	951	1597	3312	875	1183	**10054**
	No. of trees	8825	4478	1622	1557	1557	324	260	**18623**
Rural	Volume (cu m)	2518	4764	5845	7430	4900	3498	3636	**32591**
	No. of trees	27941	19539	11919	5666	3126	1368	782	**70341**
Scattered	Volume (cu m)	31350	108945	235276	151128	80910	59892	81490	**748991**
	No. of trees	428677	722400	750184	210369	87323	15877	27785	**2242615**

4.9: Prakasam District

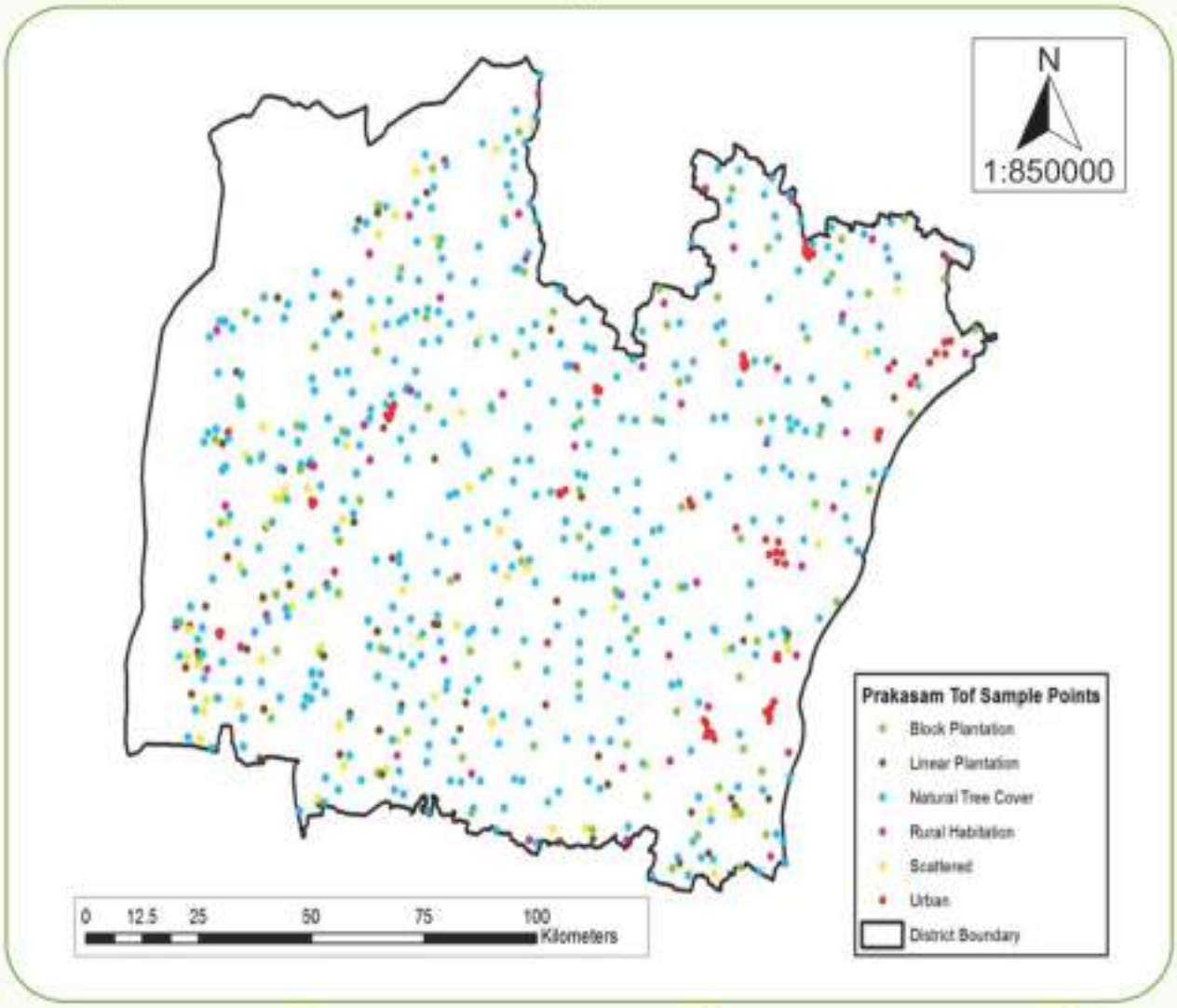
4.9.1: Prakasam District lies in the South central part of Andhra Pradesh. Geographical area of the District is 17626.00 sq.km. Out of that, notified forest area is 4481.06 sq.km, the remaining area of 13144.94 sq.km is divided into 6 strata. A total of 732 points are scattered in this TOF area.

4.9.2: The 5 strata wise areas were polygonised on the CARTOSAT-1 (Resolution - 2.5Mt) images using GIS software. The remaining non polygonised area is considered as scattered area which is 87.38 % of total TOF area.

4.9.3: The Stratum-wise points and area are shown below

S. No.	Stratum	No. of plots	Area (ha)
1	Natural Forests	400	40413
2	Block Plantations	90	80677
3	Linear Plantations	60	4902
4	Urban habitations	62	7644
5	Rural habitations	60	32318
6	Scattered	60	1148540
	Total	**732**	**1314494**

4.9.4: Map below shows distribution of inventory points in the district

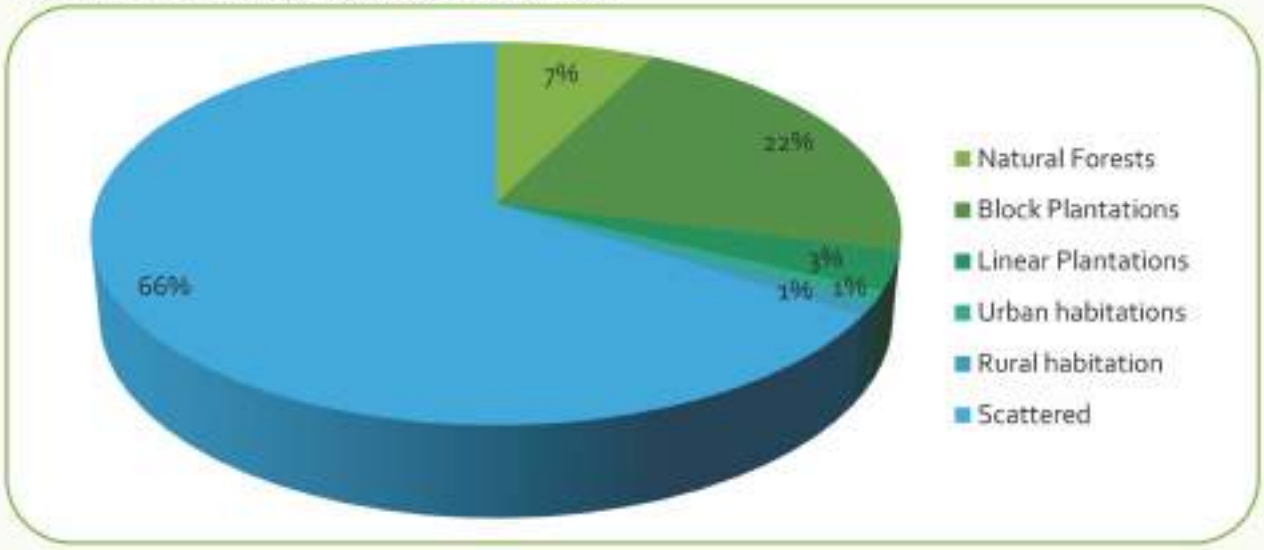


4.9.5: Results

4.9.6: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	40413	11	0.46	45	1.82
Block Plantations	80677	17	1.35	98	7.89
Linear Plantations	4902	42	0.20	97	0.48
Urban habitations	7644	8	0.06	23	0.18
Rural habitations	32318	2	0.07	5	0.18
Scattered	1148540	4	4.11	6	6.50
Total	**1314494**	-	**6.25**	-	**17.05**

4.9.7: The Stratum-wise estimated volume share



4.9.8: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	2.24
2	*Tamarindus indica*	0.47
3	*Tectona grandis*	0.46
4	*Mangifera indica*	0.46
5	*Ficus benghalensis*	0.41
6	*Bombax religiosum*	0.33
7	*Borassus flabelliformis*	0.31
8	*Peltophorum pterocarpum*	0.15
9	*Ailanthus excelsa*	0.15
10	*Albizia lebbeck*	0.12
11	*Ficus racemose*	0.12
12	*Ficus religiosa*	0.09
13	*Strychnos potatorum*	0.08
14	*Ficus mollis*	0.06
15	*Cocos nucifera*	0.06

4.9.9: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	3.80
2	*Azadirachta indica*	3.46
3	*Tectona grandis*	1.51
4	*Borassus flabelliformis*	1.14
5	*Bombax religiosum*	0.92
6	*Prosopis juliflora*	0.63
7	*Limonia alata*	0.41
8	*Phoenix sylvestris*	0.37
9	*Anacardium occidentale*	0.37
10	*Tamarindus indica*	0.37
11	*Cocos nucifera*	0.33
12	*Acacia nilotica*	0.30
13	*Strychnos potatorum*	0.28
14	*Pongamia pinnata*	0.16
15	*Acacia leucophloea*	0.15

4.9.10: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia (cm) class	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural	Volume (cu m)	68360	79481	74040	65939	40230	35430	98835	**462315**
	No. of trees	1023469	472837	176809	73754	27279	19196	25258	**1818602**
Block	Volume (cu m)	400435	252025	198898	101323	67079	43181	285194	**1348135**
	No. of trees	5235062	1586654	779881	161355	44821	17928	62749	**7888450**
Linear	Volume (cu m)	14443	23688	48764	34526	13803	25928	42853	**204005**
	No. of trees	177777	97385	127450	49673	7843	9150	8497	**477775**
Urban	Volume (cu m)	7026	13644	14077	8803	5797	4067	11273	**64688**
	No. of trees	80218	60670	24118	7229	2718	1215	2429	**178597**
Rural	Volume (cu m)	6017	16255	19453	12102	3406	1759	6392	**65384**
	No. of trees	62922	64469	35537	10529	1870	693	1039	**177059**
Scattered	Volume (cu m)	181960	396573	653520	530862	351477	346268	1646635	**4107295**
	No. of trees	2099275	1671763	1531386	580651	210566	121235	287135	**6502011**

4.10: Srikakulam District

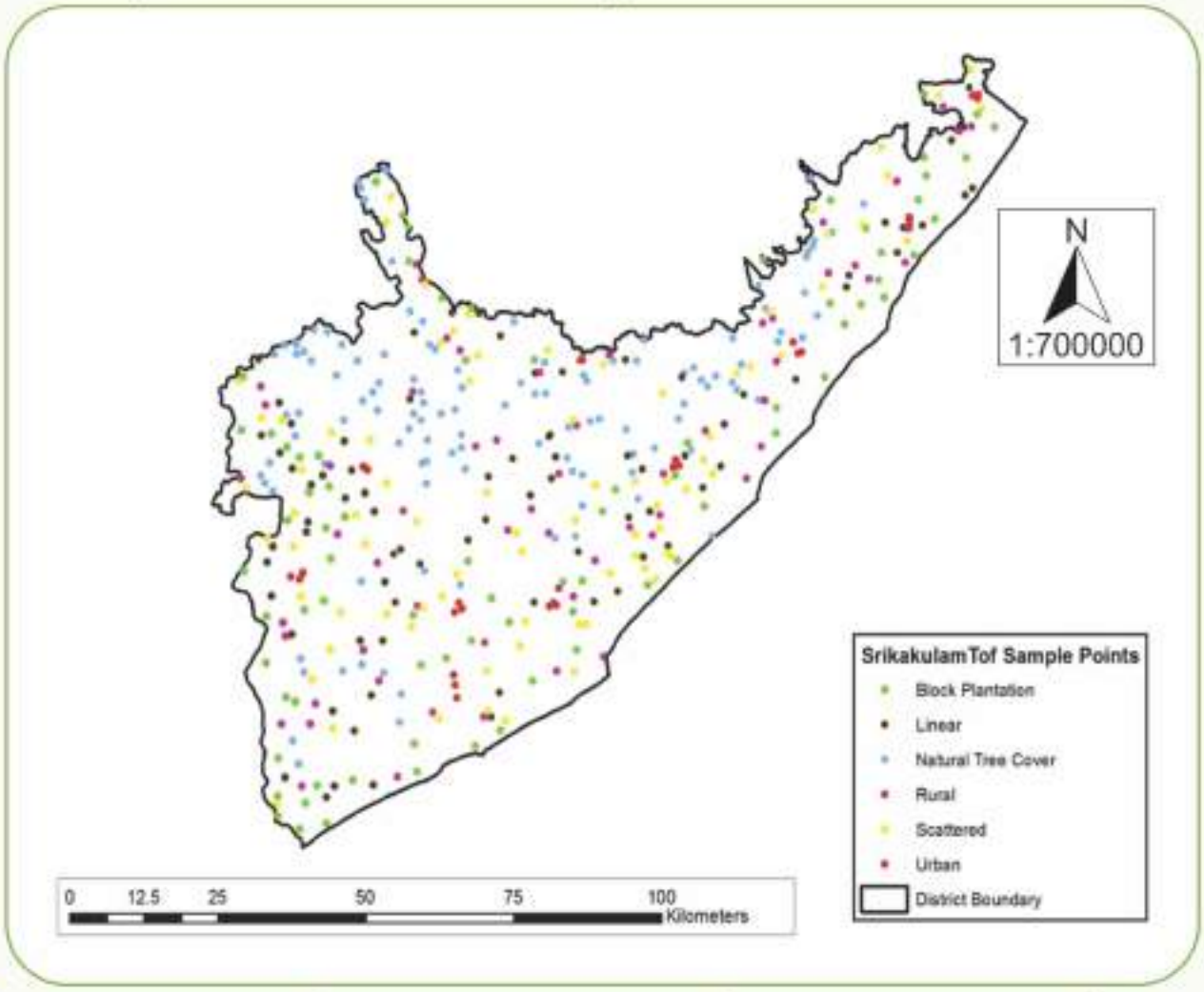
4.10.1: Srikakulam District has the longest coast line in the state of Andhra Pradesh. Two of the rivers that pass through Srikakulam district are River Nagavali and River Vamsadhara. Geographical area of the District is 5953.50 sq.km. Out of this, notified forest area is 721.72 sq.km, the remaining area, 5231.78 sq.km is divided into 6 strata. A total of 448 points are scattered in this TOF area.

4.10.2: The 5 strata wise areas were polygonised on the CARTOSAT-1 (Resolution - 2.5Mt) images using GIS software. The remaining non polygonised area is considered as scattered area which is 78.96% of total TOF area.

4.10.3: The Stratum-wise points and area are shown below

S. No.	Stratum	No. of plots	Area (ha)
1	Natural Forests	120	24151
2	Block Plantations	80	65767
3	Linear Plantations	80	4163
4	Urban habitations	28	2610
5	Rural habitations	60	13387
6	Scattered	80	413099
	Total	**448**	**523177**

4.10.4: Map below shows distribution of inventory points in the district

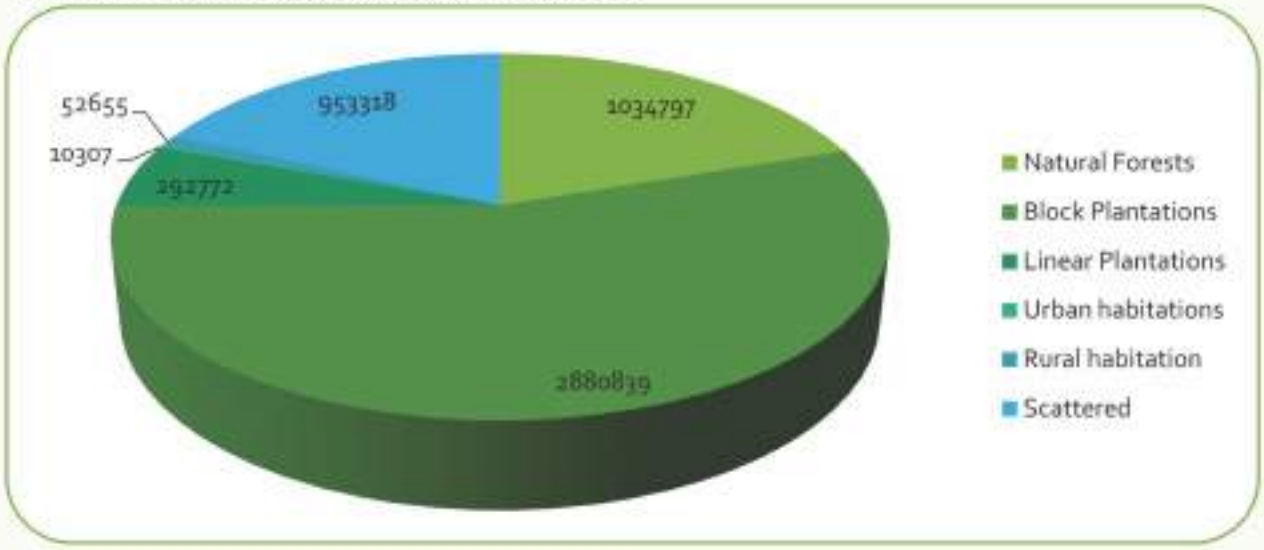


4.10.5: Results

4.10.6: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	24151	43	1.03	168	4.06
Block Plantations	65767	44	2.88	141	9.28
Linear Plantations	4163	70	0.29	156	0.65
Urban habitations	2610	4	0.01	4	0.01
Rural habitations	13387	4	0.05	7	0.10
Scattered	413099	2	0.95	6	2.60
Total	**523177**	**-**	**5.21**	**-**	**16.6**

4.10.7: The Stratum-wise estimated volume share



4.10.8: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Anacardium occidentale*	1.64
2	*Cocos nucifera*	0.63
3	*Mangifera indica*	0.55
4	*Borassus flabelliformis*	0.41
5	*Tectona grandis*	0.39
6	*Tamarindus indica*	0.25
7	*Bombax religiosum*	0.13
8	*Phoenix sylvestris*	0.11
9	*Albizia lebbeck*	0.09
10	*Artocarpus heterophyllus*	0.09
11	*Anogeissus acuminate*	0.09
12	*Terminalia arjuna*	0.09
13	*Azadirachta indica*	0.09
14	*Acacia auriculiformis*	0.08
15	*Ficus benghalensis*	0.07

4.10.9: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Anacardium occidentale*	5.10
2	*Tectona grandis*	2.46
3	*Mangifera indica*	2.09
4	*Cocos nucifera*	1.30
5	*Borassus flabelliformis*	1.15
6	*Casuarina equisetifolia*	0.51
7	*Bombax religiosum*	0.36
8	*Acacia auriculiformis*	0.35
9	*Azadirachta indica*	0.30
10	*Anogeissus acuminata*	0.22
11	*Tamarindus indica*	0.22
12	*Eucalyptus tereticornis*	0.21
13	*Syzygium cumini*	0.16
14	*Terminalia arjuna*	0.15
15	*Acacia nilotica*	0.15

4.10.10: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia (cm) class	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural	Volume (cu m)	204476	300258	149299	47784	68448	39040	225491	**1034796**
	No. of trees	2513726	1094849	275725	50315	44277	18113	62390	**4059395**
Block	Volume (cu m)	339799	823707	449713	616349	284515	91949	274807	**2880839**
	No. of trees	3896723	3526781	871419	657675	180861	49326	98651	**9281436**
Linear	Volume (cu m)	22326	60733	43270	24004	20033	27724	94683	**292773**
	No. of trees	275193	232728	74939	26645	14572	12906	12490	**649473**
Urban	Volume (cu m)	171	1117	1036	1122	1059	1741	4061	**10307**
	No. of trees	1848	4269	1536	937	573	599	599	**10361**
Rural	Volume (cu m)	2755	8743	8342	7211	5156	6685	13762	**52654**
	No. of trees	36940	31644	14982	6587	3229	2583	3100	**99065**
Scattered	Volume (cu m)	75167	283035	231463	86692	19198	43830	213933	**953318**
	No. of trees	876114	1086106	471621	92947	13770	20655	39589	**2600802**

4.11: Vizianagaram District

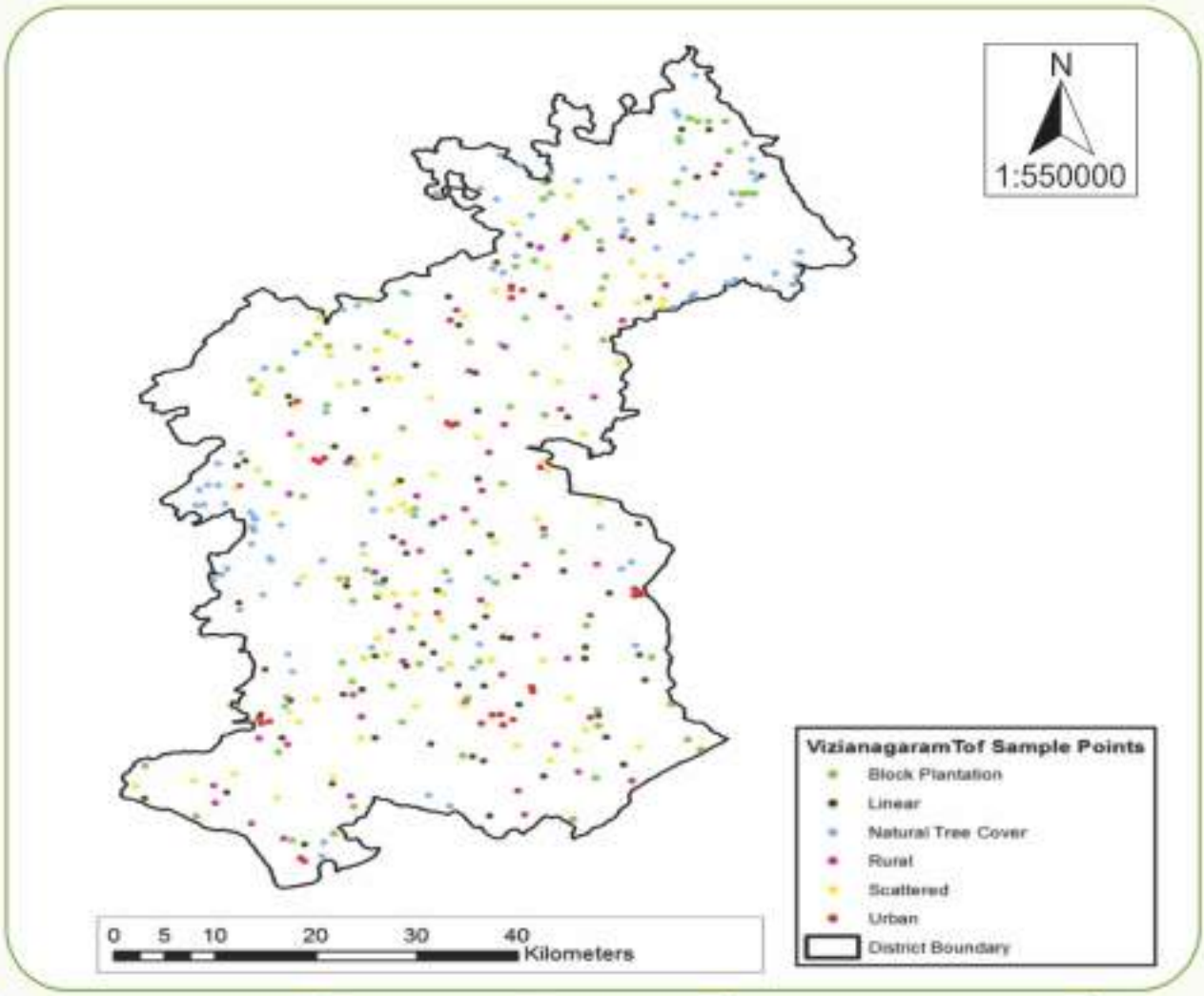
4.11.1: Vizianagaram District is bordered by Srikakulum district in the East, Orissa state and Vishakapatnam district in the West and Orissa state in the North. Geographical area of the District is 6261.64 sq.km. Out of this, notified forest area is 1219.28 sq.km, the remaining area of 5042.36 sq.km is divided into 6 strata. A total of 426 points are scattered in this TOF area.

4.11.2: The 5 strata wise areas were polygonised on the CARTOSAT-1 (Resolution - 2.5Mt) images using GIS software. The remaining non polygonised area is considered as scattered area which is 77.23% of total TOF area.

4.11.3: The Stratum-wise points and area are shown below

S. No.	Stratum	No. of plots	Area (ha)
1	Natural Forests	100	19618
2	Block Plantations	80	72686
3	Linear Plantations	80	5268
4	Urban habitations	26	3136
5	Rural habitations	60	14095
6	Scattered	80	389434
	Total	**426**	**504237**

4.11.4: Map below shows distribution of inventory points in the district

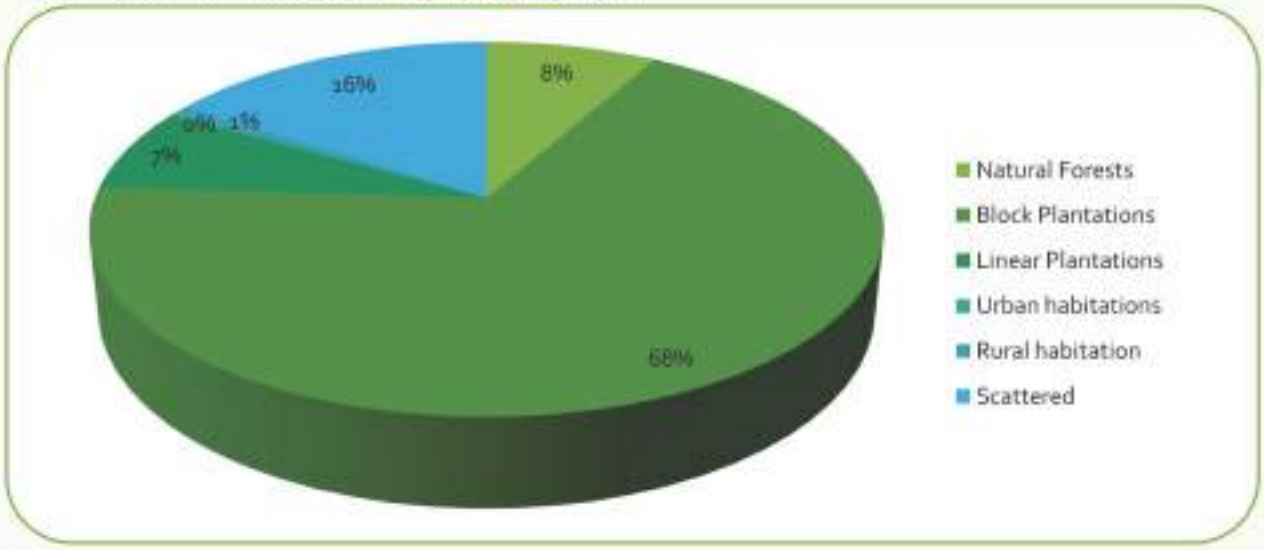


4.11.5: Results

4.11.6: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	19618	23	0.45	107	2.10
Block Plantations	72686	51	3.72	125	9.08
Linear Plantations	5268	75	0.40	113	0.59
Urban habitations	3136	3	0.01	4	0.01
Rural habitations	14095	3	0.04	7	0.10
Scattered	389434	2	0.87	5	1.86
Total	**504237**	**-**	**5.49**	**-**	**13.74**

4.11.7: The Stratum-wise estimated volume share



4.11.8: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Elaeis guineensis*	1.34
2	*Borassus flabelliformis*	0.59
3	*Anacardium occidentale*	0.48
4	*Mangifera indica*	0.42
5	*Tectona grandis*	0.39
6	*Albizia odoratissima*	0.20
7	*Bombax religiosum*	0.17
8	*Anogeissus acuminata*	0.17
9	*Semecarpus anacardium*	0.14
10	*Cocos nucifera*	0.14
11	*Azadirachta indica*	0.13
12	*Samanea saman*	0.12
13	*Tamarindus indica*	0.11
14	*Madhuca indica*	0.08
15	*Pongamia pinnata*	0.06

4.11.9: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Anacardium occidentale*	2.81
2	*Mangifera indica*	2.61
3	*Tectona grandis*	1.61
4	*Borassus flabelliformis*	0.90
5	*Elaeis guineensis*	0.82
6	*Bombax religiosum*	0.52
7	*Azadirachta indica*	0.41
8	*Cocos nucifera*	0.38
9	*Anogeissus acuminata*	0.30
10	*Diospyros sylvatica*	0.23
11	*Buchanania lanzan*	0.20
12	*Ximenia americana*	0.17
13	*Madhuca indica*	0.16
14	*Semecarpus anacardium*	0.16
15	*Tamarindus indica*	0.15

4.11.10: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia (cm) class	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural	Volume (cu m)	106917	68287	100494	30107	31549	53254	60247	**450855**
	No. of trees	1587061	241296	178520	25503	19618	23541	23541	**2099080**
Block	Volume (cu m)	464146	569465	319652	251226	350069	673870	1089237	**3717665**
	No. of trees	4715480	2434969	717771	290743	254400	318000	345257	**9076620**
Linear	Volume (cu m)	7162	39062	101215	104518	20758	20205	103857	**396777**
	No. of trees	83228	161188	194900	110619	12642	10008	21597	**594182**
Urban	Volume (cu m)	262	1622	1957	1346	1835	424	1229	**8675**
	No. of trees	2662	5819	3271	989	799	114	228	**13882**
Rural	Volume (cu m)	3155	9831	14526	2977	1592	2415	9448	**43944**
	No. of trees	36172	34405	26402	2806	832	832	1559	**103008**
Scattered	Volume (cu m)	52906	120674	288730	216533	55359	43580	94443	**872225**
	No. of trees	561435	457585	551699	220680	34076	17849	17849	**1861173**

4.12: Visakhapatnam District

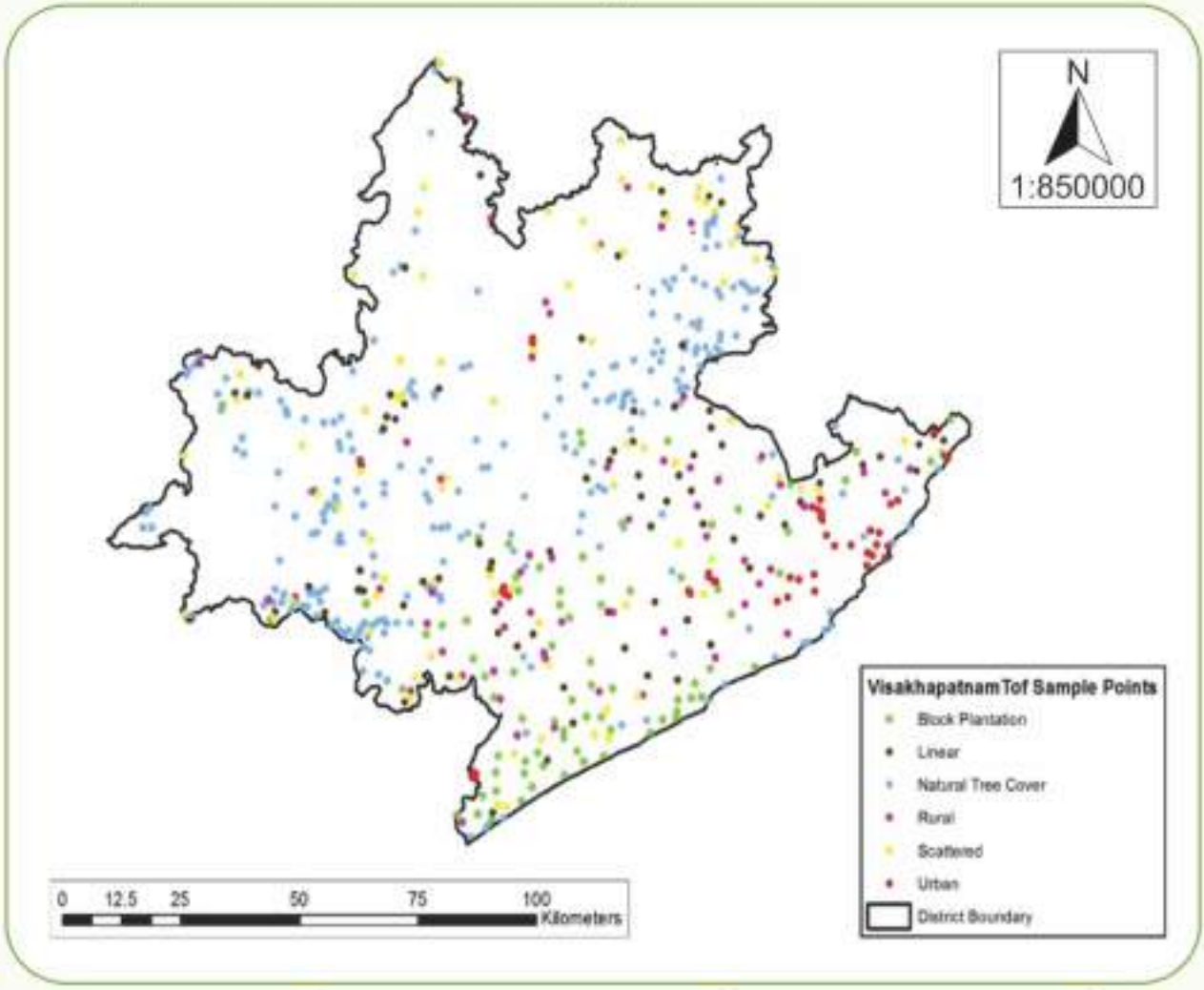
4.12.1: Visakhapatnam is a coastal port city, often called "The Jewel of the East Coast", and nestled by the hills of the Eastern Ghats and facing the Bay of Bengal to the east. Geographical Area of the District is 11161.00 sq.km. Out of this, notified forest area is 4631.37 sq.km, the remaining area of 6529.63 sq.km is divided in to 6 strata. A total of 598 points are scattered in this TOF area.

4.12.2: The 5 strata wise areas were polygonised on the CARTOSAT-1(Resolution 2.5Mt) images using GIS software. The remaining non polygonised area is considered as scattered area constitutes about 74.62% of total TOF area.

4.12.3: The Stratum-wise points and area are shown below

S. No.	Stratum	No. of plots	Area (ha)
1	Natural Forests	100	41280
2	Block Plantations	80	79264
3	Linear Plantations	80	6006
4	Urban habitations	46	23086
5	Rural habitations	60	16111
6	Scattered	80	487217
	Total	**598**	**652964**

4.12.4: Map below shows distribution of inventory points in the district

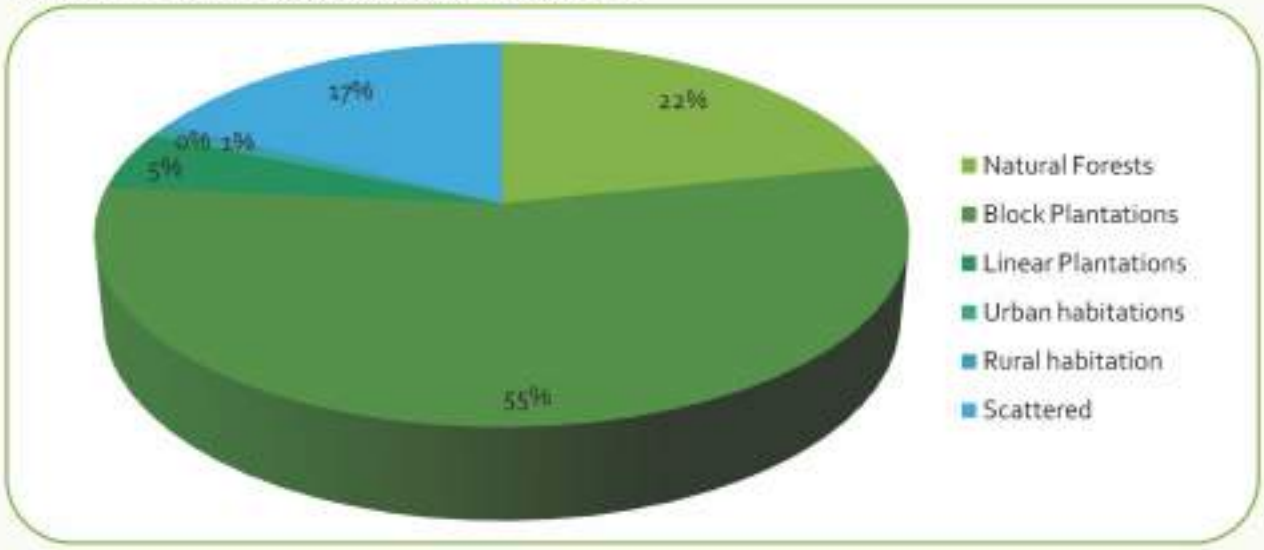


4.12.5: Results

4.12.6: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	41280	29	1.18	89	3.66
Block Plantations	79264	38	2.99	56	4.43
Linear Plantations	6006	44	0.27	88	0.53
Urban habitations	23086	1	0.02	3	0.06
Rural habitations	16111	3	0.04	6	0.09
Scattered	487217	2	0.96	3	1.44
Total	**652964**	**-**	**5.46**	**-**	**10.21**

4.12.7: The Stratum-wise estimated volume share



4.12.8: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Semecarpus anacardium*	0.73
2	*Elaeis guineensis*	0.72
3	*Anacardium occidentale*	0.69
4	*Cocos nucifera*	0.37
5	*Mangifera indica*	0.36
6	*Tamarindus indica*	0.33
7	*Borassus flabelliformis*	0.25
8	*Bombax religiosum*	0.21
9	*Tectona grandis*	0.15
10	*Pterocarpus marsupium*	0.13
11	*Artocarpus heterophyllus*	0.12
12	*Syzygium cumini*	0.11
13	*Pongamia pinnata*	0.11
14	*Grevillea robusta*	0.08
15	*Ficus religiosa*	0.07

4.12.9: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Anacardium occidentale*	1.56
2	*Mangifera indica*	1.07
3	*Cocos nucifera*	0.77
4	*Bombax religiosum*	0.59
5	*Borassus flabelliformis*	0.52
6	*Elaeis guineensis*	0.44
7	*Xylia xylocarpa*	0.36
8	*Tectona grandis*	0.35
9	*Syzygium cumini*	0.27
10	*Semecarpus anacardium*	0.24
11	*Tamarindus indica*	0.20
12	*Terminalia tomentosa*	0.18
13	*Grevillea robusta*	0.16
14	*Pongamia pinnata*	0.15
15	*Pterocarpus marsupium*	0.14

4.12.10: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia (cm) class	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural	Volume (cu m)	194242	174079	135807	86620	84199	80262	425891	**1181100**
	No. of trees	2543988	661797	229336	80268	45867	34400	62248	**3657904**
Block	Volume (cu m)	65728	441428	636162	344815	421272	351849	726198	**2987452**
	No. of trees	792639	1624910	1139418	267516	217976	69356	317056	**4428871**
Linear	Volume (cu m)	8158	43079	67500	39245	22009	38936	48143	**267070**
	No. of trees	115308	177166	159149	44442	10810	13813	8408	**529096**
Urban	Volume (cu m)	1580	5592	7435	2905	1296	1410	2501	**22719**
	No. of trees	20672	21016	14355	2527	689	574	345	**60178**
Rural	Volume (cu m)	3050	7316	6967	4137	5554	6992	10578	**44594**
	No. of trees	37607	26929	13310	3714	3405	2631	2631	**90227**
Scattered	Volume (cu m)	32919	84107	194468	126404	145412	172657	200713	**956680**
	No. of trees	424285	302481	363383	142105	75113	83233	52782	**1443382**

4.13: West Godavari District

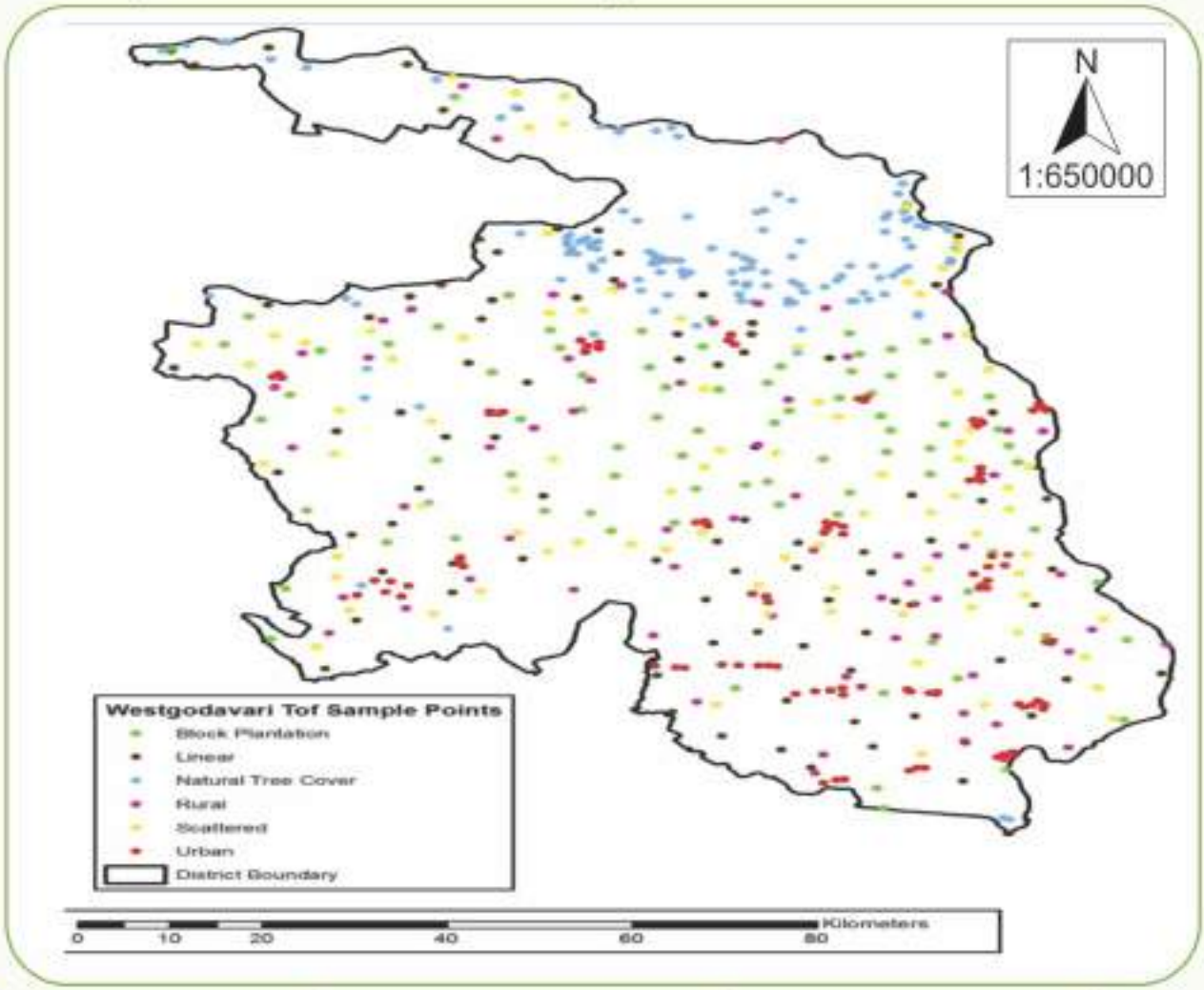
4.13.1: West Godavari District is bounded by Khammam District in the north, East Godavari District in the east, the Bay of Bengal in the south, and Krishna District in the west. Geographical area of the District is 8489.49 sq.km. Out of this, notified forest area is 1252.59 sq.km, the remaining area of 7236.89 sq.km divided into 6 strata. A total of 549 points are scattered in this TOF area.

4.13.2: The 5 strata wise areas were polygonised on the cartosat-1 (Resolution 2.5Mt) images using GIS software. The remaining non polygonised area is considered as scattered area and constitutes about 79.36% of total TOF area.

4.13.3: The Stratum-wise points and area shown below

S. No.	Revised Stratum	Stratum	No. of plots	Area (ha)
1	Block	Natural Forests	115	9908
2		Block Plantations	80	95752
3	Linear	Linear Plantations	80	7277
4	Homestead	Urban habitations	103	10566
5		Rural habitations	60	25854
6	Scattered	Scattered	80	574333
		Total	**518**	**723690**

4.13.4: Map below shows distribution of inventory points in the district

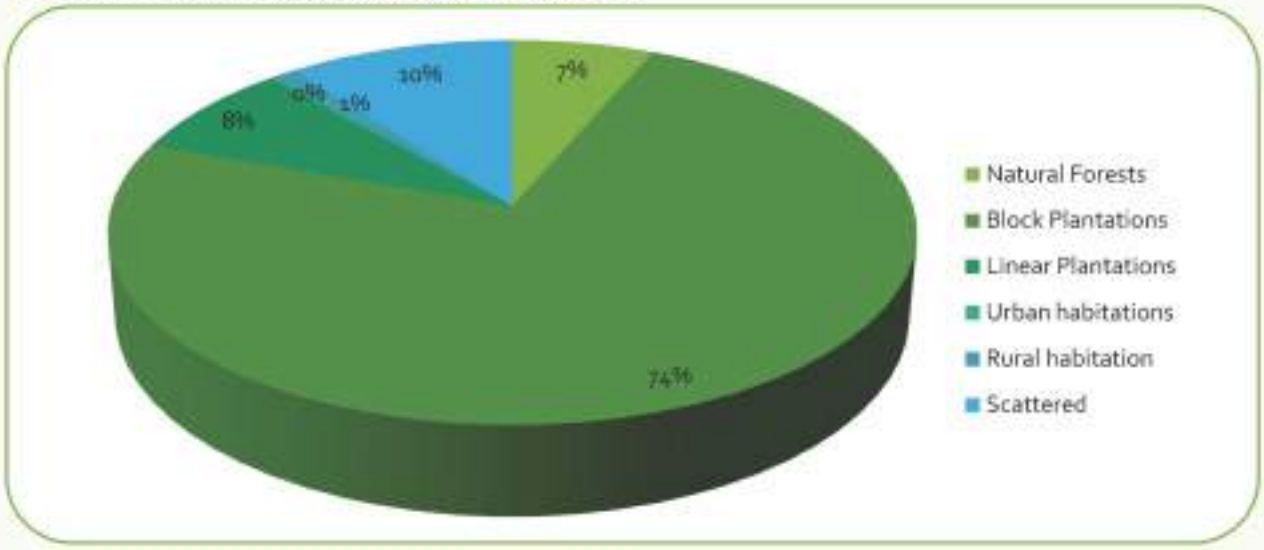


4.13.5: Results

4.13.6: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	9908	54	0.54	142	1.41
Block Plantations	95752	64	6.14	140	13.42
Linear Plantations	7277	92	0.67	136	0.99
Urban habitations	10566	2	0.02	5	0.05
Rural habitations	25854	3	0.09	9	0.23
Scattered	574333	1	0.86	2	1.29
Total	**723690**	**-**	**8.32**	**-**	**17.39**

4.13.7: The Stratum-wise estimated volume share



4.13.8: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Cocos nucifera*	1.83
2	*Borassus flabelliformis*	1.05
3	*Artocarpus heterophyllus*	0.60
4	*Phoenix sylvestris*	0.60
5	*Anacardium occidentale*	0.55
6	*Azadirachta indica*	0.42
7	*Elaeis guineensis*	0.28
8	*Mangifera indica*	0.19
9	*Eucalyptus camaldulensis*	0.18
10	*Eucalyptus tereticornis*	0.13
11	*Lagerstroemia parviflora*	0.09
12	*Tectona grandis*	0.07
13	*Xylia xylocarpa*	0.07
14	*Tamarindus indica*	0.06
15	*Grewia tiliaefolia*	0.06

4.13.9: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Cocos nucifera*	7.17
2	*Borassus flabelliformis*	1.39
3	*Phoenix sylvestris*	1.37
4	*Anacardium occidentale*	1.36
5	*Eucalyptus tereticornis*	0.80
6	*Mangifera indica*	0.63
7	*Eucalyptus camaldulensis*	0.55
8	*Azadirachta indica*	0.41
9	*Tectona grandis*	0.38
10	*Elaeis guineensis*	0.29
11	*Xylia xylocarpa*	0.28
12	*Grewia tiliaefolia*	0.13
13	*Artocarpus heterophyllus*	0.13
14	*Dalbergia paniculata*	0.12
15	*Strychnos nux vomica*	0.08

4.13.10: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia (cm) class	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural	Volume (cu m)	57413	76572	90340	74975	39394	44455	155483	**538632**
	No. of trees	774321	317807	163857	80023	25150	19053	27437	**1407648**
Block	Volume (cu m)	304983	1459315	998143	378445	745613	572195	1680262	**6138956**
	No. of trees	3970190	5628328	1891679	420373	537143	280249	688945	**13416907**
Linear	Volume (cu m)	14599	69509	157615	207923	39096	50127	128400	**667269**
	No. of trees	162466	265361	267392	214591	26401	23016	33170	**992397**
Urban	Volume (cu m)	1400	5462	3559	1046	1306	1174	5120	**19067**
	No. of trees	16743	22091	6954	1052	935	555	1695	**50025**
Rural	Volume (cu m)	6578	20322	19504	19159	6557	4679	8785	**85584**
	No. of trees	89978	77396	35849	18993	4986	2137	2374	**231713**
Scattered	Volume (cu m)	13482	98246	216818	265560	83243	42056	138492	**857897**
	No. of trees	171174	405412	360366	259013	49550	20271	24775	**1290561**

CHAPTER 5

DIVISIONS-WISE RESULTS

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"Ancient trees are precious. There is little else on Earth that plays host to such a rich community of life within a single living organism."

- Sir David Attenborough

5.1: Srikakulam Division

5.1.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	24164	43	1.04	168	4.06
Block Plantations	65757	44	2.88	141	9.28
Linear Plantations	4164	70	0.29	156	0.65
Urban habitations	2620	4	0.01	4	0.01
Rural habitations	13387	4	0.05	7	0.10
Scattered	413099	2	0.95	6	2.60
Total	**523191**	**-**	**5.22**	**-**	**16.70**

5.1.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Anacardium occidentale*	1.64
2	*Cocos nucifera*	0.63
3	*Mangifera indica*	0.55
4	*Borassus flabelliformis*	0.41
5	*Tectona grandis*	0.39
6	*Tamarindus indica*	0.25
7	*Bombax religiosum*	0.13
8	*Phoenix sylvestris*	0.11
9	*Albizia lebbeck*	0.09
10	*Artocarpus heterophyllus*	0.09
11	*Anogeissus acuminata*	0.09
12	*Terminalia arjuna*	0.09
13	*Azadirachta indica*	0.09
14	*Acacia auriculoformis*	0.08
15	*Ficus benghalensis*	0.07

5.1.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Anacardium occidentale*	5.1
2	*Tectona grandis*	2.46
3	*Mangifera indica*	2.09
4	*Cocos nucifera*	1.3
5	*Borassus flabelliformis*	1.15
6	*Casuarina equisetifolia*	0.51
7	*Bombax religiosum*	0.36
8	*Acacia auriculoformis*	0.35
9	*Azadirachta indica*	0.3
10	*Anogeissus acuminata*	0.22
11	*Tamarindus indica*	0.22
12	*Eucalyptus tereticornis*	0.21
13	*Syzygium cumini*	0.16
14	*Terminalia arjuna*	0.15
15	*Acacia nilotica*	0.15

5.1.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	204582	300414	149377	47809	68484	39060	225608	**1035332**
	No. of trees	2515026	1095416	275868	50341	44300	18123	62423	**4061495**
Block plantations	Volume (cu m)	339747	823582	449644	616256	284471	91935	274765	**2880401**
	No. of trees	3896131	3526245	871287	657575	180833	49318	98636	**9280024**
Linear plantations	Volume (cu m)	22331	60748	43281	24010	20038	27730	94706	**292843**
	No. of trees	275260	232784	74957	26651	14575	12909	12493	**649629**
Urban habitations	Volume (cu m)	172	1121	1040	1127	1063	1747	4077	**10347**
	No. of trees	1856	4286	1542	941	575	601	601	**10402**
Rural habitations	Volume (cu m)	2755	8743	8342	7211	5156	6685	13762	**52655**
	No. of trees	36940	31644	14982	6587	3229	2583	3100	**99065**
Scattered	Volume (cu m)	75167	283035	231463	86692	19198	43830	213933	**953318**
	No. of trees	876114	1086106	471621	92947	13770	20655	39589	**2600802**

5.2: Vizianagaram Division

5.2.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	19618	23	0.45	107	2.10
Block Plantations	72686	51	3.72	125	9.08
Linear Plantations	5268	75	0.40	113	0.59
Urban habitations	3136	3	0.01	4	0.01
Rural habitations	14095	3	0.04	7	0.10
Scattered	389434	2	0.87	5	1.86
Total	**504236**	**-**	**5.49**	**-**	**13.75**

5.2.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Elaeis guineensis*	1.34
2	*Borassus flabelliformis*	0.59
3	*Anacardium occidentale*	0.48
4	*Mangifera indica*	0.42
5	*Tectona grandis*	0.39
6	*Albizia odoratissima*	0.2
7	*Bombax religiosum*	0.17
8	*Anogeissus acuminata*	0.17
9	*Semecarpus anacardium*	0.14
10	*Cocos nucifera*	0.14
11	*Azadirachta indica*	0.13
12	*Samanea saman*	0.12
13	*Tamarindus indica*	0.11
14	*Madhuca indica*	0.08
15	*Pongamia pinnata*	0.00

5.2.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Anacardium occidentale*	2.81
2	*Mangifera indica*	2.61
3	*Tectona grandis*	1.61
4	*Borassus flabelliformis*	0.9
5	*Elaeis guineensis*	0.82
6	*Bombax religiosum*	0.52
7	*Azadirachta indica*	0.41
8	*Cocos nucifera*	0.38
9	*Anogeissus acuminata*	0.3
10	*Diospyros sylvatica*	0.23
11	*Buchanania lanzan*	0.2
12	*Ximenia americana*	0.17
13	*Madhuca indica*	0.16
14	*Semecarpus anacardium*	0.16
15	*Tamarindus indica*	0.15

5.2.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	106917	68287	100494	30107	31549	53254	60247	**450855**
	No. of trees	1587061	241296	178520	25503	19618	23541	23541	**2099079**
Block plantations	Volume (cu m)	464146	569465	319652	251226	350069	673870	1089237	**3717666**
	No. of trees	4715480	2434969	717771	290743	254400	318000	345257	**9076618**
Linear plantations	Volume (cu m)	7162	39062	101215	104518	20758	20205	103857	**396777**
	No. of trees	83228	161188	194900	110619	12642	10008	21597	**594182**
Urban habitations	Volume (cu m)	262	1622	1957	1346	1835	424	1229	**8675**
	No. of trees	2662	5819	3271	989	799	114	228	**13881**
Rural habitations	Volume (cu m)	3155	9831	14526	2977	1592	2415	9448	**43943**
	No. of trees	36172	34405	26402	2806	832	832	1559	**103008**
Scattered	Volume (cu m)	52906	120674	288730	216533	55359	43580	94443	**872225**
	No. of trees	561435	457585	551699	220680	34076	17849	17849	**1861172**

5.3: Visakhapatnam Division

5.3.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	21991	14	0.32	60	1.31
Block Plantations	52813	17	0.89	40	2.14
Linear Plantations	4225	25	0.10	61	0.26
Urban habitations	22384	1	0.02	3	0.06
Rural habitations	10690	2	0.02	5	0.05
Scattered	268268	0	0.11	1	0.39
Total	**380371**	**-**	**1.47**	**-**	**4.21**

5.3.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Anacardium occidentale*	0.36
2	*Cocos nucifera*	0.31
3	*Mangifera indica*	0.17
4	*Borassus flabelliformis*	0.12
5	*Tamarindus indica*	0.08
6	*Bombax religiosum*	0.04
7	*Dillenia pentagyna*	0.04
8	*Eucalyptus tereticornis*	0.03
9	*Annona squamosa*	0.02
10	*Acacia auriculoformis*	0.02
11	*Manilkara hexandra*	0.02
12	*Xylia xylocarpa*	0.02
13	*Syzygium cumini*	0.02
14	*Avicennia officinalis*	0.02
15	*Casuarina equisetifolia*	0.02

5.3.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Anacardium occidentale*	0.85
2	*Cocos nucifera*	0.59
3	*Mangifera indica*	0.59
4	*Borassus flabelliformis*	0.31
5	*Xylia xylocarpa*	0.21
6	*Bombax religiosum*	0.2
7	*Avicennia officinalis*	0.09
8	*Tectona grandis*	0.09
9	*Syzygium cumini*	0.08
10	*Cassia fistula*	0.08
11	*Acacia auriculoformis*	0.07
12	*Wrightia tinctoria*	0.06
13	*Anogeissus latifolia*	0.05
14	*Albizia odoratissima*	0.05
15	*Pterocarpus marsupium*	0.05

5.3.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	72632	45637	21525	15726	13875	22488	124036	**315919**
	No. of trees	1044586	170622	43603	17062	5687	9479	18958	**1309998**
Block plantations	Volume (cu m)	38760	254532	178516	45338	24539	65426	285327	**892437**
	No. of trees	495626	983128	455001	56875	16250	32500	97500	**2136881**
Linear plantations	Volume (cu m)	3912	32034	24021	4281	0	0	39512	**103760**
	No. of trees	63755	124437	60682	3841	0	0	4609	**257324**
Urban habitations	Volume (cu m)	1282	5103	7605	3008	1436	1562	2771	**22766**
	No. of trees	17430	19593	14885	2672	763	636	382	**56361**
Rural habitations	Volume (cu m)	1693	4295	6125	1653	1430	2306	4037	**21539**
	No. of trees	20098	17261	11349	1419	709	709	1182	**52728**
Scattered	Volume (cu m)	11675	35311	33937	2447	0	0	27182	**110552**
	No. of trees	188096	126425	61671	3084	0	0	15418	**394693**

5.4: Narsipatnam Division

5.4.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	16112	40	0.65	108	1.73
Block Plantations	22713	128	2.90	123	2.79
Linear Plantations	1315	60	0.08	125	0.16
Urban habitations	384	1	0.00	2	0.00
Rural habitations	3207	2	0.01	4	0.01
Scattered	96393	3	0.29	4	0.40
Total	**140124**	-	**3.93**	-	5.10

5.4.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Semecarpus anacardium*	1.05
2	*Elaeis guineensis*	1.05
3	*Anacardium occidentale*	0.42
4	*Tectona grandis*	0.19
5	*Tamarindus indica*	0.18
6	*Borassus flabelliformis*	0.17
7	*Mangifera indica*	0.11
8	*Bombax religiosum*	0.09
9	*Pterocarpus marsupium*	0.09
10	*Artocarpus heterophyllus*	0.06
11	*Syzygium cumini*	0.06
12	*Ficus religiosa*	0.04
13	*Spondias pinnata*	0.03
14	*Artocarpus hirsutus*	0.03
15	*Xylia xylocarpa*	0.02

5.4.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Anacardium occidentale*	0.80
2	*Elaeis guineensis*	0.65
3	*Mangifera indica*	0.40
4	*Tectona grandis*	0.37
5	*Borassus flabelliformis*	0.30
6	*Semecarpus anacardium*	0.29
7	*Bombax religiosum*	0.24
8	*Syzygium cumini*	0.16
9	*Xylia xylocarpa*	0.14
10	*Tamarindus indica*	0.14
11	*Terminalia tomentosa*	0.09
12	*Wrightia tomentosa*	0.09
13	*Anogeissus latifolia*	0.08
14	*Adina cordifolia*	0.07
15	*Cocos nucifera*	0.07

5.4.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	91087	92857	88817	46696	49061	42878	239414	**650810**
	No. of trees	1112362	354461	145651	41246	27068	18045	34802	**1733635**
Block plantations	Volume (cu m)	28215	200265	639535	442475	598081	415788	578077	**2902436**
	No. of trees	287697	651104	893376	302839	302839	45426	302839	**2786121**
Linear plantations	Volume (cu m)	2457	9030	25955	13130	9650	15201	2841	**78264**
	No. of trees	32255	42072	61355	17530	4908	5259	701	**164081**
Urban habitations	Volume (cu m)	22	92	98	07		0	0	**249**
	No. of trees	290	268	156	02		0	0	**737**
Rural habitations	Volume (cu m)	331	1002	852	432	753	1402	1007	**5780**
	No. of trees	5178	3617	1702	426	426	567	284	**12200**
Scattered	Volume (cu m)	7133	15694	61615	45167	36581	57441	67829	**291460**
	No. of trees	91211	65299	123342	54934	21766	27985	15547	**400084**

5.5: Paderu Division

5.5.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	3177	45	0.14	179	0.57
Block Plantations	0	0	0.00	0	0.00
Linear Plantations	466	115	0.05	104	0.05
Urban habitations	317	1	0.00	6	0.00
Rural habitations	2214	8	0.02	14	0.03
Scattered	122556	3	0.31	3	0.40
Total	**128730**	**-**	**0.53**	**-**	**1.05**

5.5.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Pongamia pinnata*	0.09
2	*Grevillea robusta*	0.07
3	*Mangifera indica*	0.04
4	*Artocarpus heterophyllus*	0.04
5	*Eucalyptus tereticornis*	0.04
6	*Syzygium cumini*	0.03
7	*Ficus mollis*	0.03
8	*Semecarpus anacardium*	0.02
9	*Terminalia chebula*	0.02
10	*Terminalia tomentosa*	0.02
11	*Eucalyptus camaldulensis*	0.02
12	*Ceiba pentandra*	0.02
13	*Tamarindus indica*	0.01
14	*Pterocarpus marsupium*	0.01
15	*Dendrocalamus strictus*	0.01

5.5.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Grevillea robusta*	0.15
2	*Pongamia pinnata*	0.12
3	*Eucalyptus tereticornis*	0.08
4	*Helecteres isora*	0.08
5	*Terminalia tomentosa*	0.07
6	*Mangifera indica*	0.06
7	*Pterocarpus marsupium*	0.06
8	*Syzygium cumini*	0.04
9	*Artocarpus heterophyllus*	0.04
10	*Terminalia bellerica*	0.03
11	*Mallotus phillippensis*	0.03
12	*Grewia tiliiefolia*	0.03
13	*Ceiba pentandra*	0.03
14	*Ficus religiosa*	0.03
15	*Garuga pinnata*	0.02

5.5.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	27719	29331	7638	24131	17383	11174	25473	**142850**
	No. of trees	401494	112649	11554	23108	11554	5777	2888	**569024**
Block plantations	Volume (cu m)	0	0	0	0	0	0	0	**0**
	No. of trees	0	0	0	0	0	0	0	**0**
Linear plantations	Volume (cu m)	921	2655	4408	13875	5671	13349	12817	**53696**
	No. of trees	10566	8080	6837	11809	2486	4972	3729	**48481**
Urban habitations	Volume (cu m)	109	180	23	0	0	0	0	**312**
	No. of trees	1211	687	40	0	0	0	0	**1938**
Rural habitations	Volume (cu m)	1275	2425	1149	2210	3111	2535	6002	**18707**
	No. of trees	13758	8093	2266	1942	2104	971	1295	**30430**
Scattered	Volume (cu m)	11332	30307	51763	36552	74220	60524	50276	**314974**
	No. of trees	122556	91917	81704	32682	32682	28596	12256	**402393**

5.6: Kakinada Division

5.6.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	53990	54	2.92	256	13.83
Block Plantations	113429	60	6.85	158	17.96
Linear Plantations	10228	117	1.19	222	2.27
Urban habitations	12184	2	0.03	6	0.07
Rural habitations	32446	4	0.12	9	0.30
Scattered	596850	3	1.83	4	2.59
Total	**819127**	**-**	**12.94**	**-**	**37.02**

5.6.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Cocos nucifera*	3.48
2	*Borassus flabelliformis*	2.42
3	*Anacardium occidentale*	1.10
4	*Mangifera indica*	0.96
5	*Elaeis guineensis*	0.76
6	*Tamarindus indica*	0.38
7	*Xylia xylocarpa*	0.37
8	*Anogeissus latifolia*	0.29
9	*Madhuca indica*	0.28
10	*Tectona grandis*	0.22
11	*Lannea coromandelica*	0.19
12	*Terminalia tomentosa*	0.14
13	*Azadirachta indica*	0.13
14	*Dalbergia paniculata*	0.11
15	*Cleistanthus collinus*	0.10

5.6.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Cocos nucifera*	7.33
2	*Mangifera indica*	4.77
3	*Anacardium occidentale*	4.29
4	*Borassus flabelliformis*	4.05
5	*Xylia xylocarpa*	2.29
6	*Anogeissus latifolia*	1.12
7	*Tectona grandis*	0.98
8	*Cleistanthus collinus*	0.89
9	*Lannea coromandelica*	0.63
10	*Azadirachta indica*	0.57
11	*Terminalia tomentosa*	0.51
12	*Chloroxylon swietenia*	0.50
13	*Dalbergia paniculata*	0.49
14	*Palaquium ellipticum*	0.48
15	*Elaeis guineensis*	0.45

5.6.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	693481	767328	578470	315714	187728	113705	267910	**2924335**
	No. of trees	9221564	3100684	996825	300905	113923	45817	52008	**13831726**
Block plantations	Volume (cu m)	352363	1753156	2330917	465974	350124	246877	1345708	**6845118**
	No. of trees	4282256	7086114	4766559	560772	331365	165683	764689	**17957438**
Linear plantations	Volume (cu m)	32262	172421	512897	257030	60392	40401	118820	**1194224**
	No. of trees	372103	611730	925388	274694	34093	17534	30197	**2265739**
Urban habitations	Volume (cu m)	1525	9099	10396	1979	505	1260	3420	**28184**
	No. of trees	18022	33321	20158	1688	310	517	586	**74602**
Rural habitations	Volume (cu m)	7459	31826	36229	14969	5326	14076	12078	**121963**
	No. of trees	87020	117017	67562	14323	3243	5675	3783	**298624**
Scattered	Volume (cu m)	23723	196690	564621	429910	84945	40479	490854	**1831222**
	No. of trees	264513	741541	999271	413725	54259	20347	97214	**2590870**

5.7: Eluru Division

5.7.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	7947	33	0.26	142	1.13
Block Plantations	94989	65	6.19	140	13.31
Linear Plantations	7247	89	0.64	141	1.02
Urban habitations	10566	2	0.02	5	0.05
Rural habitations	25213	3	0.07	9	0.22
Scattered	550937	1	0.71	2	1.16
Total	**696899**	**-**	**7.89**	**-**	**16.89**

5.7.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Cocos nucifera*	1.86
2	*Borassus flabelliformis*	0.93
3	*Artocarpus heterophyllus*	0.62
4	*Phoenix sylvestris*	0.61
5	*Anacardium occidentale*	0.56
6	*Azadirachta indica*	0.42
7	*Elaeis guineensis*	0.28
8	*Eucalyptus camaldulensis*	0.18
9	*Mangifera indica*	0.18
10	*Eucalyptus tereticornis*	0.09
11	*Tectona grandis*	0.07
12	*Grewia tiliaefolia*	0.06
13	*Tamarindus indica*	0.06
14	*Xylia xylocarpa*	0.04
15	*Zyzyphus mauritiana*	0.03

5.7.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Cocos nucifera*	7.3
2	*Phoenix sylvestris*	1.39
3	*Anacardium occidentale*	1.38
4	*Borassus flabelliformis*	1.3
5	*Eucalyptus tereticornis*	0.56
6	*Eucalyptus camaldulensis*	0.56
7	*Mangifera indica*	0.55
8	*Azadirachta indica*	0.4
9	*Tectona grandis*	0.38
10	*Elaeis guineensis*	0.3
11	*Xylia xylocarpa*	0.25
12	*Artocarpus heterophyllus*	0.14
13	*Grewia tiliaefolia*	0.14
14	*Dalbergia paniculata*	0.11
15	*Delonix regia*	0.08

5.7.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	49838	66813	50453	38731	17023	8796	29151	**260805**
	No. of trees	684796	279861	96742	42843	11056	4837	8983	**1129118**
Block plantations	Volume (cu m)	287206	1456445	1014946	384816	758164	581827	1708547	**6191952**
	No. of trees	3858919	5568717	1923523	427449	546185	284966	700542	**13310301**
Linear plantations	Volume (cu m)	14473	72894	167242	212075	38095	46548	92600	**643926**
	No. of trees	163775	278273	284070	221024	26088	22465	27537	**1023231**
Urban habitations	Volume (cu m)	1400	5462	3559	1046	1306	1174	5120	**19067**
	No. of trees	16743	22091	6954	1052	935	555	1695	**50025**
Rural habitations	Volume (cu m)	6326	19915	16325	16872	4898	2669	5168	**72174**
	No. of trees	86444	76024	31499	17052	4026	1421	1658	**218124**
Scattered	Volume (cu m)	13145	93729	195243	185037	47804	42864	127438	**705261**
	No. of trees	167577	394838	330562	197419	29842	20660	22956	**1163854**

5.8: Krishna Division

5.8.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	7691	14	0.11	51	0.39
Block Plantations	88962	67	5.92	160	14.27
Linear Plantations	3428	38	0.13	104	0.35
Urban habitations	14856	3	0.04	4	0.06
Rural habitations	24837	3	0.08	6	0.16
Scattered	668473	1	0.94	3	2.11
Total	**808247**	**126**	**7.22**	**328**	**17.34**

5.8.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Mangifera indica*	4.42
2	*Azadirachta indica*	0.60
3	*Cocos nucifera*	0.54
4	*Tectona grandis*	0.47
5	*Elaeis guineensis*	0.23
6	*Borassus flabelliformis*	0.23
7	*Ficus benghalensis*	0.15
8	*Ficus religiosa*	0.07
9	*Tamarindus indica*	0.06
10	*Samanea saman*	0.04
11	*Delonix regia*	0.04
12	*Albizia odoratissima*	0.04
13	*Peltophorum pterocarpum*	0.03
14	*Dalbergia paniculata*	0.03
15	*Zizyphus mauritiana*	0.02

5.8.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	13.16
2	*Borassus flabelliformis*	0.88
3	*Azadirachta indica*	0.81
4	*Cocos nucifera*	0.51
5	*Tectona grandis*	0.36
6	*Elaeis guineensis*	0.22
7	*Delonix regia*	0.13
8	*Acacia nilotica*	0.09
9	*Pithecellobium dulce*	0.09
10	*Zizyphus mauritiana*	0.08
11	*Dalbergia paniculata*	0.08
12	*Tamarindus indica*	0.07
13	*Euphorbia nivulia*	0.07
14	*Terminalia arjuna*	0.07
15	*Peltophorum pterocarpum*	0.05

5.8.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	17216	6906	22086	11510	2010	31371	16724	**107823**
	No. of trees	268073	45045	48341	12085	1099	12085	5493	**392221**
Block plantations	Volume (cu m)	317379	678435	638930	344057	468418	717026	2758751	**5922996**
	No. of trees	3958820	5215411	2468702	733938	522653	500413	867382	**14267319**
Linear plantations	Volume (cu m)	5426	19863	41472	19659	9903	10405	22627	**129355**
	No. of trees	68227	98397	143310	32228	5486	3428	3771	**354847**
Urban habitations	Volume (cu m)	1617	4504	8020	5441	3021	3648	16077	**42328**
	No. of trees	17064	17786	16781	5499	1446	1037	2294	**61907**
Rural habitations	Volume (cu m)	3596	10279	22237	9695	6729	4791	23632	**80959**
	No. of trees	44257	44898	49602	10904	3421	1283	6414	**160779**
Scattered	Volume (cu m)	61824	134828	229604	137129	92654	76198	205500	**937737**
	No. of trees	615553	587699	629479	175474	44565	22282	30638	**2105690**

5.9: Guntur Division

5.9.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	3224	46	0.15	87	0.28
Block Plantations	12716	15	0.19	86	1.10
Linear Plantations	2477	76	0.19	159	0.39
Urban habitations	13578	4	0.06	8	0.11
Rural habitations	27908	4	0.10	7	0.19
Scattered	854725	1	1.27	2	2.02
Total	**914628**	**-**	**1.96**	**-**	**4.09**

5.9.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	0.82
2	*Borassus flabelliformis*	0.35
3	*Mangifera indica*	0.1
4	*Albizia lebbeck*	0.09
5	*Tamarindus indica*	0.08
6	*Prosopis spicigera*	0.08
7	*Bombax religiosum*	0.07
8	*Ficus religiosa*	0.06
9	*Terminalia arjuna*	0.03
10	*Cocos nucifera*	0.03
11	*Tectona grandis*	0.02
12	*Citrus limon*	0.02
13	*Samanea saman*	0.02
14	*Manilkara hexandra*	0.01
15	*Ficus benghalensis*	0.01

5.9.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Borassus flabelliformis*	0.92
2	*Azadirachta indica*	0.85
3	*Mangifera indica*	0.36
4	*Prosopis spicigera*	0.28
5	*Citrus limon*	0.25
6	*Bombax religiosum*	0.19
7	*Cocos nucifera*	0.15
8	*Prosopis juliflora*	0.12
9	*Manilkara hexandra*	0.09
10	*Leucaena leucocephala*	0.07
11	*Tectona grandis*	0.07
12	*Albizia lebbeck*	0.05
13	*Tamarindus indica*	0.05
14	*Mitragyna parvifolia*	0.05
15	*Phoenix sylvestris*	0.04

5.9.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	5871	18234	8662	8689	6464	13870	84888	**146678**
	No. of trees	109600	92408	27221	11461	5731	6447	27221	**280088**
Block plantations	Volume (cu m)	48776	43008	16905	38585	19395	5856	15308	**187833**
	No. of trees	679367	264779	55743	60969	26130	5226	6968	**1099181**
Linear plantations	Volume (cu m)	4913	20575	40223	30494	8745	6467	75635	**187052**
	No. of trees	63366	119169	126992	50849	6519	2347	23730	**392972**
Urban habitations	Volume (cu m)	2933	7679	11959	7934	5813	8032	15773	**60123**
	No. of trees	36235	32168	26067	6748	2588	2958	2773	**109537**
Rural habitations	Volume (cu m)	4219	14841	18113	11634	12536	22943	19390	**103676**
	No. of trees	46868	72955	41562	9506	6190	6853	3537	**187471**
Scattered	Volume (cu m)	22935	169930	183090	231385	198909	262685	201067	**1270000**
	No. of trees	246920	812938	482444	239323	102567	91171	49384	**2024747**

5.10: Nellore Division

5.10.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	11696	18	0.21	56	0.66
Block Plantations	56056	18	1.00	60	3.36
Linear Plantations	5354	25	0.13	71	0.38
Urban habitations	7576	1	0.01	2	0.02
Rural habitations	22179	1	0.03	3	0.07
Scattered	952615	1	0.55	2	1.70
Total	**1055476**	**-**	**1.92**	**-**	**6.19**

5.10.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Mangifera indica*	0.49
2	*Azadirachta indica*	0.37
3	*Borassus flabelliformis*	0.26
4	*Tectona grandis*	0.18
5	*Limonia crenulata*	0.11
6	*Ficus benghalensis*	0.09
7	*Ficus religiosa*	0.09
8	*Elaeis guineensis*	0.04
9	*Tamarindus indica*	0.03
10	*Cocos nucifera*	0.03
11	*Dalbergia latifolia*	0.03
12	*Pithecellobium dulce*	0.02
13	*Baringtonia acutangula*	0.01
14	*Polyalthia cerasoides*	0.01
15	*Phoenis loureiroi*	0.01

5.10.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	2.23
2	*Borassus flabelliformis*	1.38
3	*Azadirachta indica*	0.48
4	*Tectona grandis*	0.29
5	*Cocos nucifera*	0.19
6	*Prosopis juliflora*	0.18
7	*Eucalyptus tereticornis*	0.16
8	*Elaeis guineensis*	0.13
9	*Acacia nilotica*	0.09
10	*Citrus limon*	0.08
11	*Phoenix loureiroi*	0.08
12	*Limonia crenulata*	0.07
13	*Limonia alata*	0.07
14	*Dalbergia latifolia*	0.06
15	*Ficus benghalensis*	0.05

5.10.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	17598	31231	58104	32201	40073	13508	14874	**207588**
	No. of trees	301324	160574	122908	43613	19824	7930	3965	**660136**
Block plantations	Volume (cu m)	83428	152147	167547	83339	70394	105850	332476	**995179**
	No. of trees	1261259	1044042	602602	189189	84084	63063	112112	**3356351**
Linear plantations	Volume (cu m)	9180	22819	33096	22073	8724	8635	27543	**132071**
	No. of trees	110060	141506	76988	31446	7048	3253	8675	**378976**
Urban habitations	Volume (cu m)	862	1274	951	1597	3312	875	1183	**10054**
	No. of trees	8825	4478	1622	1557	1557	324	260	**18624**
Rural habitations	Volume (cu m)	2518	4764	5845	7430	4900	3498	3636	**32592**
	No. of trees	27941	19539	11919	5666	3126	1368	782	**70341**
Scattered	Volume (cu m)	29324	103799	164003	93198	26861	60650	68524	**546360**
	No. of trees	409986	687330	474298	84409	12058	16078	20097	**1704256**

5.11: Giddalur Division

5.11.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	28521	17	0.49	54	1.55
Block Plantations	66124	14	0.92	92	6.10
Linear Plantations	3706	26	0.10	50	0.19
Urban habitations	6702	8	0.05	23	0.15
Rural habitations	29775	1	0.03	3	0.08
Scattered	685152	4	2.84	6	4.12
Total	**819980**	**-**	**4.43**	**-**	**12.19**

5.11.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	1.65
2	*Mangifera indica*	0.46
3	*Tectona grandis*	0.38
4	*Bombax religiosum*	0.28
5	*Tamarindus indica*	0.23
6	*Borassus flabelliformis*	0.13
7	*Peltophorum pterocarpum*	0.12
8	*Ailanthus excelsa*	0.12
9	*Albizia lebbeck*	0.1
10	*Ficus racemosa*	0.08
11	*Strychnos patatorum*	0.07
12	*Anacardium occidentale*	0.06
13	*Ficus mollis*	0.05
14	*Acacia leucophloea*	0.04
15	*Limonia alata*	0.04

5.11.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	4.04
2	*Azadirachta indica*	1.93
3	*Tectona grandis*	0.83
4	*Bombax religiosum*	0.78
5	*Limonia alata*	0.53
6	*Anacardium occidentale*	0.48
7	*Prosopis juliflora*	0.41
8	*Borassus flabelliformis*	0.39
9	*Strychnos potatorum*	0.31
10	*Acacia nilotica*	0.28
11	*Cocos nucifera*	0.19
12	*Tamarindus indica*	0.17
13	*Lannea coromandelica*	0.14
14	*Phoenix sylvestris*	0.13
15	*Canthium dicoccum*	0.11

5.11.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	53289	73913	83226	78281	48122	42380	114859	**494072**
	No. of trees	761372	416942	199407	87014	32630	22962	29005	**1549331**
Block plantations	Volume (cu m)	314374	198808	79690	86475	86808	24688	126312	**917156**
	No. of trees	4222624	1415275	232012	116006	58003	11601	46402	**6101924**
Linear plantations	Volume (cu m)	4200	7246	28350	20544	10318	10922	14501	**96081**
	No. of trees	45762	30293	69609	29004	5801	3867	2578	**186913**
Urban habitations	Volume (cu m)	6143	11768	11854	7314	3658	3532	8050	**52319**
	No. of trees	68867	53092	20660	6121	1766	1059	2060	**153626**
Rural habitations	Volume (cu m)	3065	5545	9051	4554	1711	905	4782	**29614**
	No. of trees	34647	22631	19530	3876	894	358	835	**82770**
Scattered	Volume (cu m)	102889	236927	447582	373054	283393	275312	1120145	**2839302**
	No. of trees	1088808	1009139	1136609	419589	164649	95603	201828	**4116225**

5.12: Kurnool Division

5.12.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	14297	20	0.29	37	0.52
Block Plantations	4688	24	0.11	181	0.85
Linear Plantations	2821	37	0.10	69	0.19
Urban habitations	6475	5	0.03	10	0.07
Rural habitations	17471	2	0.03	4	0.07
Scattered	1124394	0	0.52	2	2.31
Total	**1170145**	**-**	**1.09**	**-**	**4.01**

5.12.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	0.35
2	*Tamarindus indica*	0.14
3	*Canthium parviflorum*	0.11
4	*Mangifera indica*	0.1
5	*Pongamia pinnata*	0.07
6	*Prosopis spicigera*	0.06
7	*Phoenix loureiroi*	0.03
8	*Acacia nilotica*	0.02
9	*Ficus benghalensis*	0.02
10	*Tectona grandis*	0.01
11	*Prosopis juliflora*	0.01
12	*Thespesia populnea*	0.01
13	*Pithecellobium dulce*	0.01
14	*Cocos nucifera*	0.01
15	*Melia azedarach*	0.01

5.12.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Azadirachta indica*	1.15
2	*Mangifera indica*	0.73
3	*Phoenix loureiroi*	0.26
4	*Pongamia pinnata*	0.2
5	*Acacia nilotica*	0.15
6	*Prosopis spicigera*	0.1
7	*Tamarindus indica*	0.1
8	*Hardwickia binata*	0.09
9	*Tectona grandis*	0.09
10	*Carissa carandas*	0.07
11	*Bauhinia racemosa*	0.07
12	*Pithecellobium dulce*	0.06
13	*Morinda citrifolia*	0.06
14	*Prosopis juliflora*	0.06
15	*Acacia leucophloea*	0.06

5.12.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	32977	17756	20945	20689	26976	10095	161160	**290598**
	No. of trees	312415	106963	40243	24358	16945	5295	16945	**523164**
Block plantations	Volume (cu m)	43463	24265	19522	8129	7517	7411	0	**110307**
	No. of trees	580484	167562	72810	13964	6982	5984	0	**847786**
Linear plantations	Volume (cu m)	5675	10292	14074	12409	23051	15280	23631	**104413**
	No. of trees	83210	45836	25386	14103	13398	6347	5641	**193922**
Urban habitations	Volume (cu m)	2597	4775	4422	3392	2221	1732	10046	**29185**
	No. of trees	30118	20466	9652	3128	1072	536	1430	**66403**
Rural habitations	Volume (cu m)	2503	4567	5221	5287	2810	4222	9046	**33657**
	No. of trees	31677	19349	9753	4681	1404	1404	1456	**69726**
Scattered	Volume (cu m)	124818	145131	100638	86353	0	11473	56146	**524559**
	No. of trees	1467959	572608	156166	83288	0	10411	20822	**2311254**

5.13: Kadapa Division

5.13.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	399	57	0.02	60	0.02
Block Plantations	10845	30	0.32	158	1.71
Linear Plantations	67	121	0.01	177	0.01
Urban habitations	2400	12	0.03	31	0.07
Rural habitations	4108	21	0.09	39	0.16
Scattered	262625	1	0.34	3	0.83
Total	**280444**	**-**	**0.81**	**-**	**2.81**

5.13.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Mangifera indica*	0.21
2	*Azadirachta indica*	0.20
3	*Borassus flabelliformis*	0.09
4	*Sterculia urens*	0.06
5	*Ficus religiosa*	0.05
6	*Holarrhena antidysenterica*	0.04
7	*Leucaena leucocephala*	0.03
8	*Tamarindus indica*	0.02
9	*Cocos nucifera*	0.02
10	*Dolichandrone crispa*	0.01
11	*Albizia lebbeck*	0.01
12	*Pongamia pinnata*	0.01
13	*Terminalia catappa*	0.01
14	*Peltophorum pterocarpum*	0.01
15	*Tectona grandis*	0.01

5.13.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	1.39
2	*Azadirachta indica*	0.43
3	*Borassus flabelliformis*	0.18
4	*Holarrhena antidysenterica*	0.17
5	*Cocos nucifera*	0.09
6	*Leucaena leucocephala*	0.07
7	*Sterculia urens*	0.06
8	*Tectona grandis*	0.06
9	*Tamarindus indica*	0.05
10	*Pongamia pinnata*	0.04
11	*Dolichandrone crispa*	0.03
12	*Ficus religiosa*	0.02
13	*Moringa oleifera*	0.02
14	*Zizyphus mauritiana*	0.02
15	*Sapindus emarginatus*	0.01

5.13.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	270	1409	3226	7367	8225	0	2322	**22818**
	No. of trees	3995	4993	3995	5992	3995	0	999	**23967**
Block plantations	Volume (cu m)	61141	60430	48494	103563	18296	0	30210	**322134**
	No. of trees	834216	442135	175185	216896	25026	0	16684	**1710143**
Linear plantations	Volume (cu m)	261	695	1778	1080	298	399	3606	**8117**
	No. of trees	2652	2921	3958	1537	192	192	423	**11874**
Urban habitations	Volume (cu m)	2845	6014	7769	7554	4245	0	0	**28427**
	No. of trees	32794	21567	12113	5466	2068	0	0	**74009**
Rural habitations	Volume (cu m)	5235	11512	8837	11161	13185	10827	25903	**86660**
	No. of trees	65869	52848	16850	9957	5872	3319	3830	**158544**
Scattered	Volume (cu m)	22942	50397	68747	73498	5541	9204	107985	**338315**
	No. of trees	315150	210100	175083	87542	8754	8754	26263	**831646**

5.14: Proddatur Division

5.14.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	1689	9	0.02	78	0.13
Block Plantations	7776	14	0.11	16	0.12
Linear Plantations	140	51	0.01	99	0.01
Urban habitations	3397	6	0.02	9	0.03
Rural habitations	8687	8	0.07	15	0.13
Scattered	573199	1	0.59	1	0.68
Total	**594888**	**-**	**0.81**	**-**	**1.11**

5.14.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	0.63
2	*Tectona grandis*	0.07
3	*Albizia lebbeck*	0.03
4	*Prosopis juliflora*	0.02
5	*Ficus racemosa*	0.01
6	*Eucalyptus tereticornis*	0.01
7	*Leucaena leucocephala*	0.01
8	*Tamarindus indica*	0.00
9	*Pongamia pinnata*	0.00
10	*Anogeissus latifolia*	0.00
11	*Acacia nilotica*	0.00
12	*Prosopis spicigera*	0.00
13	*Mangifera indica*	0.00
14	*Ficus religiosa*	0.00
15	*Acacia chundra*	0.00

5.14.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Azadirachta indica*	0.58
2	*Prosopis juliflora*	0.13
3	*Tectona grandis*	0.11
4	*Leucaena leucocephala*	0.03
5	*Ficus racemosa*	0.03
6	*Acacia chundra*	0.02
7	*Anogeissus latifolia*	0.02
8	*Mangifera indica*	0.02
9	*Albizia lebbeck*	0.02
10	*Boswellia serrata*	0.02
11	*Dalbergia sissoo*	0.01
12	*Acacia nilotica*	0.01
13	*Zizyphus mauritiana*	0.01
14	*Prosopis spicigera*	0.01
15	*Chloroxylon swietenia*	0.01

5.14.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	8054	2664	2426	749	1188	0	0	**15080**
	No. of trees	99492	18772	9386	1877	1877	0	0	**131405**
Block plantations	Volume (cu m)	368	5701	10931	63422	11014	14787	0	**106223**
	No. of trees	12961	25922	19441	51843	6480	6480	0	**123127**
Linear plantations	Volume (cu m)	384	742	1793	1461	1401	338	1018	**7138**
	No. of trees	4271	3118	3694	1559	847	136	237	**13862**
Urban habitations	Volume (cu m)	935	3048	2817	5138	2473	1360	5053	**20842**
	No. of trees	9015	11043	4808	4132	1427	601	1052	**32153**
Rural habitations	Volume (cu m)	3371	10053	18308	15046	8632	10458	1449	**67317**
	No. of trees	38391	40725	30090	11673	4150	3632	519	**129179**
Scattered	Volume (cu m)	19575	45183	42236	152147	103479	135298	91320	**589238**
	No. of trees	229280	157630	76427	114640	47767	38213	19107	**683062**

5.15: Nandyal Division

5.15.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	1239	18	0.02	13	0.02
Block Plantations	528	7	0.00	30	0.02
Linear Plantations	416	59	0.02	43	0.02
Urban habitations	1942	5	0.01	11	0.02
Rural habitations	3914	2	0.01	2	0.01
Scattered	145315	0	0.07	1	0.12
Total	**153354**	**-**	**0.13**	**-**	**0.21**

5.15.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	0.07
2	*Albizia lebbeck*	0.02
3	*Ficus benghalensis*	0.01
4	*Tamarindus indica*	0.01
5	*Ficus religiosa*	0
6	*Terminalia bellerica*	0
7	*Zizyphus mauritiana*	0
8	*Mangifera indica*	0
9	*Pongamia pinnata*	0
10	*Tectona grandis*	0
11	*Leucaena leucocephala*	0
12	*Albizia odoratissima*	0
13	*Prosopis juliflora*	0
14	*Peltophorum pterocarpum*	0
15	*Phoenix loureiroi*	0

5.15.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Azadirachta indica*	0.1
2	*Mangifera indica*	0.02
3	*Zizyphus mauritiana*	0.01
4	*Pongamia pinnata*	0.01
5	*Tectona grandis*	0.01
6	*Phoenix loureiroi*	0.01
7	*Prosopis juliflora*	0.01
8	*Phoenix sylvestris*	0.01
9	*Leucaena leucocephala*	0
10	*Tamarindus indica*	0
11	*Prosopis spicigera*	0
12	*Acacia nilotica*	0
13	*Ficus religiosa*	0
14	*Albizia lebbeck*	0
15	*Cocos nucifera*	0

5.15.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	281	1107	990	0	0	1386	18923	**22687**
	No. of trees	3540	7670	2360	0	0	590	2360	**16521**
Block plantations	Volume (cu m)	203	714	1131	1481	0	0	0	**3529**
	No. of trees	2638	5275	4616	3297	0	0	0	**15826**
Linear plantations	Volume (cu m)	458	1976	1586	1472	480	3362	15422	**24756**
	No. of trees	4441	7031	2405	1110	185	925	1665	**17763**
Urban habitations	Volume (cu m)	721	1435	1548	1233	524	1158	3900	**10519**
	No. of trees	9668	5621	3035	1012	225	337	675	**20573**
Rural habitations	Volume (cu m)	271	503	669	497	794	2474	1911	**7118**
	No. of trees	1695	1574	969	484	363	908	363	**6357**
Scattered	Volume (cu m)	3906	11476	13001	16427	12239	9261	0	**66308**
	No. of trees	39356	42384	18164	12110	6055	3027	0	**121096**

5.16: Atmakur Division

5.16.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	1732	39	0.07	52	0.09
Block Plantations	169	46	0.01	245	0.04
Linear Plantations	352	143	0.05	134	0.05
Urban habitations	625	15	0.01	9	0.01
Rural habitations	2457	8	0.02	6	0.02
Scattered	81487	2	0.12	1	0.06
Total	**86822**	**-**	**0.28**	**-**	**0.27**

5.16.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	0.07
2	*Pongamia pinnata*	0.07
3	*Phoenix loureiroi*	0.04
4	*Tectona grandis*	0.03
5	*Hardwickia binata*	0.01
6	*Mangifera indica*	0.01
7	*Borassus flabelliformis*	0.01
8	*Tamarindus indica*	0.01
9	*Prosopis spicigera*	0
10	*Lannea coromandelica*	0
11	*Zizyphus mauritiana*	0
12	*Acacia nilotica*	0
13	*Morinda citrifolia*	0
14	*Delonix regia*	0
15	*Prosopis juliflora*	0

5.16.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	0.04
2	*Pongamia pinnata*	0.03
3	*Azadirachta indica*	0.03
4	*Phoenix loureiroi*	0.02
5	*Acacia nilotica*	0.02
6	*Tectona grandis*	0.02
7	*Prosopis juliflora*	0.02
8	*Borassus flabelliformis*	0.01
9	*Prosopis spicigera*	0.01
10	*Hardwickia binata*	0.01
11	*Chloroxylon swietenia*	0.01
12	*Tamarindus indica*	0.01
13	*Albizia amara*	0
14	*Acacia chundra*	0
15	*Pithecellobium dulce*	0

5.16.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	1144	5308	3746	4205	4601	6625	42522	**68152**
	No. of trees	22133	31756	12510	4812	3849	4812	9623	**89495**
Block plantations	Volume (cu m)	1413	1396	1494	688	282	887	1535	**7695**
	No. of trees	19406	12234	6328	1688	422	844	422	**41344**
Linear plantations	Volume (cu m)	1839	1581	4121	4065	5260	7046	26569	**50481**
	No. of trees	9022	6485	6767	6203	4229	5075	9304	**47086**
Urban habitations	Volume (cu m)	85	168	635	1294	1436	1367	4551	**9536**
	No. of trees	973	608	1054	1013	608	405	851	**5512**
Rural habitations	Volume (cu m)	255	1057	1678	2149	2470	2444	8527	**18579**
	No. of trees	1990	4195	3092	1963	1425	995	2044	**15703**
Scattered	Volume (cu m)	0	1367	6086	17654	8741	29068	60214	**123130**
	No. of trees	0	3395	10186	16976	3395	10186	13581	**57720**

5.17: Markapur Division

5.17.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	11709	4	0.04	31	0.36
Block Plantations	14351	18	0.26	92	1.31
Linear Plantations	1182	91	0.11	222	0.26
Urban habitations	942	13	0.01	26	0.02
Rural habitations	10111	5	0.05	12	0.12
Scattered	456219	2	0.77	4	1.69
Total	**494514**	**-**	**1.25**	**-**	**3.78**

5.17.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	0.37
2	*Ficus benghalensis*	0.26
3	*Tamarindus indica*	0.19
4	*Borassus flabelliformis*	0.09
5	*Tectona grandis*	0.07
6	*Ficus religiosa*	0.05
7	*Mangifera indica*	0.03
8	*Ficus racemosa*	0.03
9	*Pongamia pinnata*	0.02
10	*Phoenix sylvestris*	0.02
11	*Albizia lebbeck*	0.01
12	*Cocos nucifera*	0.01
13	*Sapindus emarginatus*	0.01
14	*Prosopis spicigera*	0.01
15	*Prosopis juliflora*	0

5.17.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Azadirachta indica*	1.11
2	*Tectona grandis*	0.46
3	*Borassus flabelliformis*	0.35
4	*Mangifera indica*	0.29
5	*Prosopis juliflora*	0.19
6	*Tamarindus indica*	0.16
7	*Phoenix sylvestris*	0.15
8	*Cocos nucifera*	0.1
9	*Pongamia pinnata*	0.09
10	*Acacia leucophloea*	0.07
11	*Ficus racemosa*	0.05
12	*Ficus benghalensis*	0.04
13	*Moringa oleifera*	0.04
14	*Leucaena leucocephala*	0.03
15	*Sapindus emarginatus*	0.03

5.17.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	16424	12202	3079	342	0	0	9865	**41912**
	No. of trees	266929	85724	6969	697	0	0	1394	**361714**
Block plantations	Volume (cu m)	64655	41558	57039	14162	0	9894	77003	**264312**
	No. of trees	809529	209742	250218	29437	0	3680	11039	**1313646**
Linear plantations	Volume (cu m)	9205	14770	18092	12378	3019	13426	36568	**107458**
	No. of trees	118749	60261	51399	18314	1772	4726	6499	**261720**
Urban habitations	Volume (cu m)	881	1852	2161	1438	1960	531	2993	**11816**
	No. of trees	11168	7565	3397	1081	875	154	360	**24600**
Rural habitations	Volume (cu m)	3979	13062	13589	9364	2272	1156	2936	**46358**
	No. of trees	39413	51265	22291	8221	1286	454	429	**123359**
Scattered	Volume (cu m)	63214	121263	125458	89575	11936	37128	326003	**774576**
	No. of trees	857139	497694	179723	82949	13825	13825	48387	**1693542**

5.18: Chittoor East Division

5.18.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	6349	16	0.10	56	0.36
Block Plantations	36583	63	2.30	224	8.19
Linear Plantations	1041	90	0.09	190	0.20
Urban habitations	3660	6	0.02	12	0.04
Rural habitations	10614	27	0.28	38	0.40
Scattered	418540	6	2.63	6	2.37
Total	**476787**	-	**5.42**	-	**11.56**

5.18.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	1.78
2	*Mangifera indica*	1.36
3	*Pongamia pinnata*	0.56
4	*Delonix regia*	0.34
5	*Wrightia tinctoria*	0.22
6	*Borassus flabelliformis*	0.17
7	*Syzygium cumini*	0.15
8	*Tectona grandis*	0.12
9	*Strychnos nuxvomica*	0.08
10	*Tamarindus indica*	0.08
11	*Pithecellobium dulce*	0.06
12	*Bombax ceiba*	0.06
13	*Albizia lebbeck*	0.05
14	*Ficus benghalensis*	0.04
15	*Prosopis juliflora*	0.04

5.18.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	6.74
2	*Azadirachta indica*	1.52
3	*Tectona grandis*	0.67
4	*Wrightia tinctoria*	0.32
5	*Prosopis juliflora*	0.28
6	*Pongamia pinnata*	0.25
7	*Grewia rothii*	0.24
8	*Borassus flabelliformis*	0.2
9	*Syzygium cumini*	0.17
10	*Strychnos nuxvomica*	0.13
11	*Annona squamosa*	0.08
12	*Leucaena leucocephala*	0.07
13	*Albizia lebbeck*	0.06
14	*Acacia chundra*	0.05
15	*Tamarindus indica*	0.05

5.18.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	113126	12287	14472	13738	13089	3490	34083	**104285**
	No. of trees	232814	72901	18813	16462	9407	2352	2352	**355099**
Block plantations	Volume (cu m)	311354	273815	345569	253343	356412	247222	515567	**2303281**
	No. of trees	3784430	1942674	1362395	542435	264910	138762	151377	**8186983**
Linear plantations	Volume (cu m)	7586	10478	14014	17415	11189	15086	18120	**93889**
	No. of trees	90256	43045	31104	18884	6943	4443	3610	**198286**
Urban habitations	Volume (cu m)	1365	2981	4154	3166	3484	3210	4916	**23277**
	No. of trees	16577	12720	7194	3232	2294	1355	1147	**44519**
Rural habitations	Volume (cu m)	12387	23664	36377	29372	27433	22984	130648	**282865**
	No. of trees	125017	106558	76353	41952	17620	8810	25591	**401901**
Scattered	Volume (cu m)	70659	153671	169340	187535	273444	296030	1479304	**2629984**
	No. of trees	798016	613859	284607	1841 58	150674	100450	239963	**2371**

5.19: WLM Tirupathi Division

5.19.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	2445	16	0.04	40	0.10
Block Plantations	205	0	0	0	0
Urban habitations	3	5	18	4	15
Rural habitations	4	0	0	0	0
Scattered	1428	0	0	0	0
Total	**4085**	**-**	**0.04**	**-**	**0.01**

5.19.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Tamarindus indica*	0.02
2	*Artocarpus hirsutus*	0.01
3	*Ficus benghalensis*	0.00
4	*Mangifera indica*	0.00
5	*Cassia siamea*	0.00
6	*Millingtonia hortensis*	0.00
7	*Syzygium cumini*	0.00
8	*Cocos nucifera*	0.00
9	*Ficus racemosa*	0.00
10	*Eucalyptus camaldulensis*	0.00
11	*Samanea saman*	0.00
12	*Pongamia pinnata*	0.00
13	*Azadirachta indica*	0.00
14	*Ficus religiosa*	0.00
15	*Dolichandrone crispa*	0.00

5.19.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Tamarindus indica*	0.03
2	*Syzygium cumini*	0.01
3	*Mangifera indica*	0.01
4	*Millingtonia hortensis*	0.01
5	*Cocos nucifera*	0.01
6	*Cassia siamea*	0.01
7	*Ficus racemosa*	0.01
8	*Ficus benghalensis*	0.01
9	*Artocarpus hirsutus*	0.01
10	*Polyalthia longifolia*	0.00
11	*Dolichandrone crispa*	0.00
12	*Eucalyptus camaldulensis*	0.00
13	*Samanea saman*	0.00
14	*Pongamia pinnata*	0.00
15	*Azadirachta indica*	0.00

5.19.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	2090	13228	6382	3255	15146	0	0	**40102**
	No. of trees	24454	40756	16302	8151	8151	0	0	**97814**
Block plantations	Volume (cu m)	0	0	0	0	0	0	0	**0**
	No. of trees	0	0	0	0	0	0	0	**0**
Linear plantations	Volume (cu m)	0	0	0	0	0	0	0	**0**
	No. of trees	0	0	0	0	0	0	0	**0**
Urban habitations	Volume (cu m)	0	0	2	2	3	3	8	**18**
	No. of trees	4	2	3	2	2	1	2	**15**
Rural habitations	Volume (cu m)	0	0	0	0	0	0	0	**0**
	No. of trees	0	0	0	0	0	0	0	**0**
Scattered	Volume (cu m)	0	0	0	0	0	0	0	**0**
	No. of trees	0	0	0	0	0	0	0	**0**

5.20: Rajampet Division

5.20.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	1279	10	0.01	72	0.09
Block Plantations	22862	18	0.42	129	2.95
Linear Plantations	59	55	0.00	96	0.01
Urban habitations	911	1	0.00	3	0.00
Rural habitations	3285	1	0.00	6	0.02
Scattered	129109	1	0.14	2	0.25
Total	**157505**	**-**	**0.58**	**-**	**3.31**

5.20.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Mangifera indica*	0.33
2	*Azadirachta indica*	0.17
3	*Ficus racemosa*	0.02
4	*Tectona grandis*	0.02
5	*Tamarindus indica*	0.01
6	*Pterocarpus santalinus*	0.01
7	*Artocarpus heterophyllus*	0.01
8	*Holarrhena antidysenterica*	0.00
9	*Ficus religiosa*	0.00
10	*Cocos nucifera*	0.00
11	*Dillenia pentagyna*	0.00
12	*Samanea saman*	0.00
13	*Acacia chundra*	0.00
14	*Zizyphus xylopyrus*	0.00
15	*Dalbergia paniculata*	0.00

5.20.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	2.62
2	*Azadirachta indica*	0.41
3	*Tectona grandis*	0.12
4	*Pterocarpus santalinus*	0.03
5	*Tamarindus indica*	0.02
6	*Cocos nucifera*	0.02
7	*Acacia chundra*	0.01
8	*Acacia nilotica*	0.01
9	*Zizyphus xylopyrus*	0.01
10	*Holarrhena antidysenterica*	0.01
11	*Artocarpus heterophyllus*	0.01
12	*Dalbergia paniculata*	0.01
13	*Strychnos nuxvomica*	0.01
14	*Acacia leucophloea*	0.01
15	*Wrightia tinctoria*	0.01

5.20.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	5163	5685	1424	0	0	0	0	**12272**
	No. of trees	71428	18123	2132	0	0	0	0	**91683**
Block plantations	Volume (cu m)	126658	127356	85475	40676	29545	8140	0	**417850**
	No. of trees	1593786	940595	307000	78383	19596	6532	0	**2945892**
Linear plantations	Volume (cu m)	229	539	714	308	150	370	925	**3235**
	No. of trees	2167	1878	975	289	72	108	144	**5635**
Urban habitations	Volume (cu m)	103	124	336	420	0	0	0	**984**
	No. of trees	1102	661	441	331	0	0	0	**2535**
Rural habitations	Volume (cu m)	758	1415	1192	1392	0	0	0	**4757**
	No. of trees	9022	6822	1981	1100	0	0	0	**18925**
Scattered	Volume (cu m)	4208	38514	32274	30690	11167	0	22080	**138934**
	No. of trees	38733	124806	47340	25822	4304	0	4304	**245308**

5.21: Chittoor West Division

5.21.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	6746	10	0.07	56	0.38
Block Plantations	37842	20	0.77	111	4.19
Linear Plantations	1204	80	0.10	131	0.16
Urban habitations	1540	3	0.00	7	0.01
Rural habitations	11895	6	0.08	13	0.15
Scattered	526197	2	0.84	5	2.73
Total	**585424**	**-**	**1.86**	**-**	**7.62**

5.21.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Mangifera indica*	0.55
2	*Tamarindus indica*	0.35
3	*Pongamia pinnata*	0.24
4	*Azadirachta indica*	0.19
5	*Cocos nucifera*	0.11
6	*Pithecellobium dulce*	0.06
7	*Wrightia tinctoria*	0.05
8	*Ficus benghalensis*	0.04
9	*Tectona grandis*	0.03
10	*Cassia siamea*	0.03
11	*Eucalyptus camaldulensis*	0.03
12	*Sterculia urens*	0.02
13	*Syzygium jambos*	0.02
14	*Ficus religiosa*	0.01
15	*Ficus mollis*	0.01

5.21.3: Number of trees for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	3.6
2	*Azadirachta indica*	0.86
3	*Pongamia pinnata*	0.72
4	*Cocos nucifera*	0.41
5	*Tamarindus indica*	0.24
6	*Wrightia tinctoria*	0.24
7	*Tectona grandis*	0.18
8	*Cassia siamea*	0.15
9	*Acacia nilotica*	0.09
10	*Eucalyptus camaldulensis*	0.08
11	*Cassia fistula*	0.07
12	*Gmelina arborea*	0.07
13	*Pithecellobium dulce*	0.06
14	*Prosopis juliflora*	0.06
15	*Sterculia urens*	0.06

5.21.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	18658	13417	16002	3624	3911	1691	10801	**68104**
	No. of trees	279945	57338	31480	3373	2249	1124	2249	**377758**
Block plantations	Volume (cu m)	223954	121730	76799	96037	125284	16488	113210	**773503**
	No. of trees	2779395	743782	247927	208781	182683	13049	13049	**4188666**
Linear plantations	Volume (cu m)	6611	10997	15778	7377	5541	8366	41423	**96093**
	No. of trees	72265	38541	26337	6102	3212	3533	7387	**157378**
Urban habitations	Volume (cu m)	343	1157	1654	408	532	346	433	**4872**
	No. of trees	3437	3920	2631	376	268	161	54	**10847**
Rural habitations	Volume (cu m)	5845	9693	11745	1262	4963	4114	39078	**76701**
	No. of trees	75090	37545	26098	1374	2747	1374	5952	**150179**
Scattered	Volume (cu m)	134818	135521	172785	129238	10820	23501	238186	**844868**
	No. of trees	1594068	484927	433339	165081	5159	10318	41270	**2734161**

5.22: Ananthapur Division

5.22.1: Growing Stock - Estimated volume and number of trees

Stratum	Area (ha)	Volume /ha	Volume (million cu m)	Trees /ha	Trees (million)
Natural Forests	5833	21	0.12	94	0.55
Block Plantations	33523	16	0.54	63	2.10
Linear Plantations	1290	50	0.06	115	0.15
Urban habitations	9096	2	0.02	4	0.03
Rural habitations	28120	3	0.09	6	0.18
Scattered	1640577	1	1.34	2	2.87
Total	**1718439**	**-**	**2.17**	**-**	**5.88**

5.22.2: Species-wise volume for top 15 species

S. No.	Species name	Volume (million cu m)
1	*Azadirachta indica*	0.77
2	*Tamarindus indica*	0.43
3	*Mangifera indica*	0.39
4	*Pongamia pinnata*	0.1
5	*Ficus religiosa*	0.08
6	*Acacia nilotica*	0.08
7	*Cocos nucifera*	0.05
8	*Sterculia urens*	0.05
9	*Prosopis spicigera*	0.02
10	*Phoenix loureirii*	0.02
11	*Citrus limon*	0.01
12	*Syzygium cumini*	0.01
13	*Zizyphus mauritiana*	0.01
14	*Albizia amara*	0.01
15	*Butea monosperma*	0.01

5.22.3: Species-wise volume for top 15 species

S. No.	Species name	No. of Trees (million)
1	*Mangifera indica*	1.42
2	*Azadirachta indica*	1.2
3	*Pongamia pinnata*	0.71
4	*Acacia nilotica*	0.38
5	*Tamarindus indica*	0.36
6	*Cocos nucifera*	0.28
7	*Albizia amara*	0.22
8	*Prosopis juliflora*	0.1
9	*Citrus limon*	0.09
10	*Acacia chundra*	0.09
11	*Zizyphus mauritiana*	0.08
12	*Phoenix sylvestris*	0.05
13	*Acacia leucophloea*	0.04
14	*Butea monosperma*	0.04
15	*Holoptelea integrifolia*	0.04

5.22.4: Diameter class-wise estimated volume and number of trees for various strata

Stratum	Dia-Class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	> 70	Total
Natural forests	Volume (cu m)	17655	25141	15257	19187	5452	14867	22253	**119811**
	No. of trees	325775	131925	43078	29616	4487	8975	7180	**551036**
Block plantations	Volume (cu m)	82497	76622	58986	14349	59186	113751	131493	**536884**
	No. of trees	1093690	527989	247233	20952	71237	87998	54475	**2103573**
Linear plantations	Volume (cu m)	5700	10056	9567	11522	10862	7625	9607	**64939**
	No. of trees	70940	39855	15994	10705	5675	2838	2064	**148070**
Urban habitations	Volume (cu m)	1297	2403	3169	2403	1699	2298	7377	**20645**
	No. of trees	15602	9403	4909	1872	749	707	999	**34241**
Rural habitations	Volume (cu m)	4858	13262	16321	11732	7307	8061	32360	**93900**
	No. of trees	63363	56753	34665	10802	4031	2902	4192	**176708**
Scattered	Volume (cu m)	113117	124627	215869	126471	155349	208454	399733	**1343622**
	No. of trees	1585891	553695	362294	123043	88865	75193	82029	**2871010**

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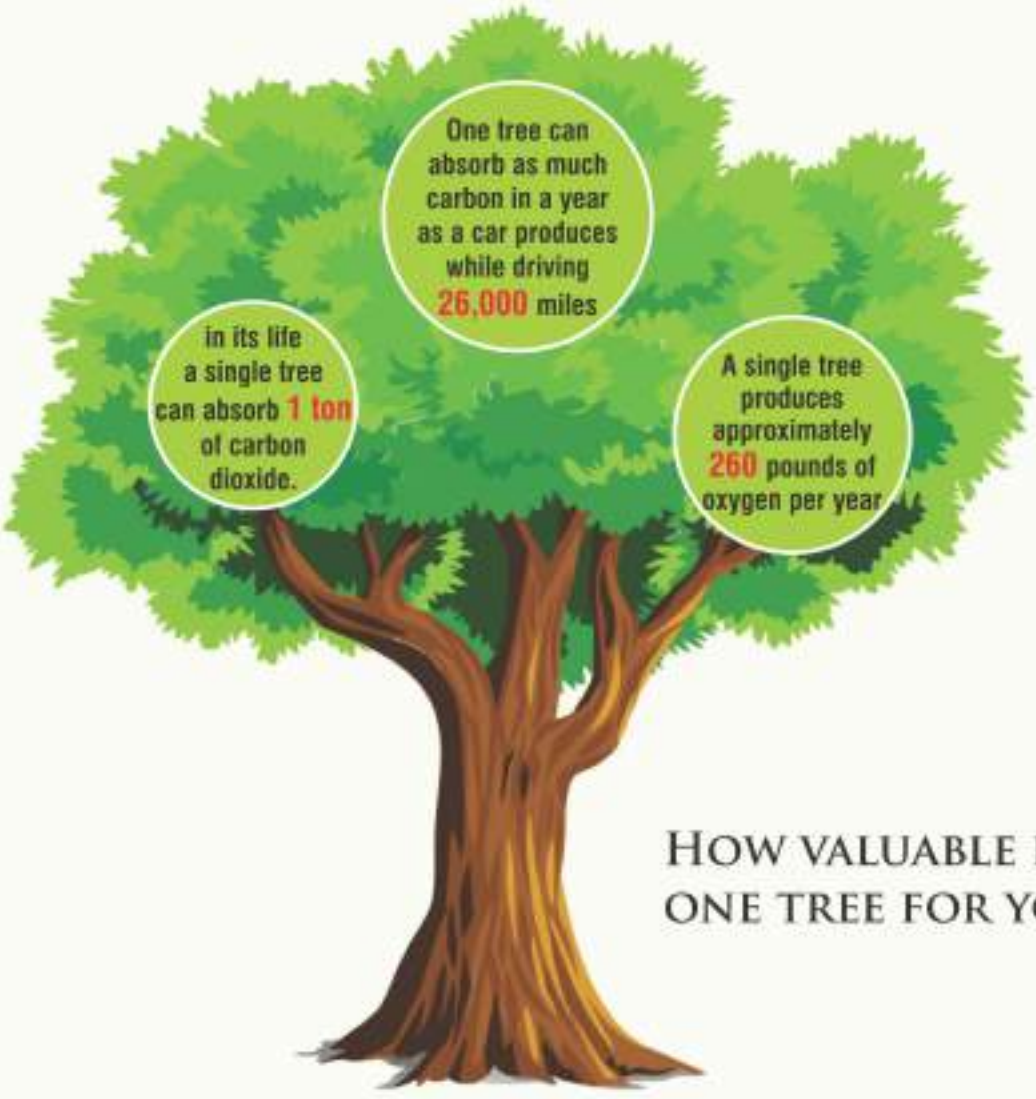
CHAPTER 6

CARBON ESTIMATION



HOW VALUABLE IS ONE TREE FOR YOU?

"The best friend on the earth of man is the tree. When we use the tree respectfully and economically, we have one of the greatest resources on the earth."

- Frank Lloyd Wright

Forests are the primary carbon sink that offsets the carbon emissions. Trees outside Forests also form an important carbon capturing ecosystem. Street/avenue trees, urban trees, parks and gardens and trees on waste lands play a very important role as such. Even grassland parks currently store about 0.5 tons of Carbon per hectare in above ground biomass, still capable of storing up to 2 tons per hectare (Julie Francis).

It is estimated that about 30 billion tons of CO_2 is entering the atmosphere per annum which is a matter of global concern. Considering the fact that CO_2 emissions will increase in future due to rapid population growth and industrialization, the only answer to offset it is by afforestation and reforestation.

6.1: Global scenario

Trees absorb CO_2 from atmosphere and store carbon. India is a large developing country known for its diverse ecosystems and mega biodiversity. It ranks 10th amongst the most forested nations of the world (FAO) with 23.4 percent (76.87 million ha) of its geographical area under forest and tree cover (FSI). Worldwide numerous ecological studies have been conducted to assess carbon stocks based on carbon density of vegetation and soils. The results of these studies are not uniform and have wide variations and uncertainties due to large heterogeneity and adoption of different methodologies. IPCC in 2000 has estimated an average carbon stock of 86 tons per hectare in the vegetation of the world's forests during mid-1990. The corresponding carbon in biomass and dead wood in forests for the year 1990 was assessed as 82 tons and for the year 2005 as 81 tons assessed by FRA, 2005.

Each cubic meter of growing stock equals on an average 1 ton above ground biomass, 1.3 tons of total biomass and 0.7 tons of carbon in biomass (FAO, 2006).The Country reports of FAO indicate that global forest vegetation stores 283 Gt of Carbon in its biomass and assessed another 38 Gt in dead wood, totally making 321 Gt of Carbon, whereas IPCC (2000) assumed 359 Gt of Carbon in the same pool. It is estimated that world's forests store 638 Gt of Carbon in the ecosystem as a whole to a soil depth of 30cm. The forests contain more carbon than the entire atmosphere. Roughly half of the total carbon is found in forests biomass and dead wood combined and half in soils and litter combined (FAO, 2006).

Earlier attempts at estimating forest carbon did not take into consideration the soil carbon. However as considerable carbon exists below soil, modern studies in later half of twentieth century have taken soil carbon and surface carbon into account. Further an expansion factor called Biomass Expansion factor is considered to expand growing stock or commercial round wood harvest volume or growing stock volume increment data to account for non-merchantable biomass components such as branches, foliage and non-commercial trees. (IPCC – 2003)

6.2: Andhra Pradesh scenario

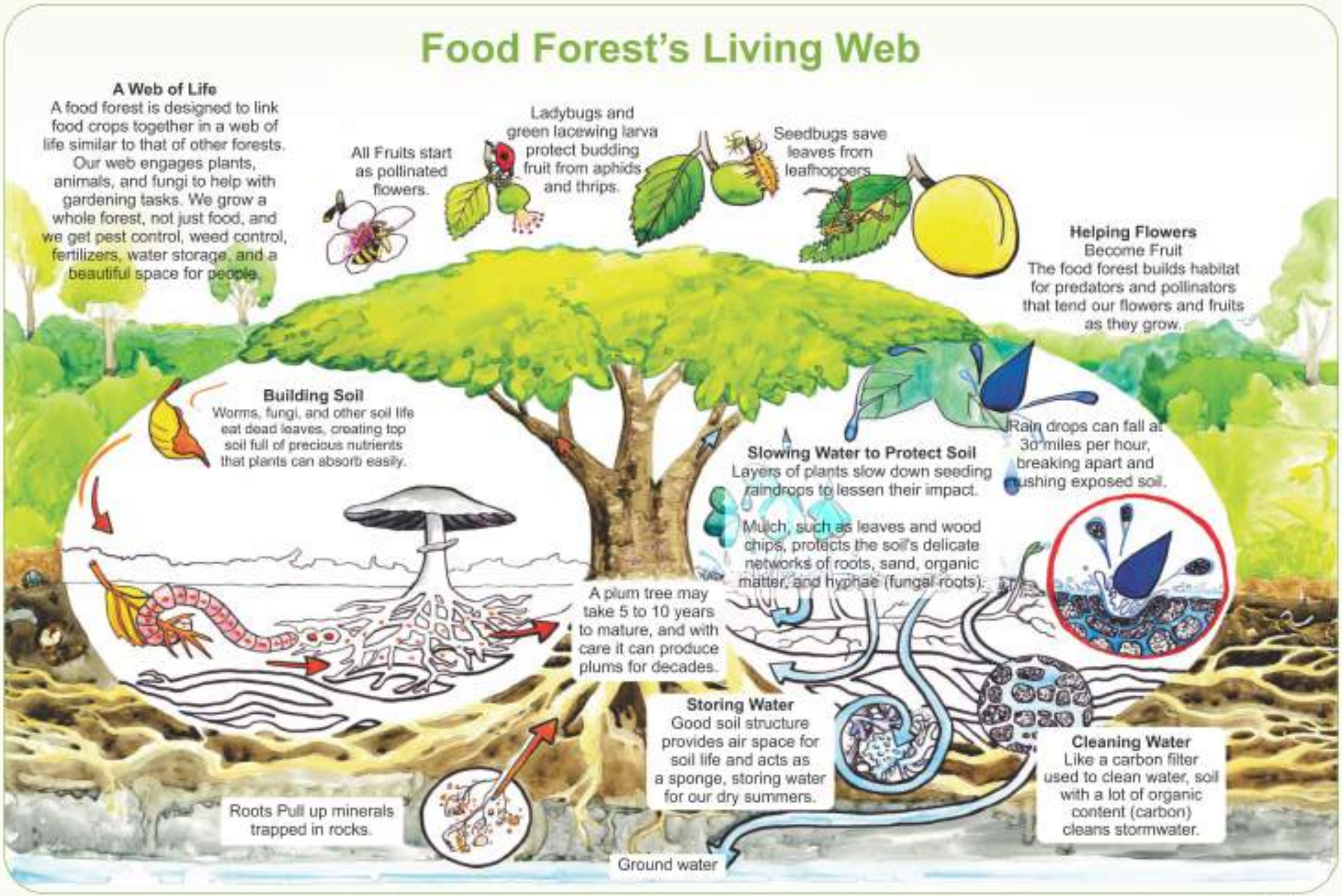
Andhra Pradesh was bifurcated in 2014 into Andhra Pradesh and Telangana. Andhra Pradesh has now 36,914.7 sq.km of notified forests with 112.33 million cubic meters of growing stock. The TOF contribute 67.98 million tons of growing stock. Based on above, the contribution of carbon in the state of Andhra Pradesh has been estimated for the period 2007-08 as follows:

Tree outside Forests biomass in (million tons) in Andhra Pradesh.

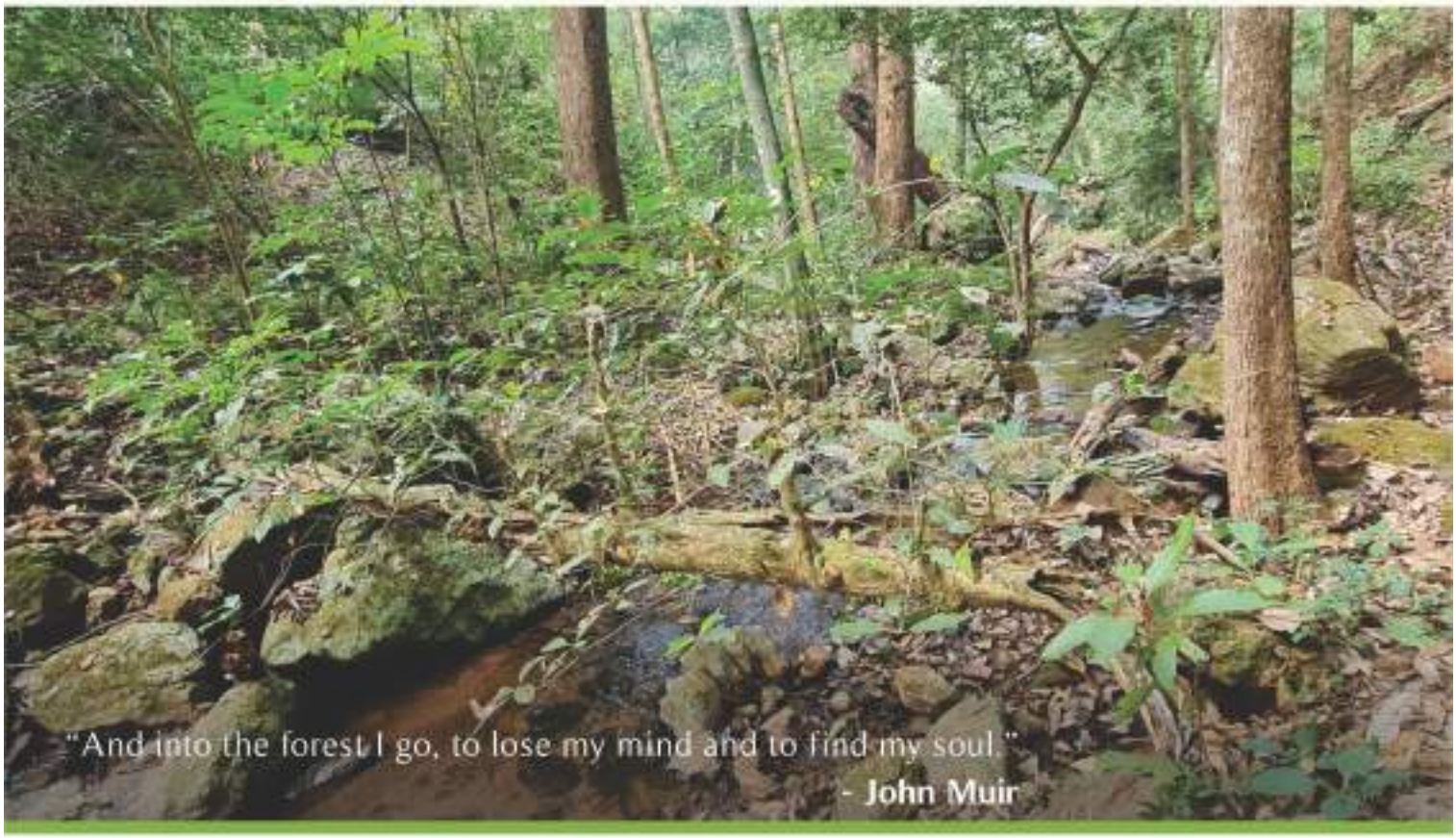
Item with symbolic description	Factor	Notified Forests	TOF 2007
Growing stock in Million M3 (GS)		112.33	67.98
Mean Biomass Expansion Factor (EF)	1.575	--	--
Ratio below and above Ground Biomass (RBA)	0.266	--	--
Above ground biomass volume – AGB= (GSxEF)		176.92	107.07
Below ground Biomass volume – BGB = AGBxRBA		47.06	28.46
Total Biomass volume – TB = AGB+BGB		223.98	135.53
Mean Density (MD)	0.7116	----	-----
Biomass in Million tons Biomass = TBxMD		159.38	96.44
Ratio (other Forest floor biomass except tree to tree Biomass)	0.015	----	----
Total Forest Biomass in million Tons TFBM = 1.015xBiomass		161.77	97.89
Dry Weight in MT (80%)DW		129.42	78.31
Carbon in MT (40% of DW)		**51.76**	**31.32**

Thus the estimated Carbon in notified forests of Andhra Pradesh (13 Districts) is 51.76 million tons whereas in TOF areas it is 31.32 million tons.

Food Forest's Living Web



Source - **Internet**



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