

Third Party Monitoring and Evaluation of Compensatory Afforestation Fund Management and Planning Authority (CAMPA) Activities of Andhra Pradesh Forest Department (APFD) During 2016-17



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PREFACE

The report on the Monitoring and Evaluation of Forestry Works under the Compensatory Afforestation Management and Planning Authority (CAMPA) Scheme presents a comprehensive assessment of forestry interventions implemented by Andhra Pradesh Forest Department (APFD) during 2016–17. The evaluation was undertaken by a team of scientists and officers from the Indian Council of Forestry Research and Education – Institute of Wood Science and Technology (ICFRE–IWST), Bengaluru, and provides a detailed appraisal of the planning, implementation, and outcomes of CAMPA-funded activities across various forest divisions of the state. By systematically examining plantation performance, soil and moisture conservation (SMC) works, protection measures, construction activities, and community participation, the study highlights best practices, identifies challenges, and derives actionable lessons to strengthen future forestry interventions under the CAMPA framework.

Andhra Pradesh Forest Department, as custodian of the state's rich forest resources, holds a crucial mandate to conserve, protect, and sustainably manage forests and wildlife that underpin the region's ecological stability. To offset the impacts of deforestation and forest degradation resulting from developmental activities, the CAMPA scheme serves as a key mechanism through which funds collected from user agencies diverting forest land are utilized for compensatory afforestation, forest restoration, wildlife habitat improvement, and other ecological works. In the context of increasing developmental pressures, CAMPA-funded interventions play an essential role in maintaining ecological balance while aligning with the state's developmental objectives.

This evaluation, covering diverse forest ecosystems ranging from the moist evergreen forests of the Eastern Ghats to dry deciduous and scrub forests in the plains, provides critical insights into the effectiveness, efficiency, and sustainability of CAMPA activities. The findings not only assess the performance of implemented works but also offer strategic recommendations to enhance the long-term ecological resilience and sustainability of Andhra Pradesh's forest landscapes.



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LIST OF ABBREVIATIONS

ABO	Assistant Beat Officer
ACF	Assistant Conservator of Forests
ANR	Assisted Natural Regeneration
APC	Anti-Poaching Camp
APFD	Andhra Pradesh Forest Department
APSF	Andhra Pradesh State forest
AR	Artificial Regeneration
CA	Compensatory Afforestation
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
CCT	Continuous Contour Trenches
CF	Conservator of Forests
CG	Collar Girth
CPT	Cattle Proof Trench
DCF	Deputy Chief Conservator of Forests
DRFO	Deputy Range Forest Officer
DSO	Division Sanction Order
EEC	Environmental Education Centre
EPT	Elephant Proof Trench
FBO	Forest Beat Officer
FNB	Field Note Book
FRO	Forest Range Officer
FSO	Forest Section Officer
GBH	Girth at Breast Height
GPS	Geographic Positioning System
JFMC	Joint Forest Management Committee
KML	Keyhole Mark-up Language
NA	Not Available/Not Applicable
NPV	Net Present Value
NTSH	Non-Teak Secondary Hardwood
PCCF	Principal Chief Conservation of Forests
PPT	Peripheral Trenches
PT	Percolation tank
PW	Protection Watcher
QGIS	Quantum Geographic Information System
RF	Reserved Forest
RSO	Range Sanction Order
RSP	Road Side Plantation
SDSO	Sub-division Sanction Order
SF	State Forest
SMC	Soil Moisture Conservation
ST	Staggered Trenches
SO. No	Sanctioned Order Number
Sy. No	Survey Number
VSS	Vana Samrakshana Samithi
WL/WLM	Wild life/ Wild life management

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I. EXECUTIVE SUMMARY

Andhra Pradesh Forest Department has implemented a wide range of activities under CAMPA, including plantations, maintenance, protection, construction, and soil and moisture conservation (SMC) work across all forest circles and divisions. To evaluate the quality, effectiveness, and field-level outcomes of these interventions, third-party monitoring, and evaluation for the year 2016–17 was entrusted to the Institute of Wood Science and Technology (ICFRE–IWST), Bengaluru. During 2016-17 across all 24 divisions a total of 3146 activities were implemented of which 726 were sampled/selected for monitoring and evaluation purpose. Among these, plantation activities accounted for 319 implemented (79 sampled), maintenance activities were the most with 905 implemented (203 sampled), 119 protection activities (40 sampled), SMC 63 activities implemented (19 sampled), 55 construction activities (16 sampled) and other activities were the highest in number, with 1,685 implemented (369 sampled). The evaluation of CAMPA activities during 2016–17 highlights ecologically critical interventions such as plantations, maintenance, protection, soil and moisture conservation (SMC), construction, and other activities. Afforestation activities were assessed after a time gap of nine years to evaluate their survival, growth performance, and site sustainability outcomes based on all the interventions. While financial management was generally sound and compliant with audit requirements, the ecological outcomes were mixed, largely due to issues related to site-species compatibility.

The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) scheme has played a pivotal role in ecological restoration by rejuvenating degraded landscapes and significantly increasing green cover across targeted regions. It has also led to improved soil quality, better moisture retention in afforested areas, and greater community involvement in plantation and maintenance activities, thereby supporting the safeguarding of biodiversity and wildlife habitats. The scheme primarily focuses on compensatory afforestation, forest protection notably through strengthened fire prevention and control mechanisms and wildlife habitat improvement. These interventions have made a meaningful contribution to balancing developmental needs with environmental conservation. Overall, the evaluation highlights CAMPA's effectiveness in fostering a more resilient, sustainable, and biodiverse forest ecosystem within the state. The important findings of each intervention are as follows;

Plantation success varied significantly across divisions, largely due to the suitability of species to local site conditions. Divisions that matched species well with ecological conditions such as Chittoor East, Kadapa, and Guntur achieved excellent survival rates, particularly with species like *Pterocarpus santalinus*, *Hardwickia binata*, *Terminalia arjuna*, and *Sterculia urens* which thrived in fertile or ecologically appropriate soils. In contrast, plantations in Chintur, Krishna, and some bamboo sites in Markapur and Atmakur experienced low performance, primarily due to rocky terrain, poor soils, drought-prone conditions, or inadequate protection from grazing and encroachment. Plantations were taken up in nearly all divisions, and performance trends clearly demonstrated the critical role of species–site matching and local environmental conditions. High survival and healthy growth were observed in redsanders plantations on sandy soils in Chittoor East, in mixed plantations in

Chittoor West, and in *Pterocarpus santalinus* sites in Kadapa and Proddatur. Similarly, *Sterculia urens* showed vigorous growth in Nellore, while teak and bamboo established successfully in Eluru, Kakinada, and Paderu. However, several plantations expressed low performance such as redsanders in Tirupati, teak in Chintur, and bamboo in parts of Markapur and Chintur due to unfavorable site conditions, water stress, and poor protection. Field verification through ground-truthing and GIS revealed frequent discrepancies between reported and actual plantation areas. In many cases, the perambulated extents either exceeded or fell short of the sanctioned figures, and documentation such as plantation boards and journals was often missing, outdated, or poorly maintained. These findings underline the need for accurate GIS-based monitoring systems and stronger record-keeping practices to ensure transparency and accountability in plantation programs.

Maintenance was the most extensive ecological intervention undertaken across most of the divisions and proved critical for supporting the establishment and growth of young plantations. Key operations included casualty replacement, weeding, coppice management, pruning, soil working, fertilizer application, and fire line maintenance. These interventions generally contributed to improved plant survival, bole formation, and overall plantation health. However, several recurring shortcomings were observed. Damaged or missing plantation boards, incomplete or irregular plantation journals, uneven fertilizer application, and inadequate weeding particularly along fire lines were commonly noted. In many cases, rapid regrowth of invasive species such as *Lantana* and grasses compromised fire line effectiveness, posing a threat to plantation safety. Evaluators consistently recommended the extension of maintenance cycles to ensure full plantation stabilization, particularly in semi-arid divisions such as Ananthapuramu and Chittoor West, where ecological stress requires longer-term care. While maintenance operations were carried out in most divisions, the quality and consistency of implementation varied. Divisions like Ananthapuramu, Rajampet, and Kadapa demonstrated effective and sustained maintenance efforts, contributing to better plantation outcomes. In contrast, divisions such as Chittoor East, Guntur, and Markapur faced issues related to poor signage, missing plantation records, and insufficient monitoring. In Nandyal and Atmakur, maintenance was minimal or poorly executed, resulting in low survival rates and limited growth in plantations. These findings highlight the need for standardized maintenance protocols, improved record-keeping systems, and more frequent monitoring to ensure the ecological and financial success of plantation investments.

Protection works during 2016–17 was primarily focused on the creation of fire lines and the provision of fencing, both of which were essential to safeguarding plantations from threats such as grazing, encroachment, and forest fires. In divisions like Ananthapuramu, Paderu, and parts of Chittoor West, fire lines were well-maintained, dimensionally accurate, and visibly effective in mitigating fire risk. Chain-link fencing, where installed, was generally intact and provided effective deterrence against livestock grazing and illegal entry. However, the overall coverage of fencing was insufficient, relative to the extent of plantation areas, leaving many sites vulnerable. In several divisions such as Chittoor East, Tirupati, Nellore, and Narsipatnam fire lines had become overgrown with *Lantana*, grasses, or other weeds, severely reducing their functionality. In some instances, fire lines were created during initial establishment but deteriorated over time due to inconsistent maintenance. Certain divisions like Guntur, Kadapa,

and Narsipatnam implemented protection measures more systematically, combining fencing and fire lines to effectively reduce grazing pressure. In contrast, areas such as Tirupati, Chintur, and parts of Nellore reported significant plantation losses attributable to poor or absent protection infrastructure. Although watchers and patrol systems were deployed in some divisions to deter illicit felling and monitor threats, their deployment was uneven and often lacked adequate coverage, particularly in remote or vulnerable areas. The findings highlight the need for a more comprehensive and sustained protection strategy, including regular fire line upkeep, adequate fencing coverage, and enhanced monitoring personnel, especially in high-risk zones.

Soil and Moisture Conservation (SMC) works were notably underrepresented across many divisions, despite their recognized ecological importance in improving water retention, reducing soil erosion, and enhancing plantation success. Divisions such as Rajampet, Eluru, Kakinada, Ananthapuramu, and Giddalur implemented various SMC structures including check dams, saucer pits, percolation tanks, contour trenches, and rock-fill dams which were largely constructed to specification and were initially effective in controlling runoff and retaining soil moisture. However, monitoring revealed that nearly all sampled structures suffered from issues such as siltation, weed infestation, seepage, or minor structural damage. These issues significantly reduced the long-term functionality of the structures, and many required desilting or repairs to restore effectiveness. Regular maintenance, which is crucial for sustaining the benefits of SMC works, was often lacking. Several divisions including Chittoor East, Chittoor West, Kadapa, Markapur, Guntur, and Vizianagaram reported minimal or no SMC interventions, representing a critical gap, particularly in drought-prone or erosion-sensitive landscapes. The absence of such measures in these regions undermines the ecological stability of plantations and reduces their resilience to climatic stress. These findings underscore the need for expanded SMC coverage, prioritization of ecologically vulnerable areas, and the establishment of regular maintenance protocols such as timely desilting and structural checks, to ensure sustained impact of these interventions.

Construction activities during 2016–17 were relatively limited in scope and scale, with interventions concentrated in select divisions. Key works included the installation of RCC boundary pillars, cairns, bird enclosures, water tanks, watchtowers, and eco-tourism infrastructure. Where undertaken such as RCC pillar installations in Markapur, boundary demarcation works in Visakhapatnam and Kakinada, eco-infrastructure in Tirupati and Guntur, and enclosures in Ananthapuramu and Guntur structures were generally found to be intact, constructed to specification, and functionally serving their intended purposes. Minor maintenance issues were observed across multiple sites, including plaster deterioration, soil accumulation, and weed growth around structure bases, indicating the need for periodic upkeep to preserve functionality and visibility. Divisions such as Nellore, Kurnool, Guntur, Kakinada, and Visakhapatnam successfully implemented these infrastructure works, contributing to improved ecological monitoring, protection, and in some cases, public engagement through eco-tourism. However, many other divisions had no recorded construction interventions, which may reflect either limited budgetary allocation or differing priorities. While not widespread, these construction activities added long-term value to

forestry infrastructure and, with regular maintenance, can enhance the effectiveness of protection, boundary enforcement, and community engagement efforts.

“Other works” constituted the largest share of the activity portfolio across most divisions during 2016–17. These activities encompassed a wide range of administrative, ancillary, and facilitative tasks, including boundary marking, internal roads, nursery operations, and documentation support. While financial compliance was generally strong, with sanction orders, estimates, and expenditures aligning well, and both internal and external audits confirming appropriate fund utilization, significant gaps in technical documentation were repeatedly observed. Issues included missing or incomplete work registers, absence of original estimates, typographical errors, and irregular or outdated journal entries. These deficiencies weakened technical traceability and accountability, despite otherwise robust financial management. Some divisions, such as Kadapa and Visakhapatnam, demonstrated exemplary record-keeping and documentation, contributing to both ecological and administrative accountability. In contrast, several ranges lacked consistent updates to records, especially in the “other works” category, which hindered verification and performance assessment during monitoring. These findings highlight the need for standardized documentation practices, routine technical audits alongside financial audits, and improved record maintenance systems to ensure comprehensive oversight of all forestry interventions.

Community engagement through **Van Samrakshana Samithis (VSS)** and Joint Forest Management Committees (JFMCs) was found to be inconsistent across divisions during the monitoring period. In divisions such as Paderu, Vizianagaram, and select areas in Narsipatnam, active community involvement significantly enhanced plantation protection, maintenance efforts, and provided livelihood support to forest-dependent households. These sites demonstrated improved ecological outcomes and stronger local stewardship. In contrast, several divisions including Chittoor East, Tirupati, Krishna, and Chintur lacked meaningful community participation, which contributed to increased exposure to grazing, encroachment, and overall weaker sustainability of plantations. The absence of community engagement in these areas posed a clear risk to the long-term success of afforestation and regeneration efforts. The evaluation highlights that active and empowered VSS participation is central to achieving the objectives of CAMPA-funded plantations, not only from an ecological standpoint but also in delivering socio-economic benefits. Where VSSs were effectively engaged, plantations served dual purposes of ecological restoration and community development. However, divisions with weak or absent VSS involvement revealed critical gaps in participatory forest management that require urgent policy and operational attention. To address these challenges, the report recommends the strengthening of awareness campaigns, greater inclusion of NTFP (Non-Timber Forest Product) species to support livelihoods, and institutional capacity building of VSS to enable active, long-term community stewardship. Ultimately, community-driven forest management remains the cornerstone of sustainable afforestation and ecological security in Andhra Pradesh.

II. INTRODUCTION

Andhra Pradesh is a geographically diverse state, extending from the eastern coastal plains to the Eastern Ghats, encompassing a wide range of topographic and climatic conditions that foster rich edaphic and biotic diversity. Politically, by Reorganization act, 2014, the erstwhile state of Andhra Pradesh has been bifurcated into two states, Andhra Pradesh, and Telangana by June 2014. Andhra Pradesh is the 8th largest state in India having the geographical area of 1,62,760 km², comprising 4.56 % land area of the country situated in the South-Eastern part of the country. The state lies between 12° 37' N to 19° 55' N latitude and 76° 45' E to 84° 46' E longitude and is bordered by Odisha & Chhattisgarh in the north, Telangana & Karnataka in the west and Tamil Nadu in the south. The Bay of Bengal is on the East to the state. After Gujarat, the state of Andhra Pradesh has the second-longest coastline among the states of India. Physio graphically, the state can be divided into Coastal Andhra and the comparatively drier Rayalaseema regions. The major peninsular rivers the Godavari and Krishna along with the Pennar support the state of Andhra Pradesh.

Physiographically, Andhra Pradesh experiences a hot and humid climate, with annual rainfall ranging from 1,100 mm to 1,250 mm and temperatures varying from 15°C to 45°C. Major soil types include red, black, deltaic alluvial, and coastal alluvial. The state is drained by significant rivers such as the Godavari, Krishna, and Penna.

The state's diverse topography, from the Eastern Ghats and Nallamala hills to the Bay of Bengal shore, supports varied ecosystems rich in flora and fauna. The forests are broadly categorised into four biotic provinces: Deccan Plateau, Central Plateau, Eastern Highland, and East Coastal Plains.

Forest Types and Distribution

As per the Champion and Seth Classification of Forest Types (1968), Andhra Pradesh's forests belong to five type groups, further categorised into 20 forest types. The vegetation is predominantly dry deciduous, with species like Teak, *Terminalia*, *Dalbergia*, *Pterocarpus*, and *Anogeissus*. Red Sanders (*Pterocarpus santalinus*) is an endemic species highly valued for its distinct red colour and grain pattern. Andhra Pradesh is also a pioneer in adopting Joint Forest Management (JFM), with approximately one-third of its forest area under JFM.

Forests in Andhra Pradesh are primarily divided into two broad legal categories:

- **Reserved Forests (RF):** These are legally protected for conservation purposes, with public use generally restricted unless specific legal provisions allow. The majority of forested areas in the state fall under this category.
- **Protected Forests (PF):** Under government control, these are less restrictive than Reserved Forests, allowing regulated logging and local community use for activities such as grazing and firewood collection.

Based on vegetation, influenced by climatic, edaphic, and biotic factors, the forests are classified into six major types:

1. **Tropical Semi-Evergreen Forests:** Found at altitudes around 800 m in districts like Visakhapatnam, Vizianagaram, Srikakulam, and East Godavari, these are a mix of

deciduous (e.g., *Michelia champaca*, *Dillenia pentagyna*) and evergreen species (e.g., *Psychortia fulva*, *Leea crispa*, *Diospyros malabarica*, *Syzygium cumini*).

2. Tropical Moist Deciduous Forests: Characterised by over 1000mm annual rainfall and a dry period in March-April, these are further sub-divided:

- Northern Tropical Moist Deciduous Sal Forests: Dominated by *Shorea robusta*, found exclusively in Srikakulam district, marking the species' southern limit.
- Southern Tropical Moist Deciduous Forests: Found in Vizianagaram, Visakhapatnam, East Godavari, West Godavari, Kurnool, and Chittoor districts, dominated by species like *Terminalia alata*, *Anogeissus latifolia*, *Dalbergia latifolia*, and *Sterculia urens*.
- Southern Tropical Moist Deciduous Riparian Forests: Common along riverbanks, especially the Godavari, featuring semi-evergreen species such as *Terminalia arjuna*, *Ficus racemosa*, and *Syzygium cumini*.

3. Tropical Dry Deciduous Forests: Widespread across the state, these forests exhibit leaf-fall during summer and are classified into teak, non-teak, and mixed deciduous types:

- Dry Deciduous Teak Forests: Dominated by *Tectona grandis*, found mostly in the Eastern Ghats of Visakhapatnam, East and West Godavari, and Kurnool.
- Dry Deciduous Non-Teak Forests: Found in Rayalaseema and Nellore districts, dominated by *Pterocarpus santalinus*, *Anogeissus latifolia*, and *Hardwickia binata*.

4. Dry Savannah Forests: Primarily found in the Eastern Ghats, these are characterized by grasses with scattered, stunted trees, resulting from biotic interference. Common species include *Phyllanthus emblica* and *Phoenix humilis*.

5. Dry Evergreen Forests: Occur in coastal and plain areas with less than 600mm rainfall and altitudes below 250m, in districts such as Vizianagaram, Visakhapatnam, Srikakulam, Nellore, and Chittoor. Common species include *Manilkara hexandra*, *Sapindus emarginatus*, and *Garcinia spicata*.

6. Thorny Scrub Forests: These are degraded deciduous forests found in arid and semi-arid parts of the Eastern Ghats, particularly in forest peripheries, due to biotic interference, overexploitation, and frequent fires. Common species include *Balanitis aegyptica*, *Capparis zeylanica*, and *Cadaba fruticosa*.

The Eastern Ghats region is dominated by dry deciduous forests, comprising 52 % of the total forest cover. This region has experienced significant forest fragmentation, with the largest patch shrinking from 41,669 km² in 1930 to 27,800 km² by 2013.

CAMPA (Compensatory Afforestation Management and Planning Authority)

CAMPA is an authority established by the Indian government to manage funds for compensatory afforestation (reforestation) when forests are diverted for non-forest purposes like infrastructure development, mining, or urbanisation. Andhra Pradesh initiated its State CAMPA on 11th September 2009, under orders from the Ministry of Environment, Forests and Climate Change, Government of India. The primary goal is to enhance forest and tree

cover, conserve and manage wildlife, by utilising funds from Compensatory Afforestation (CA) and improving Net Present Value (NPV) of forests.

Key Objectives of State CAMPA

- Conservation, protection, regeneration, and management of existing natural forests.
- Management of wildlife and its habitat within and outside protected areas, including consolidation of protected areas.
- Implementation of compensatory afforestation.
- Generation of wood and non-timber forest products.
- Provision of ecosystem services such as climate regulation, flood moderation, carbon sequestration, soil health, and air and water regime improvement.
- Enhancement of biodiversity services.
- Training and capacity building to strengthen research activities.

The Andhra Pradesh Forest Department, as the custodian of the state's rich and diverse forest resources, bears the crucial responsibility of conserving, protecting, and managing forests and wildlife that form the ecological backbone of the state. To mitigate the adverse impacts of deforestation and forest degradation arising from developmental activities, the Compensatory Afforestation Fund Management and Planning Authority (CAMPA) scheme has emerged as a vital mechanism. It ensures that the diversion of forest land for non-forestry purposes is offset through compensatory afforestation, forest restoration, and biodiversity enhancement measures aimed at maintaining ecological balance.

Under the CAMPA framework, funds collected from user agencies responsible for forest land diversion are utilized for afforestation, wildlife habitat improvement, soil and moisture conservation, and other allied activities that promote long-term sustainability. In the face of increasing developmental pressures and rising demands on forest resources, compensatory afforestation plays a key role in reconciling ecological conservation with economic growth.

The Forest (Conservation) Act, 1980 significantly curtailed the diversion of forest lands from about 1.43 lakh hectares annually at country level before its enactment to around 15,000 hectares per annum thereafter primarily for essential public projects such as drinking water supply, irrigation, power generation, transportation, defence, and mining. For each approved diversion, compensatory measures such as afforestation, catchment area treatment, wildlife habitat improvement, and rehabilitation are mandated to mitigate ecological loss.

To oversee these initiatives, the Compensatory Afforestation Management and Planning Authority (CAMPA) was constituted at the national level, supported by a dedicated monitoring cell within the Ministry of Environment, Forest and Climate Change (MoEF&CC) to track proposal progress and ensure compliance with forest clearance conditions. Andhra Pradesh State CAMPA was formally established on 11th September 2009, with the objective of enhancing forest and tree cover, improving wildlife conservation, and managing funds received towards Compensatory Afforestation (CA) and Net Present Value (NPV).

The Andhra Pradesh Forest Department has since implemented a wide range of activities under CAMPA, including plantations, maintenance, protection, construction, and soil and moisture conservation (SMC) work across all forest circles and divisions. To assess the quality and effectiveness of these interventions, a third-party monitoring and evaluation was entrusted to the Institute of Wood Science and Technology (ICFRE–IWST), Bengaluru for the year 2016–17.

This report presents the comprehensive findings from seven circles and twenty-four divisions across Andhra Pradesh, assessing key parameters such as plantation area, species survival, average growth, and the condition of plantations, protection measures, constructions, and SMC works. It also offers division-wise observations, lessons learned, and strategic recommendations to enhance the effectiveness and sustainability of future CAMPA interventions in the state.

III. METHODOLOGY

The monitoring and evaluation (M&E) of CAMPA initiatives constitute systematic and iterative processes wherein all implemented interventions together with ancillary activities are critically appraised using objective, quantifiable indicators as prescribed under the CAMPA framework. For the assessment of afforestation and associated activities executed under CAMPA during 2016–2017, comprehensive records of all sanctioned undertakings were meticulously obtained from the respective Division and Range Forest offices. The entire spectrum of interventions was stratified into six principal categories: plantation, maintenance, soil and moisture conservation (SMC), construction, protection, and miscellaneous (“other”) actions.

To ensure statistical rigor and representativeness, 20 % of these activities were randomly sampled at division level from the consolidated list using random number generator and incorporated into an evaluation checklist. This checklist was disseminated to the respective divisions and ranges a minimum of one week before commencing on-site assessments, thereby fostering operational preparedness, transparency, and stakeholder engagement.

1. Methodology for Evaluation of Plantation

This project section delineates the methodology and outcomes of an evaluation undertaken on a designated plantation site

- a. Verification of Plantation Area: The spatial extent of each plantation activity was meticulously validated through systematic field verification. This entailed physical traversal of plantation boundaries, guided by geospatial reference data derived from Keyhole Markup Language (KML) files. The data acquired during these perambulations were subsequently processed using Quantum Geographic Information System (QGIS) software, allowing for precise computation of the actual plantation area.
- b. Sample Plot Layout: Within the plantation, five sample plots of 0.1 hectares each were strategically established in a quadratic configuration each measuring 33 x 33 meters. For line plantations situated along linear features such as roads or canals, sample data were collected via transects of 100 meters in length to ensure equivalency in assessing seedling condition and survival.
- c. Enumeration of Plantation Growth Parameters: Comprehensive enumeration was conducted to assess fundamental growth metrics of the planted species. Parameters measured included plant height, girth at breast height (GBH) or collar girth (as appropriate for species and developmental stage), survival rates, and the incidence of pests or diseases. This provided valuable insights into individual and overall plantation performance.
- d. Evaluation of Seedling Survival: Seedling survival rates at each site were estimated employing a randomized sampling approach. Survival counts within each designated sample plot were recorded, from which survival percentages were derived. This metric served as a critical indicator of the plantation’s establishment success and ecological health.

- e. **Data Analysis and Reporting:** All field data were rigorously analysed and synthesized into the final plantation evaluation report. The report comprises key statistics such as mean plant height and girth, calculated survival percentages, detailed documentation of perambulation, and geospatial tracking of the plantation via GPS coordinates.

2. Methodology for Evaluation of Maintenance

Maintenance activities are pivotal for fostering the healthy development and long-term success of plantation species. Under the CAMPA scheme, all maintenance operations—including qualitative and quantitative interventions—were monitored and evaluated during the initial and subsequent years of plantation establishment. This project aimed to critically evaluate maintenance activities integral to cultural operations within plantation management, such as weeding, trenching, pruning, climber and coppice cutting, pit reopening, and fire line maintenance.

Methodology

- a. **Documentary Review:** Comprehensive examination of plantation journals, measurement books, work registers and estimate sheets was undertaken to ascertain the scope, nature, and frequency of sanctioned maintenance activities, as well as their associated expenditures.
- b. **Field Verification:** Targeted field inspections were conducted to directly observe the execution and efficacy of maintenance tasks. The assessment encompassed the quality and extent of weeding, trenching, pruning, climber and coppice removal, pit reopening, and the upkeep of fire lines.

Table 1 Details of year wise maintenance operations

Sl. no.	Operations	Years when carried out
1	Replacement of up to 25 % casualties with new seedlings, including pit preparation, transportation, and planting	1 Year, 2 & 3 Year
2	Dual cutting of coppice growth to ground level across the entire site, retaining beneficial species	1 Year
3	Two rounds of circular weeding within a 0.5-meter radius around each plant	1 Year, 2&3 Year, 4&5 Year
4	Thorough soil working to a radius of 0.5 meters and depth of 15 cm using manual methods	1 Year, 2&3 Year, 4&5 Year
5	Pruning lower branches to up to one-third of plant height	1 Year, 2&3 Year
6	Creation and ongoing maintenance of fire lines	1 Year, 2&3 Year, 4&5 Year
7	Additional contingencies: maintenance of plantation boards, journals, and stationery	1 Year, 2&3 Year, 4&5 Year

- c. **Data Collection:** Field data capturing the timing, frequency, and qualitative aspects of all maintenance activities were systematically collected during on-site evaluations.
- d. **Analysis:** The gathered data were analysed to detect discrepancies between planned and actual implementation. The effectiveness of each maintenance intervention was further assessed based on its contribution to seedling vigor, overall growth, and plantation

productivity. Upon completion of the analysis, a comprehensive Maintenance Evaluation Report was compiled, offering actionable insights to optimize future maintenance protocols and enhance plantation outcomes.

3. Methodology for Evaluation of Protection

The division implemented a range of protective measures, including fencing, terracing, trenching, and fire line creation, aimed at securing forest assets and mitigating risks such as grazing, encroachment, and fire hazards. During evaluation, the executed works were systematically cross-verified with sanctioned estimates and entries recorded in the Measurement Book (MB). The verification process involved: Dimensional checks to confirm adherence to prescribed specifications. Physical inspection to assess the structural integrity and functionality of each protective measure. Condition assessment to determine the current status, durability, and effectiveness of the assets in fulfilling their intended purpose. Any deviations or deficiencies noted during field verification were documented for corrective action, ensuring that the protective interventions conform to the standards envisaged at the planning and sanctioning stage.

4. Methodology for Evaluation of Soil and Moisture Conservation (SMC)

The Soil and Moisture Conservation (SMC) initiative was strategically implemented to enhance soil moisture retention and curtail nutrient depletion through the deployment of context-appropriate conservation interventions. This report outlines the rigorous evaluation protocol, encompassing detailed appraisal of primary SMC structures and their current operational status.

Dimensional Verification: All SMC interventions including check dams, saucer pits, gully plugs, and various trench types (continuous contour trenches, staggered trenches, percolation tanks, mini percolation tanks, and semi-lunar trenches) were subject to precise dimensional measurement. These data points were systematically cross-referenced with sanctioned estimates and measurement book entries to validate construction integrity and adherence to design specifications.

- **Check Dams:** Length, height, and width were meticulously recorded and reconciled with official documentation, facilitating the assessment of hydraulic regulation efficacy and moisture retention potential.
- **Saucer Pits:** Diameter and depth measurements allowed for evaluation of moisture augmentation capacity and plant establishment support.
- **Gully Plugs:** Dimensional reviews provided insight into erosion control effectiveness and surface runoff retention.
- **Trenches:** Key trench parameters length, depth, and inter-trench spacing were analyzed to determine their performance in runoff moderation, moisture conservation, and landscape hydrological improvement.

- **Structural and Functional Appraisal:** Each Soil and Moisture Conservation asset was comprehensively inspected to identify manifestation of wear, structural compromise, or ongoing degradation. Inspection criteria included the identification of cracks or breaches in check dams, evidence of erosional processes adjacent to saucer pits, and observations of silt deposition within gully plugs. The vitality and proliferation of vegetative cover on and around SMC structures were also evaluated as proxy indicators of ecological performance and asset sustainability.

Data Analysis and Reporting: All collected measurements and field observations underwent systematic analysis to discern trends, outliers, and overall efficacy of the SMC interventions. The findings were synthesized into the final project report, providing actionable insights and evidence-based recommendations for ongoing and future soil and moisture conservation initiatives.

5. Methodology for Evaluation of Construction

Construction interventions including watchtowers, RCC cairns, seed storage facilities, protective walls, and boundary pillars constitute critical elements of forest protection infrastructure. The dimensions of these structures were precisely measured and systematically cross-referenced with sanctioned specifications and measurement records to ensure compliance and structural adequacy. Concurrently, each asset's physical condition was rigorously evaluated to ascertain its functional effectiveness in forest safeguarding. Subsequently, all collected data was subject to comprehensive analysis, culminating in the preparation of a detailed construction assessment report

6. Methodology for Evaluation of Others

Certain Forest Department initiatives such as the procurement of laptops, disbursement of bill vouchers and wage payments, maintenance of vehicles, provision of stationery and communication facilities, compensation for crop damage, execution of elephant drives, and advance operations are not amenable to physical verification. Accordingly, these activities were evaluated through a financial audit, wherein sanctioned allocations were systematically reconciled with actual expenditures as documented in divisional and range sanction orders, estimation sheets, and work registers. As part of this process, relevant supporting documentation including photocopies of estimate bills and work registers was collated, and a comprehensive "Others Report" was compiled to encapsulate the financial conformity and procedural integrity of these non-physical interventions.

7. Details of Data Collected

1. **Primary Data:** Firsthand information was systematically collected using customized data collection instruments tailored to capture the full spectrum of CAMPA activity components and sub-components. This approach ensured accurate documentation of on-ground realities essential for robust evaluation.
2. **Secondary Data:** Supplementary data pertaining to CAMPA implementation was sourced from Division and Range offices through standardized formats and comprehensive checklists. These records detailing sanctioned works, financial expenditures, and

progress milestones served as the foundational documentation for triangulating and cross-validating field-based findings.

3. Focus Group Discussions (FGDs): Focused group discussions were organized with Vana Samrakshana Samithi (VSS) members to elicit community perspectives, lived experiences, and levels of engagement in CAMPA interventions. These interactive sessions provided nuanced qualitative insights into public participation, operational challenges, and the perceived social and ecological impacts of project activities.

4. Consultations with Forest Officials: Structured interviews and consultations were conducted with key forest personnel spanning all levels of CAMPA implementation including Division Forest Officers (DFOs), Forest Range Officers (RFOs), Forest Section Officers (FSOs), Forest Beat Officers (FBOs), and Forest Guards. These dialogues yielded critical insights into the processes of planning, resource allocation, execution, and performance monitoring from an administrative and operational standpoint.

5. Field Observations: Comprehensive field inspections were undertaken to rigorously assess:

- Plantation Performance: Survival rates, tree height and girth, and overall vegetative health.
- Soil and Moisture Conservation (SMC) Works: Structural stability, water retention efficiency, and operational functionality.
- Protection Measures: Effectiveness of fire lines, fencing, and boundary demarcations.
- Weed and Invasive Species Management: Prevalence and distribution within plantation areas.
- Detailed field notes and photographic records were systematically compiled, providing verifiable evidence for the comprehensive evaluation of CAMPA intervention outcomes and impact.

8. Division wise activities undertaken

The tables present a structured account of CAMPA activities implemented across forest divisions during 2016–17. Activities were categorized under six major heads: plantation, maintenance, protection, soil and moisture conservation, construction, and other works. A consistent pattern emerges across the period, with maintenance and “other” activities constituting the bulk of interventions, while plantation, protection, and soil/moisture conservation works, though present, were comparatively limited.

The evaluation sampling (ranging from about 20–25 % of total activities) ensured representativeness across activity types. Over time, the dataset shows stable maintenance workloads, incremental plantation efforts, and gradual inclusion of soil and moisture conservation and construction works. The “other” category consistently absorbed a significant share, pointing to diversified interventions outside the main plantation-protection framework. Overall, the tables highlight both the breadth of CAMPA implementation and the relative emphasis on routine and auxiliary activities. This provides a useful baseline for assessing division-wise performance and planning balanced interventions in future cycles.

9. Limitations of the Study

While the monitoring and evaluation exercise provides valuable insights into the implementation and outcomes of CAMPA activities, certain limitations need to be acknowledged:

1. Sampling constraint: Only about 20–25 % of activities were sampled for field verification, which may not fully capture the diversity and variability of outcomes across the entire division.
2. Temporal limitation: Evaluations were conducted in a single season, meaning survival and growth data reflect conditions at the time of inspection but not year-round variations.
3. Ecological variability: Outcomes such as survival and growth are heavily influenced by rainfall, soil conditions, and grazing pressures, factors beyond administrative control, which can bias assessment results.
4. Documentation gaps: Incomplete maintenance of plantation journals, missing plantation boards, and inconsistent community records limit the ability to triangulate field observations with historical data.
5. Community involvement: Limited participation of VSS/JFMCs in some sites restricted the inclusion of local perspectives and reduced opportunities for cross-validation of findings.
6. Assessment gap: Afforestation activities were assessed after a time gap of nine years to evaluate their survival, growth performance, and site sustainability outcomes.

Considering these limitations, results should be interpreted as indicative rather than exhaustive, with emphasis on improving future monitoring systems, ensuring comprehensive record-keeping, and strengthening participatory approaches for more robust and representative evaluation.

Table 2 Details of activities implemented/sampled for monitoring and evaluation on division basis during 2016-17

Sl. no.	Divisions	Plantation activity		Maintenance activity		Protection activity		SMC activity		Construction activity		Other Activity		Grand Total	
		No. implemented	No. sampled	No. implemented	No. sampled	No. implemented	No. sampled	No. implemented	No. sampled	No. implemented	No. sampled	No. implemented	No. sampled	Total no. implemented	Total no. sampled
1	Chittoor-East	21	4	49	11	19	6	0	0	4	1	125	26	218	48
2	Chittoor-West	24	5	60	14	7	2	1	1	0	0	83	19	175	41
3	Rajampet	7	4	34	9	0	0	10	2	0	0	26	7	77	22
4	Tirupati	3	2	2	1	7	2	1	1	6	1	57	12	76	19
5	Nellore	26	5	97	21	9	2	10	2	11	2	153	32	306	64
6	Kadapa	6	4	22	6	2	1	0	0	0	0	91	18	121	29
7	Proddatur	9	4	29	6	6	2	0	0	0	0	102	24	146	36
8	Ananthapuram	31	7	127	25	2	1	3	2	3	1	56	12	222	48
9	Giddalur	4	1	3	1	4	2	6	1	0	0	36	8	53	13
10	Kurnool	3	1	38	8	1	1	0	0	8	2	35	8	85	20
11	Nandyal	0	0	9	4	1	1	0	0	0	0	0	0	10	5
12	Atmakur	14	5	6	2	0	0	1	1	0	0	99	22	120	30
13	Markapur	19	5	9	2	0	0	0	0	4	2	90	18	122	27
14	Guntur	5	1	41	8	7	2	0	0	4	1	70	14	127	26
15	Krishna	6	1	53	11	8	2	0	0	0	0	27	7	94	21
16	Eluru	16	3	41	9	3	2	23	4	0	0	100	25	183	43
17	Eluru- WLM	0	0	1	1	0	0	0	0	5	1	66	14	72	16
18	Chintur	10	2	11	3	15	5	0	0	0	0	24	5	60	15
19	Kakinada	36	7	27	6	9	3	4	2	3	2	57	13	136	33
20	Narsipatnam	17	3	73	16	1	1	0	0	0	0	35	8	126	28
21	Paderu	12	3	104	21	7	2	0	0	0	0	109	22	232	48
22	Visakhapatnam	25	5	27	6	5	1	3	2	1	1	95	23	156	38
23	Vizianagaram	15	4	30	7	6	2	0	0	0	0	94	21	145	34
24	Srikakulam	10	3	12	5	0	0	1	1	6	2	55	11	84	22
	Grand Total	319	79	905	203	119	40	63	19	55	16	1685	369	3146	726

IV. MONITORING AND EVALUATION OF CAMPA ACTIVITIES DIVISION WISE



As per ISFR-2023, Andhra Pradesh has 30,084.96 sq. km of forest cover and 35,424.98 sq. km of forest & tree cover (21.74% of the state's geographical area). Of this, 23,867.76 sq. km lies within the Recorded Forest Area (RFA) and 6,217.20 sq. km outside RFA. Forests are classified into Very Dense (≥ 70 % canopy), Moderately Dense (40–70 %), and Open Forests (10–40 %), with the state's cover dominated by MDF and OF classes. Over the past decade (2013–2023), forest cover has increased by ~4,041 sq. km (15.5 %), though recent years show slight declines in dense forests. Mangrove cover stands at 421.43 sq. km, showing modest gains. Major challenges include forest fires, district-level losses, development pressures, and degradation of dense canopy forests, which are more difficult to regenerate.

The Andhra Pradesh Forest Department administers the state's forest resources through a structured system of territorial and functional divisions. The state's forest area extends across the Eastern Ghats, Nallamala, and Seshachalam hill ranges, with significant tracts of Reserved Forest, Protected Forest, and Wildlife Sanctuaries. For effective management, the department is organized into Forest Circles, each comprising several Divisions that oversee protection, conservation, afforestation, and sustainable utilization of forest resources. Each Forest Division is the primary field unit, headed by a Divisional Forest Officer (DFO), responsible for enforcement of the Forest Acts, prevention of encroachments, wildlife management, soil and moisture conservation, and implementation of schemes like CAMPA, NREGS, and State Forestry Programs. Functional divisions such as Wildlife, Social Forestry, Working Plan, and Flying Squads support territorial divisions in specialized areas. Currently, Andhra Pradesh has multiple territorial divisions distributed across the state, covering the varied ecological zones of Rayalaseema, Coastal Andhra, and Northern Andhra. These divisions play a critical role in biodiversity conservation, protection of critical wildlife habitats, supply of timber and NTFPs, and promotion of eco-tourism, while also acting as the frontline agency in addressing challenges like deforestation, forest fires, and human-wildlife conflict.

The assessment spanned the entire geographical gradient of the state from the southern dry deciduous tracts of Rayalaseema (including Chittoor-East, Chittoor-West, Rajampet, Tirupati, Nellore, Kadapa, Proddatur, Anantapuramu, Giddalur, Kurnool, Nandyal, Atmakur, and Markapur) through the central divisions of Guntur, Krishna, and Eluru, to the northern Eastern Ghats and coastal regions (such as Eluru–WLM, Chintur, Kakinada, Narsipatnam, Paderu, Visakhapatnam, Vizianagaram, and Srikakulam). Each division was evaluated for implementation efficiency, quality of works, and the impact of CAMPA interventions including plantations, soil and moisture conservation measures, fire protection, and maintenance of existing assets. This state-wide assessment provided a comprehensive understanding of the performance of territorial divisions and their collective role in advancing ecological restoration and sustainable forest management across Andhra Pradesh's diverse landscapes. Divisions, formed the core units covered under the monitoring and evaluation of CAMPA activities across Andhra Pradesh and are presented as follows;

1. Chittoor-East Division
2. Chittoor-West Division
3. Rajampet Division
4. Tirupati Division
5. Nellore Division
6. Kadapa Division
7. Proddatur Division
8. Anantapuramu Division
9. Giddalur Division
10. Kurnool Division
11. Nandyal Division
12. Atmakur Division
13. Markapur Division
14. Guntur Division
15. Krishna Division
16. Eluru Division
17. Eluru- WLM Division
18. Chintur Division
19. Kakinada Division
20. Narsipatnam Division
21. Paderu Division
22. Visakhapatnam Division
23. Vizianagaram Division
24. Srikakulam Division

1. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN CHITTOOR EAST DIVISION

Introduction

The Chittoor East division, situated in the eastern part of Chittoor district in Andhra Pradesh, forms part of the Eastern Ghats landscape and is characterized primarily by Southern Tropical Dry Deciduous Forests interspersed with scrub and degraded patches. While the India State of Forest Report (ISFR) 2023 does not publish forest data at the division level, it reports that Chittoor district has a total forest cover of 1,246.31 sq. km accounting for 18.79 % of the district's geographical area. This includes 457.98 sq.km of Moderately Dense Forest and 788.33 sq. km of Open Forest with no area classified as Very Dense Forest an indication of generally fragmented forests with low canopy density. Chittoor district, which includes the East Division, also witnessed a net loss of 5.44 sq. km in forest cover compared to ISFR 2021 highlighting ongoing pressures such as land-use change, encroachment and degradation. Chittoor East shares ecological features with the rest of the district and includes parts of the Seshachalam hill ranges which are known for redsanders-bearing forests and rich biodiversity. The flora of the region includes key species such as *Pterocarpus santalinus* (redsanders), *Terminalia arjuna*, *Anogeissus latifolia*, *Lannea coromandelica*, *Albizia amara*, *Syzygium cumini* and *Azadirachta indica*. In the understory and degraded zones, drought-resistant shrubs and grasses are common along with several medicinal plants like *Phyllanthus amarus*, *Adhatoda vasica* and *Andrographis paniculata* which are widely used by local communities. The presence of endemic and threatened species such as *Shorea tumbuggaia* and *Cycas beddomei* further underscores the conservation value of the division. Forest fires are a major issue in the region especially during dry seasons. While fire alerts are recorded at the district level, satellite data (SNPP-VIIRS) show Chittoor as one of the more fire-prone districts in Andhra Pradesh, with over 1,000 alerts in the 2023-24 season alone. These fires, combined with grazing, fuelwood collection and NTFP overharvesting, pose serious threats to regeneration and ecological stability. Additionally, Chittoor district has 625.25 sq.km of scrubland, much of which is likely within Chittoor East Division offering potential for ecological restoration and CAMPA-supported afforestation programs. While ISFR 2023 lacks a specific breakdown for Chittoor East, the division clearly represents a critical area for forest conservation, endemic species protection and community-based resource management within the Eastern Ghats landscape.

A total of 218 activities were implemented across all seven ranges, out of which 48 activities (22.02 %) were sampled. Among the activity types, plantation recorded 21 implemented with 4 sampled, maintenance 49 implemented with 11 sampled, protection 19 implemented with 6 sampled, construction 4 implemented with 1 sampled, while others had the highest count with 125 implemented and 26 sampled. No Soil and Moisture Conservation (SMC) activities were recorded. Chittoor East Range: A total of 30 activities were implemented, out of which 8 were sampled. This included 8 plantation (2 sampled), 9 maintenance (2 sampled), 2 protection (1 sampled), and 11 others (3 sampled). Karvetinagar Range: Here, 27 activities were implemented, of which 6 were sampled. These comprised 6 maintenance (1 sampled), 3 protection (1 sampled), and 18 others (4 sampled). No plantation, SMC, or construction activities were taken up. Piler Range: In this range, 11 activities were implemented, with 2 sampled. All 11 belonged to the "Others" category, of which 2 were sampled. No plantation, maintenance, protection, SMC, or construction activities were undertaken. Tirupati Range: A

total of 29 activities were implemented, and 6 were sampled. These included 1 plantation (none sampled), 6 maintenance (1 sampled), 4 protection (1 sampled), and 18 others (4 sampled). Puttur Range: Here, 31 activities were implemented, out of which 6 were sampled. This consisted of 10 maintenance (2 sampled), 3 protection (1 sampled), and 18 others (3 sampled). No plantation, SMC, or construction activities were implemented. Sathyavedu Range: The range recorded 43 implemented activities, of which 11 were sampled. These included 6 plantation (1 sampled), 5 maintenance (2 sampled), 2 protection (1 sampled), 4 construction (1 sampled), and 26 others (6 sampled). No SMC activities were carried out. Srikalahasti Range: A total of 47 activities were implemented, and 9 were sampled. This comprised 6 plantation (1 sampled), 13 maintenance (3 sampled), 5 protection (1 sampled), and 23 others (4 sampled). No SMC or construction activities were taken up.

1. Monitoring and Evaluation of Plantation Activities

A total of 21 plantation activities were implemented in Chittoor east division of which 4 sampled during 206-17. In Chittoor East, 8 plantation activities were implemented of which 2 were sampled, In Sathyavedu, 6 were implemented and 1 sampled, while in Srikalahasti, 6 were implemented and 1 sampled, none of the plantation activities were implemented in Karvetinagar, Piler, and Puttur, In Tirupati, 1 was implemented but none sampled during 2016-17.

1.1 Chittoor east range

A total of eight plantation activities were implemented under the CAMPA scheme in Chittoor east range during the year 2016–17. For monitoring and evaluation, two plantation activities constituting 25 % of the total were selected.

Table 3 Details of plantations selected in Chittoor east range

Sl. no.	Plantations	SO no. and year
1	Raising of 30 Ha RS plantation in Chittoor beat	CSO 1 (2016-17)
2	Raising of 10 Ha RS plantation in Chittoor beat	DSO 110 (2016-17)

The selected 30-hectare Red Sanders plantation site at Chittoor beat is characterized by a landscape where approximately one-fourth of the area is plain terrain, while the remaining portion consists of hilly land with gravelly loam and granite formations. The 10-hectare Red Sanders plantation site selected at Chittoor is characterized by diverse topographical and soil features. Approximately one-fourth of the area consists of plain terrain, which provides relatively easier conditions for plantation activities such as soil preparation, planting, and maintenance. The remaining three-fourths of the site is hilly, with gravelly loam soil interspersed with granite formations.

Survival percentage: The Chittoor beat 30 Ha Red sander plantation site shows good suitability for *Pterocarpus santalinus* with an average survival rate of 96.02 %.

In Chittoor east Range, the 10 Ha Chittoor beat plantation site has shown good suitability for *Pterocarpus santalinus* 88.09 %.

Growth: In the 30 Ha Chittoor beat plantation, the average tree height ranges from 4.49 to 4.87 meters, with a girth range from 13.49 to 28.37 cm. In the 10 Ha Chittoor plantation, the average tree height ranges from 2.67 to 3.89 m, while the average girth ranges from 23.88 to 35.79 cm.

Table 4 Details of plantations enumerated in Chittoor east range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Chittoor (10 Ha)	1	<i>Pterocarpus santalinus</i>	N 13.126343 E 79.164464	90.90	3.89 ±0.47	32.62 ±8.19
		2	<i>Pterocarpus santalinus</i>	N 13.127001 E 79.164611	86.77	3.63 ±1.16	32.52 ±8.43
		3	<i>Pterocarpus santalinus</i>	N 13.127393 E 79.164576	89.25	3.87 ±0.65	35.79 ±10.07
		4	<i>Pterocarpus santalinus</i>	N 13.129185 E 79.163443	85.95	2.67 ±0.48	23.88 ±7.23
		5	<i>Pterocarpus santalinus</i>	N 13.129713 E 79.163649	87.60	2.90 ±0.58	27.87 ±8.13
Plantation average					88.09	3.39	30.54
2	Chittoor (30 Ha)	1	<i>Pterocarpus santalinus</i>	N 13.127536 E 79.162521	98.34	4.71 ±0.98	38.15 ±9.31
		2	<i>Pterocarpus santalinus</i>	N 13.127602 E 79.162454	95.86	4.72 ±0.92	40.93 ±7.67
		3	<i>Pterocarpus santalinus</i>	N 13.126828 E 79.162762	96.69	4.65 ±0.76	34.75 ±8.85
		4	<i>Pterocarpus santalinus</i>	N 13.126647 E 79.162726	90.90	4.87 ±0.67	39.73 ±9.04
		5	<i>Pterocarpus santalinus</i>	N 13.125959 E 79.163056	98.34	4.49 ±0.63	34.18 ±8.00
Plantation average					96.03	4.69	37.55

1.2 Sathyavedu range

A total of six plantation activities were implemented under the CAMPA scheme in Sathyavedu range during the year 2016–17. Accordingly, one plantation activity constituting approximately 20 % of the total was selected for monitoring and evaluation purpose.

Table 5 Details of plantation selected in Sathyavedu range

Sl. no.	Plantation	SO no. and year
1	Raising of 7 Ha Misc., Plantation in Pandur beat Kambakam Section of Sathyavedu Range	DSO 153 (2016-17)

The selected 7-hectare miscellaneous plantation site at Pandur is characterized by red soil interspersed with rocks, which may influence soil aeration, drainage, and root penetration.

Survival percentage: In Sathyavedu Range, the Pandur plantation site has shown good suitability for *Pterocarpus santalinus*, *Syzygium cumini* and *Hardwickia binata* with an average survival rate of 85.70 %, 95.08 % and 90.9 % respectively.

Growth: In the Pandur plantation, the average tree height ranges from 2.30 to 4.77 meters, while the average girth ranges from 24.78 to 35.77 cm.

Table 6 Details of plantation enumerated in Sathyavedu range

Sl. no.	Plantation / Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Pandur	1	<i>Pterocarpus santalinus</i>	N 13.562926	83.33	4.77 ±0.84	35.68 ±6.30
			<i>Syzygium cumini</i>	E 79.910198	95.08	4.51 ±0.99	33.43 ±7.33
		2	<i>Pterocarpus santalinus</i>	N 13.562883 E 79.910229	86.77	4.71 ±1.16	35.77 ±8.43
		3	<i>Hardwickia binata</i>	N 13.562864 E 79.909423	90.9	2.30 ±0.37	24.78 ±6.20
		4	<i>Pterocarpus santalinus</i>	N 13.562592 E 79.908367	85.12	2.70 ±0.52	27.55 ±6.94
		5	<i>Pterocarpus santalinus</i>	N 13.562758 E 79.909452	87.6	4.57 ±0.94	33.42 ±9.84
Plantation average					88.13	3.93	31.77

1.3 Srikalahasti range

A total of six plantation activities were implemented under the CAMPA scheme in Sri Kalahasti range during the year 2016–17. Accordingly, one plantation activity constituting approximately 20 % of the total was selected for monitoring and evaluation purposes.

Table 7 Details of plantation selected in Srikalahasti range

Sl. no.	Plantation	SO no. and year
1	Raising of 20 Ha RS plantation in Kesigunta locality of Kasaram beat of Srikalahasti range	DSO 127 (2016-17)

The 20-hectare plantation site at Kasaram is characterized by red soil mixed with sand and boulders. The coarse soil structure and good drainage due to sand may lower water-holding capacity, influencing species selection and management practices.

Survival percentage: At Kasaram, the plantation has shown good suitability for *Pterocarpus santalinus* with an average survival rate of 94.70 %.

Growth: In Kasaram, average tree height ranges from 5.37 to 6.94 m with girth ranging from 28.07 to 36.34 cm.

Table 8 Details of plantation enumerated in Srikalahasti range

Sl. no.	Plantation /Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Kasaram	1	<i>Pterocarpus santalinus</i>	N 13.911718 E 79.688467	94.21	6.94 ±1.67	36.34 ±7.91
		2	<i>Pterocarpus santalinus</i>	N 13.909279 E 79.68796	91.73	6.68 ±1.31	33.00 ±6.95

		3	<i>Pterocarpus santalinus</i>	N 13.908221 E 79.692246	93.38	6.69 ±1.22	32.50 ±5.81
		4	<i>Pterocarpus santalinus</i>	N 13.91158 E 79.689165	98.34	6.26 ±1.76	30.34 ±7.93
		5	<i>Pterocarpus santalinus</i>	N 13.912014 E 79.692324	95.86	5.37 ±1.30	28.07 ±6.44
Plantation average					94.70	6.39	32.05

Comparative assessment of plantations in Chittoor east division during 2016-17

The four plantation sites exhibited distinct soil and terrain characteristics influencing the performance of *Pterocarpus santalinus* and associated species. The Pandur (7 ha) site, with red rocky soil, supported multiple species including *P. santalinus*, *Syzygium cumini*, and *Hardwickia binata*, recording high survival (85.70–95.08 %) but moderate growth (height: 2.30–4.77 m; girth: 24.78–35.77 cm). The Kasaram (20 ha) site, characterized by red sandy soil with boulders and good drainage, showed excellent adaptability of *P. santalinus*, achieving 94.70 % survival and superior growth (height: 5.37–6.94 m; girth: 28.07–36.34 cm). In the Chittoor beat (30 ha) plantation, with a mix of plain and hilly terrain and gravelly loam soil, *P. santalinus* recorded the highest survival (96.02 %) but moderate growth (height: 4.49–4.87 m; girth: 13.49–28.37 cm). The 10-ha Chittoor site showed slightly lower survival (88.09%) but better girth development (23.88–35.79 cm) despite limited height growth (2.67–3.89 m). Overall, Kasaram demonstrated superior growth, while Chittoor sites achieved the highest survival, and Pandur supported multi-species establishment under rocky soil conditions.

Verification of plantation area and boundaries

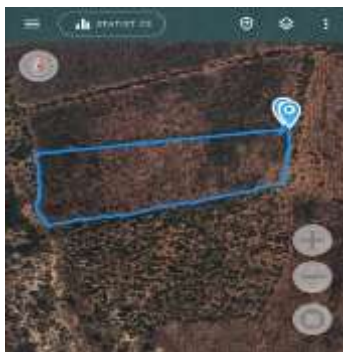
The plantation boundaries and areas were verified using KML files obtained for each site. These files were processed using GIS tools to generate accurate maps and to calculate the actual area covered under each plantation. This geospatial verification ensured consistency between recorded and actual field data.

Table 9 Details of plantation area perambulation in Chittoor east division

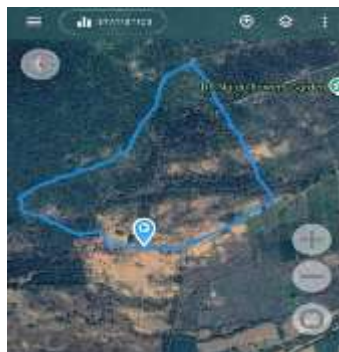
Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising of 7 Ha Misc., Plantation in Pandur beat Kambakam Section of Sathyavedu Range	7 Ha	6.98 Ha
2	Raising of 20 Ha RS plantation in Kesigunta locality of Kasaram beat of Sri Kalahasti range	20 Ha (Bit I-15, Bit II-5)	Bit I-15.08 Bit II-28.53 Total – 43.61 Ha
4	Raising of 30 Ha RS plantation in Chittoor beat	30	37.73
5	Raising of 10 Ha RS plantation in Chittoor beat	10	11.66

During the verification of plantation areas, the perambulated extents were consistently found to be larger than the officially recorded areas across multiple sites. Perambulation was conducted with the assistance of local forest beat officers, and in each case, dense jungle growth, trenches, and other natural obstructions surrounded the plantations. As a result, the field teams followed the outer boundary of these features rather than the precise recorded plantation limits. At the Pandur plantation, the perambulated area was found to be 0.02 hectares less than the official record, likely due to dense forest cover obscuring boundary identification. In contrast, the

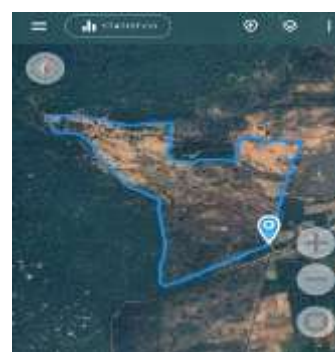
Kasaram plantation showed an increase of 23.61 hectares over the recorded area, suggesting inclusion of adjoining forest patches during field verification. Similarly, in the Chittoor beat, the perambulated area exceeded the official records by 7.73 hectares in the 30-hectare Red Sanders plantation and by 1.66 hectares in the 10-hectare plantation. All measurements were carried out using QGIS software for spatial analysis and verified through physical perambulation with the Geo Tracker mobile application. Geotagged photographs and GIS mapping outputs were generated to provide evidence of the verification process.



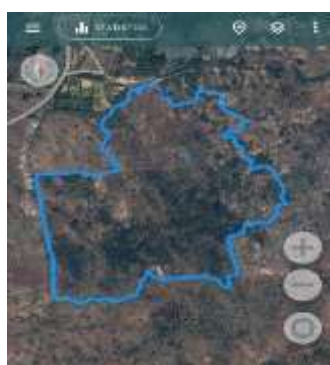
6.98 Ha Pandur



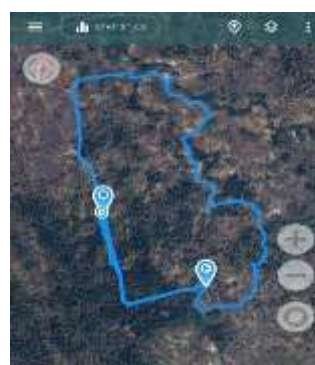
15.08 Ha Kasaram (Bit I)



28.53 Ha Kasaram (Bit II)



7.73 Ha (30 Ha) Chittoor



11.66 Ha (10 Ha) Chittoor

Health status of plantations: Across Chittoor east, Sathyavedu and Srikalahasti ranges, field observations indicated that the plantations were generally healthy, with no visible evidence of damage caused by pests/insects.

Protection of plantations: In all ranges, protective measures such as fire lines, inspection paths, and the deployment of fire watchers were established and properly maintained, ensuring protection from fire and related environmental threats.

Biotic (human/cattle) pressure on plantations: Observations revealed minimal grazing and browsing pressure in both ranges, suggesting that biotic disturbances were not a significant threat to the plantations.

Maintenance of plantation journals and records: Plantation journals were generally well maintained in all ranges. However, in the Sathyavedu Range, journals were not available in Pandur beat and plantation boards were absent across the plantation assessed. In the Srikalahasti Range, while journals were available, the plantation board was broken at Kasaram. In both ranges, the need for periodic updating of plantation parameters in the journals was emphasized to ensure accuracy and completeness of records. Plantations are inspected by the concerned forest officials, and their observations are duly recorded.

Vana Samrakshana Samithi (VSS): In Sathyavedu Range, the Pandur plantations did not involve the Vana Samrakshana Samithi (VSS) in the implementation and maintenance of activities, and therefore FGDs were not conducted. Similarly, in the Srikalahasti Range, the Kasaram plantations lacked VSS involvement in activities, leading to the non-conduct of FGDs.



Pandur, Sathyavedu range



Kasaram, Srikalahasti range

2. Monitoring and Evaluation of Maintenance Activities

During 2016-17, in Chittoor East, 9 maintenance activities were implemented and 2 sampled, Karvetinagar had 6 implemented and 1 sampled, Piler did not record any maintenance activities, Tirupati had 6 implemented and 1 sampled, while Puttur had 10 implemented and 2 sampled, In Sathyavedu, 5 were implemented and 2 sampled, and in Srikalahasti, 13 were implemented and 3 sampled.

Table 10 Maintenance activities selected for evaluation in Chittoor east division

Sl. no.	Maintenance Activities	GPS Co-ordinates	SO no. and year
Chittoor east range			
1	Third year maintenance of 20 Ha NTSHS plantation in Amudala beat	N 13.187672 E 79.321568	DSO 250 (2016-17)
2	Fifth year maintenance of 33 Ha CA plantation in Amudala beat	N 13.181239 E 79.342227	DSO 236 (2016-17)
Karvetinagar range			
1	Second year maintenance of 25 Ha CA plantation in Rayalacheruvu beat	N 13.518241 E 79.383802	DSO 238 (2016-17)
Tirupati range			
1	Third year maintenance of 8.5 Ha peanal CA plot at P. Gollapalli beat	N 13.548991 E 79.552264	DSO 261 (2016-17)
Puttur range			
1	First year maintenance of 20 Ha Red Sanders plantation at Malligunta locality in Nandanam beat of Puttur range	N 13.404877 E 79.837165	DSO 163 (2016-17)
2	Third year maintenance of 20 Ha NTSHS plantation in Palamangalam beat of Puttur range	N 13.438636 E 79.669908	DSO 172 A (2016-17)
Sathyavedu range			
1	First year maintenance of 30 Ha miscellaneous plantation in Pandur beat, Kambakam section	N 13.559467 E 79.911202	DSO 157 (2016-17)
2	First year maintenance of 20 Ha NTSHS plantation in Vanelloore beat, Beerakuppam section	N 13.523342 E 79.922593	DSO 158 (2016-17)
Srikalahasti			
1	First year maintenance of 10 Ha Red Sanders plantation in Yerramattidibbalu locality of Kukkambakam beat	N 13.646198 E 79.877187	DSO 119 A (2016-17)

2	First year maintenance of 10 Ha Red Sanders plantation in Billipodal locality of Kukkambakam beat	N 13.639243 E 79.86653	DSO 122 A (2016-17)
3	First year maintenance of 20 Ha Red Sanders plantation in Yerrachennumitta locality of Thimmasamudram beat	N 13.62314 E 79.717938	DSO 116 A (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. The works undertaken included casualty replacement, circular weeding and soil working, coppice management, pruning of lower branches, fertilizer application, creation and upkeep of fire lines, and other contingency measures. Verification showed that most of these activities had been properly executed in accordance with sanctioned orders. Circular weeding and soil working reduced weed competition and improved aeration, coppice cutting minimized competition from secondary shoots, and pruning promoted healthier plant structure. Fertilizer application was carried out in several plantations, though in some cases the dosage and distribution were not uniform. Fire lines were created or maintained, but at certain locations they required better clearance to remain effective in peak summer. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Plantation records should be accurate and regularly updated to reflect the current status.
- Weed control should be strengthened, with particular focus on lantana and bushy grasses.
- Fire lines should be regularly cleared and maintained to ensure visibility and effectiveness in reducing fire risks.
- Pruning should be undertaken to promote clear bole formation and support healthy tree growth.
- Overall maintenance activities, including weeding, fire line upkeep, and pruning, should be extended for at least two more years to ensure sustained plantation establishment.
- Adequate stocking levels should be maintained, along with appropriate contingency measures.
- Plantation boards and boundary stones should be installed or replaced to ensure proper identification.
- Damaged boards and stones should be repainted to improve visibility.



33 Ha CA plantation in Amudala beat



8.5 Ha CA plot at P. Gollapalli beat



20 Ha Red Sanders in Nandanam beat



20 Ha NTSHS in Palamangalam beat



30 Ha miscellaneous in Pandur beat



20 Ha NTSHS in Vanelloore beat



10 Ha Red Sanders in Kukkambakam



10 Ha Red Sanders in Billipodalu

3. Monitoring and Evaluation of Protection Activities

Chittoor East recorded 2 implemented and 1 sampled, Karvetinagar had 3 implemented and 1 sampled, Tirupati had 4 implemented and 1 sampled, while Puttur recorded 3 implemented and 1 sampled, In Sathyavedu, 2 were implemented and 1 sampled, and in Srikalahasti, 5 were implemented and 1 sampled, none of the protection activities were implemented in Piler range.

3.1 Creation of new fire lines in Pachigunta beat of Chittoor east range

GPS location: N 13.226451 E 79.283614

SO no. and year: RSO 17 (2016-17)

3.2 Creation of new fire lines in Rayalacheruvu beat, Karvetinagar section of Karvetinagar

GPS location: N 13.502614 E 79.401854

SO no. and year: RSO 11 (2016-17)

In the Chittoor East Range, a fire line was created and maintained in the Pachigunta beat, while in the Karvetinagar Range, a similar fire line was established in the Rayalacheruvu beat of the Karvetinagar section. Both sites were monitored and evaluated against the specifications recorded in the measurement book, and the actual field measurements were found to match the documented dimensions, indicating no deviations. The fire lines at both locations were

constructed with a uniform width of 6 meters, while the lengths varied 4000 meters in Pachigunta beat and 4900 meters in Rayalacheruvu beat. Field inspections revealed that although the fire lines had been properly laid across the natural forest, their visibility was compromised due to moderate growth of boda grass and weeds. This suggests that regular maintenance will be necessary to retain their effectiveness as protective barriers. In addition, the fire lines in these beats were demarcated by rocks and boulders, providing a physical boundary.



Fire lines in Pachigunta beat



Fire lines in Rayalacheruvu beat

3.3 Estimate for creation of new fire lines in Diguvauputtur beat of Puttur section and range

GPS location: N 13.491658 E 79.695301

SO no. and year: RSO 09 (2016-17)

3.4 Creation of new fire lines in Mungilipattu beat, Panapakam section of Tirupati range

GPS location: N 13.550612 E 79.233057

SO no. and year: RSO 11 (2016-17)

In the Puttur Range, a new fire line was established and maintained in the Diguvauputtur beat, while in the Tirupati Range, another was created in the Mungilipattu beat of Panapakam section. These fire lines were monitored and compared with the specifications recorded in the measurement book, and the field measurements were found to be consistent with the records, indicating no deviations. Both fire lines were constructed with a uniform width of 3 meters, with lengths of 2000 meters in Diguvauputtur and 5000 meters in Mungilipattu. Field observations showed that the fire lines were properly laid across the natural forest; however, their visibility was partly reduced due to moderate growth of boda grass and weeds, underscoring the need for timely maintenance. The boundaries of the fire lines were clearly marked with rocks and boulders, while dense growth of *Lantana camara* was noted along the peripheral areas. Despite this, the inspection paths remained clear and unobstructed, ensuring accessibility.



Fire lines in Diguvauputtur beat



Fire lines in Mungilipattu beat

3.5 Formation of the new fire lines at Adavaram RF & beat of Srikalahasthi range

GPS location: N 13.649025 E 79.802883

SO no. and year: RSO 07 (2016-17)

3.6 Creation and maintenance of fire lines in Ambakam beat of Sathyavedu range

GPS location: N 13.390651 E 79.911955 **SO no. and year:** DSO 310 (2016-17)

In the Srikalahasthi Range, a fire line was created and maintained in the Adavaram beat, while in the Sathyavedu Range, a similar intervention was undertaken in the Ambakam beat. Both sites were monitored and evaluated against the specifications recorded in the measurement book, and the field measurements corresponded accurately with the documented dimensions, confirming no deviations. The newly created fire line in Adavaram beat measured 6 meters in width and 2000 meters in length, whereas in Ambakam beat it measured 3 meters in width and 10,000 meters in length. Field inspection further revealed variation in the condition of the fire lines across the two sites. In Adavaram beat, the fire line was clearly visible, with no dense grass or weed growth, reflecting effective and consistent maintenance across the natural forest area. Conversely, in Ambakam beat, visibility was poor due to dense growth of grasses and weeds along the fire line, indicating the need for more frequent upkeep to maintain a protective barrier.



Fire lines in Adavaram beat



Fire lines in Ambakam beat

4. Monitoring and Evaluation of Construction Activities

Construction activity was taken up only in Sathyavedu, 4 were implemented and one was sampled during 2016-17.

1. Construction of RCC water tank in Kurinjalam of Sathyavedu range

GPS Location: N 13.601347 E 79.902022 **SO no. and year:** DSO 340 (2016-17)

The RCC water tank constructed in Kurinjalam of Sathyavedu range during 2016-17 was monitored and evaluated against the specifications recorded in the measurement book. The tank dimensions are: height 3.0 m and width 1.8 m, with four supporting pillars each measuring 1.2 m in height and 0.25 m in width. Field measurements confirmed full compliance with the documented specifications, indicating no deviations. The RCC water tank, constructed for storage purposes, has been well maintained and remains in good condition.



RCC water tank in Kurinjalam of Kambakam section

5. Monitoring and Evaluation of Other Activities

Under the “Others” category in Chittoor East Division during 2016–17, a total of 125 activities were carried out, of which 26 were sampled for verification. The distribution of implementation across ranges was as follows: Chittoor East range recorded 11 activities (3 sampled), Karvetinagar range had 18 (4 sampled), Piler range implemented 11 (2 sampled), Tirupati range reported 18 (4 sampled), Puttur range also carried out 18 (3 sampled), Sathyavedu range had the highest with 26 activities (6 sampled), and Srikalahasti range implemented 23 activities (4 sampled). Document verification and cross-checking were conducted in the presence of Division and Range office staff. The verification process relied on the review of sanction orders, estimation sheets, and work registers. In most cases, the sanctioned amounts were found to be in alignment with actual expenditures. Financial records were well maintained and authenticated by the concerned officials, including the Divisional Forest Officer (DFO), Sub-Divisional Officer (SDO), and Forest Range Officer (FRO). Utilization of funds was appropriate and consistent with approved estimates and CAMPA guidelines. Both internal audits, conducted by the Conservator of Forests, and external audit by the Accountant General’s office, confirmed compliance with financial and administrative protocols.

However, several shortcomings were observed in the availability of records. In Karvetinagar range, the estimates and work registers relating to RSO 2, DSO 82, RSO 12, and DSO 5 (2016–17) were not made available for verification. Similarly, in Sathyavedu range, the estimates for DSO 295, RSO 31, and DSO 332 (2016–17), along with the work registers for DSO 162 and DSO 89 (2016–17), were not presented during verification. In Tirupati range, the estimates pertaining to DSO 97 (2016–17) were also not produced. These gaps in record availability limited the scope of verification in the affected ranges, although the majority of works were adequately documented and confirmed. Overall, while financial discipline and compliance with CAMPA guidelines were evident in most ranges, the lapses in documentation in Karvetinagar, Sathyavedu, and Tirupati highlight the need for stricter record-keeping and improved transparency to ensure consistency.

Key Findings

- Plantations showed excellent survival of *P. santalinus*, *S. cumini*, and *H. binata*, with Red Sanders thriving in sandy soils.
- Growth remained moderate in rocky sites, reflecting site limitations despite high survival.
- Maintenance was widespread but uneven in quality, weakened by record-keeping lapses and poor signage.
- Fire line creation was implemented but not consistently maintained, reducing effectiveness.
- No SMC works were undertaken, a critical shortfall in moisture-stressed landscapes.
- Financial accountability was strong, but technical monitoring and GIS verification revealed serious area mismatches.
- Community engagement was absent, exposing plantations to long-term risks from grazing and lack of ownership.

Recommendations

- Rebalance the activity portfolio by scaling up SMC and protection works to complement plantations.

- Institutionalize seasonal fire line clearance, ensuring functionality during summer.
- Strengthen maintenance cycles with an extended duration of at least two years, focusing on systematic weed management, soil work, and pruning.
- Introduce mandatory geospatial verification of plantation extents to eliminate area mismatches.
- Ensure plantation journals and signage are updated and displayed at all sites.
- Prioritize species–site matching: continue Red Sanders (*P. santalinus*) on sandy soils and encourage mixed plantations on rocky soils.
- Mandate VSS involvement and FGDs, linking community incentives to plantation survival and protection outcomes.

2. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN CHITTOOR WEST DIVISION

Introduction

Chittoor West division, located in the south-western region of Andhra Pradesh, is a critical ecological zone within the Anantapur Forest Circle. Characterized by a mix of dry deciduous forests, southern thorn scrub, and semi-arid landscapes, the division spans undulating terrain with elevations reaching up to 2,500 feet. The region falls under a semi-arid climate, with red sandy and loamy soils supporting native vegetation adapted to seasonal rainfall and prolonged dry periods. The forests host a variety of native and locally significant tree species, such as *Azadirachta indica* (Neem), *Ficus racemosa* (Athi), and *Acacia auriculiformis*, along with regenerating species like Adavi Gummadi and Adavi Nimma. Despite this biodiversity, overall forest density is low (approximately 0.2), reflecting degradation due to anthropogenic pressures including deforestation, habitat fragmentation, and land diversion for infrastructure projects. A key ecological feature of the division is the presence of redsanders (*Pterocarpus santalinus*), a rare and high-value endemic tree species. However, illegal harvesting and smuggling have placed immense pressure on its remaining habitats. The division also faces conservation challenges such as human-wildlife conflict particularly with elephants along with threats from quarrying, road construction, and forest clearance proposals. To safeguard its ecological integrity, the division requires a multi-pronged approach focusing on sustainable forest management, community engagement, and strong enforcement against illegal activities. Strategic conservation of biodiversity-rich corridors, protection of Red Sanders habitats, and effective implementation of compensatory afforestation are essential to ensure the long-term resilience and sustainability of the Chittoor West Forest Division.

In Chittoor division during 2016–17, a total of 175 afforestation activities were implemented across all categories. Of these, 41 activities were sampled, representing approximately 23 % of the total activities. In the Chittoor west range, 46 activities were carried out. Of these, 9 activities were sampled. This includes: 2 plantation activities, of which 1 was sampled. 16 maintenance activities, with 3 sampled. 1 protection activity, which was not sampled. No activities were recorded under SMC or construction. 27 activities were classified under others, with 5 sampled. Palamaner range recorded 32 activities, from which 9 were sampled. This includes; 3 plantation activities, with 1 sampled. 13 maintenance activities, of which 3 were sampled. No protection, SMC, or construction activities were recorded. 16 activities under others, with 5 sampled. In Kuppam, 38 activities were undertaken the second-highest among all ranges and 9 were sampled, the highest number of selections overall. Details include: 6 plantation activities, with 1 sampled. 11 maintenance activities, with 3 sampled. 1 SMC activity, which was also sampled. No construction and protection activities were recorded. 20 activities under others, with 4 sampled. Punganur range carried out 20 activities, with 7 sampled. Among them: 3 plantation activities, 1 sampled. 9 maintenance activities, 3 sampled. 2 protection activities, 1 sampled. No SMC or construction activities. 6 activities under others, with 2 sampled. In Madanapalle range, 39 activities were implemented, with 7 sampled. 10 plantation activities, with 1 sampled. 11 maintenance activities, with 2 sampled. 4 protection activities, of which 1 was sampled. No activities were recorded under SMC or construction. 14 activities under others, with 3 sampled.

6. Monitoring and Evaluation of Plantation Activities

A total of 24 plantation activities were implemented across all ranges. Of these, 5 activities were sampled, one from each range. Chittoor west: 2 activities implemented (1 sampled), Palamaner: 3 activities implemented (1 sampled), Kuppam: 6 activities implemented (1 sampled), Punganur: 3 activities implemented (1 sampled), Madanapalle: 10 implemented (1 sampled).

1.1 Chittoor west range

During 2016–17, a total of two plantation activities were undertaken under the CAMPA scheme in Chittoor west range. As part of the monitoring and evaluation process, one plantation site constituting 50 % of the total was selected for assessment.

Table 11 Details of plantation selected in Chittoor West range

Sl. no.	Plantation	SO no. and year
1	Raising of 20 Ha NTSH (SMM) plantation plot in M. V. Giri beat of M.V. Giri section (bit – 1) 2016-17.	DSO 10 (2016-17)

The selected site for the 20-hectare plantation at M.V. Giri in Chittoor west range is characterized by sandy loamy soil, offering favourable conditions for the growth of planted species. The site demonstrates good suitability in terms of soil texture and drainage, positively contributing to plantation establishment and development.

Survival percentage: M.V. Giri plantation in Chittoor west range, the planted species showed excellent adaptability. *Pterocarpus santalinus*, *Hardwickia binata*, and *Ficus spp.* recorded high survival rates of 95.03 %, 93.38 %, and 89.25 % respectively, reflecting strong species-site suitability and effective plantation management.

Growth: M.V. Giri plantation in Chittoor west range, average tree height ranged from 2.90 to 6.30 meters, with girth varying between 19.35 and 37.13 cm. Variations are attributed to site-specific factors such as soil quality and micro-environmental conditions.

Table 12 Details of plantation enumerated in Chittoor west range

Sl. no.	Plantation/ Village name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	M.V. Giri	1	<i>Pterocarpus santalinus</i>	N 13.142695 E 78.876389	96.69	6.30 ±5.66	-	37.13 ±11.25
		2	<i>Pterocarpus santalinus</i>	N 13.142574 E 78.875432	95.04	4.87 ±0.99	-	32.85 ±10.75
		3	<i>Hardwickia binata</i>	N 13.142269 E 78.872437	92.56	2.90 ±0.57	19.35 ±3.21	-
		4	<i>Pterocarpus santalinus</i>	N 13.142205 E 78.872743	93.38	4.53 ±1.00	-	32.36 ±9.57
		5	<i>Ficus spp</i>	N 13.142491 E 78.87443	89.25	4.26 ±0.84	-	29.05 ±7.56
Plantation average					93.38	4.57	19.35	32.85

1.2 Palamaner range

A total of three plantation activities were undertaken under the CAMPA scheme in Palamaner range during 2016–17. For monitoring and evaluation purposes, one plantation activity constituting approximately 33 % of the total was selected for detailed assessment.

Table 13 Details of plantation selected in Palamaner range

Sl. no.	Plantation	SO no. and year
1	Raising of 20 Ha NTSH (SMM) plantation in Pathikonda RF, compartment no. 272 of Pathikonda beat	DSO 102 (2016-17)

The Pathikonda 20 Ha plantation site is characterized by sandy loamy soil, which is well-suited for the growth of the selected plantation species. The site conditions are favorable and contribute to the overall success of plantation development.

Survival Percentage: In Pathikonda plantation of Palamaner range, the survival rates of planted species were as follows: *Hardwickia binata* – 91.32 %, *Pterocarpus santalinus* – 81.81 %, *Azadirachta indica* – 77.68 %, *Santalum album* – 85.93 %. These results indicate particularly high success for *Hardwickia binata* and *Santalum album*, while *Pterocarpus santalinus* and *Azadirachta indica* also show good adaptability to local conditions.

Growth Performance: In Pathikonda plantation of Palamaner range, average tree heights ranged from 1.12 to 5.34 meters, and girths ranged from 17.08 to 41.62 cm. The variation reflects differing soil conditions, microclimates, and other environmental factors influencing growth.

Table 14 Details of plantation enumerated in Palamaner range

Sl. no.	Plantation / Village name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Pathikonda	1	<i>Hardwickia binata</i>	N 13.175722 E 78.632389	92.56	5.34 ±0.56	-	28.04 ±5.24
		2	<i>Pterocarpus santalinus</i>	N 13.176028 E 78.631944	81.81	5.04 ±0.46	-	41.62 ±7.19
		3	<i>Azadirachta indica</i>	N 13.176567 E 78.630083	77.68	3.24 ±0.47	-	24.10 ±4.27
		4	<i>Santalum album</i>	N 13.176400 E 78.627583	85.93	1.12 ±0.29	17.08 ±2.61	-
		5	<i>Hardwickia binata</i>	N 13.176389 E 78.627580	90.08	3.65 ±0.73	-	33.84 ±5.77
Plantation average					85.61	3.68	17.08	31.90

1.3 Kuppam range

A total of six plantation activities were undertaken under the CAMPA scheme in Kuppam range during 2016–17. For monitoring and evaluation purposes, one plantation activity constituting approximately 20 % of the total was selected for detailed assessment.

Table 15 Details of plantation selected in Kuppam range

Sl. no.	Plantation	SO no. and year
1	Raising of 10 Ha AR-SMM plot at Kangundi beat of Kuppam range	DSO 178 (2016-17)

In Kangundi plantation, the selected site for planting was well-suited for the survival and growth of the trees.

Survival percentage: 10 Ha Kangundi plantation in Kuppam range shows excellent suitability for *Pterocarpus santalinus*, *Hardwickia binata*, *Terminalia arjuna* and *Sterculia urens*, with high survival rates of 85.12%, 85.94%, 90.08%, and 89.25% respectively. This indicates favorable site conditions and effective plantation management.

Growth: In 10 Ha Kangundi plantation in Kuppam range, the average tree height ranges from 3.38 to 5.70 m and the girth ranges from 19.6 to 29.91 cm. The observed variation in tree height and girth across different plots can be attributed to differences in soil conditions, micro-environments, and other environmental factors, which influence overall tree growth.

Table 16 Details of plantation enumerated in Kuppam range

Sl. no.	Plantation/ Village name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Kangundi	1	<i>Pterocarpus santalinus</i>	N 12.794149 E 78.452759	85.12	5.63 ±0.78	-	29.91 ±4.89
		2	<i>Hardwickia binata</i>	N 12.795353 E 78.452606	84.29	4.80 ±0.91	25.57 ±6.06	-
		3	<i>Terminalia arjuna</i>	N 12.795436 E 78.45225	90.08	5.70 ±0.75	-	28.97 ±5.90
		4	<i>Sterculia urens</i>	N 12.79598 E 78.452394	89.25	3.38 ±0.79	19.6 ±4.19	-
		5	<i>Hardwickia binata</i>	N 12.796509 E 78.452571	87.6	5.16 ±0.64	25.34 ±6.68	-
Plantation average					87.27	4.93	23.50	29.44

1.4 Punganur range

A total of three plantation activities were undertaken under the CAMPA scheme in Punganur range during 2016–17. As part of the monitoring and evaluation process, one plantation site constituting approximately 33 % of the total was selected for assessment.

Table 17 Details of plantation selected in Punganur range

Sl. no.	Plantation	SO no. and year
1	Raising of 10 Ha NTS (SMM) plantation in Muthukur beat in compartment no.114 of Muthukur beat, during 2016-17.	DSO 116 (2016-17)

The selected site for the 10-hectare plantation at Muthukur is characterized by sandy loamy soil, which offers favorable conditions for the growth of the planted species. The site demonstrates good suitability in terms of soil texture and drainage, contributing positively to the overall establishment and development of the plantation.

Survival Percentage: In Punganur range, Muthukur plantation exhibits strong suitability for species such as *Sterculia urens*, *Azadirachta indica*, *Hardwickia binata*, and *Terminalia arjuna*, with survival rates of 71.90%, 81.81%, 90.90%, 85.12%, and 80.99% respectively. These figures indicate the adaptability of each species to the site's conditions, including soil quality, moisture availability, and microclimatic factors. The notably high survival rates of *Hardwickia binata* and *Terminalia arjuna* suggest the plantation's strong potential for timber production and high-value forestry. Meanwhile, species like *Azadirachta indica* and *Terminalia arjuna* enhance both biodiversity and the economic viability of the plantation, offering ecological and commercial benefits. Although *Sterculia urens* shows a relatively lower survival rate, this can be improved through targeted interventions such as soil enrichment and supplemental irrigation. Overall, the plantation demonstrates promising ecological and economic outcomes.

Growth: In Muthukur plantation, average tree heights range from 1.53 to 3.06 meters, with girth measurements between 19.83 and 28.08 cm. The variation in height and girth across different plots in both plantations can be attributed to site-specific factors such as soil properties, microclimatic conditions, and other environmental influences affecting tree growth.

Table 18 Details of plantation enumerated in Punganur range

Sl. no.	Plantation / Village name	Plot no	Species Name	GPS Coordinates	Survival (%)	Average Growth	
						Height (m)	Collar Girth (cm)
1	Muthukur	1	<i>Sterculia urens</i>	N 13.264819 E 78.654595	71.90	1.53 ±0.77	19.83 ±2.88
		2	<i>Azadirachta indica</i>	N 13.264787 E 78.654947	81.81	2.41 ±2.05	22.26 ±2.64
		3	<i>Hardwickia binata</i>	N 13.265025 E 78.655227	90.90	2.31 ±0.73	21.71 ±2.91
		4	<i>Terminalia arjuna</i>	N 13.265211 E 78.655868	85.12	3.06 ±0.68	28.08 ±7.70
		5	<i>Terminalia arjuna</i>	N 13.26474 E 78.656007	80.99	1.85 ±0.63	19.86 ±2.60
Plantation average					82.14	2.23	22.35

1.5 Madanapalle range

This report presents the findings from the monitoring and evaluation of activities implemented under CAMPA in Madanapalle range during 2016–17. A representative sample comprising 20 % of plantation activities from each range was selected for assessment.

Table 19 Details of plantations selected in Madanapalle range

Sl. no.	Plantations	SO no. and year
1	Raising of 10 Ha NTSH plantation (SMM) in Neredikonda RF and beat, compartment no. 3 of Thamballapalle section in Madanapalle range	DSO 75 (2016-17)
2	Raising of 04 Ha NTSH plantation (SMM) in Gundluru RF, compartment no. 54 of Marripadu beat of Valmikipuram section in Madanapalle range	DSO 74 (2016-17)

The Neredikonda plantation is located on a site with moderate suitability, meaning the environmental conditions are adequate but not ideal for growth of the chosen species. The

Marripadu plantation is situated on an ideal site, providing optimal environmental conditions (such as soil quality, climate, and water availability). These conditions support excellent survival and growth rates for the planted species, allowing them to thrive.

Survival percentage: In Madanapalle range, the Neredikonda plantation demonstrates good suitability for *Sterculia urens*, *Pongamia pinnata*, and *Hardwickia binata*, with survival rates of 86.77 %, 86.77 %, and 74.37 %, respectively. This indicates that the site provides favorable conditions for these species, allowing them to establish successfully, though *Hardwickia binata* has a slightly lower survival rate compared to the other two species. In the Madanapalle range, the Marripadu plantation demonstrates excellent suitability for *Hardwickia binata*, *Terminalia arjuna*, and *Pterocarpus santalinus*, with survival rates of 97.52 %, 94.21 %, and 57.81 %, respectively. These high survival rates reflect the site's optimal environmental conditions, which support the healthy establishment and growth of these species.

Growth: In Neredikonda plantation of Madanapalle range, the average tree height ranges from 1.60 to 4.07 m, and the average girth ranges from 22.19 to 39.35 cm. This variation suggests differing growth rates likely due to species type, site conditions, or management practices. In Marripadu plantation of Madanapalle range, the average tree height ranges from 4.04 to 5.40 m, and the average girth ranges from 56.98 to 76.23 cm. This variation suggests differing growth rates likely due to species type, site conditions, or management practices.

Table 20 Details of plantations enumerated in Madanapalle range

Sl. no.	Plantation /Village name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth	GBH (cm)
1	Neredi-konda	1	<i>Sterculia urens</i>	N 13.861434 E 78.390585	86.77	1.60 ±0.55	25.41 ±4.39	-
		2	<i>Sterculia urens</i>	N 13.861233 E 78.390042	86.77	2.16 ±0.85	26.41 ±6.29	-
		3	<i>Pongamia pinnata</i>	N 13.861253 E 78.389109	80.99	3.74 ±1.19	39.35 ±8.80	-
		4	<i>Hardwickia binata</i>	N13.861405 E 78.387928	71.07	4.07 ±0.25	-	28.03 ±1.68
		5	<i>Hardwickia binata</i>	N13.861911 E 78.387564	77.68	2.52 ±0.59	22.19 ±2.98	-
Plantation average					80.656	2.818	28.34	28.03
2	Marripadu	1	<i>Hardwickia binata</i>	N 13.748463 E 78.764475	97.52	5.40 ±0.56	-	73.63 ±13.16
		2	<i>Terminalia arjuna</i>	N 13.748197 E 78.765146	94.21	5.05 ±0.50	-	76.23 ±11.20
		3	<i>Hardwickia binata</i>	N 13.747379 E 78.764960	97.52	4.04 ±0.75	-	56.98 ±6.80
		4	<i>Pterocarpus santalinus</i>	N 13.747487 E 78.764293	95.04	4.29 ±0.77	-	60.08 ±2.71
		5	<i>Pterocarpus santalinus</i>	N 13.748014 E 78.764399	94.21	4.58 ±1.14	-	67.31 ±15.87
Plantation average					95.70	4.67	-	66.85

Comparative assessment of plantations in Chittoor west division during 2016-17

Among the plantations, M.V. Giri in Chittoor West Range recorded the highest overall survival, with *Pterocarpus santalinus* at 95.03% and *Hardwickia binata* at 93.38%, reflecting excellent species-site suitability. Marripadu plantation of Madanapalle Range also showed very high survival for *Hardwickia binata* (97.52%) and *Terminalia arjuna* (94.21%), although *Pterocarpus santalinus* had a lower survival of 57.81%, indicating site-specific limitations. Pathikonda plantation in Palamaner Range demonstrated strong adaptability of *Hardwickia binata* (91.32%) and *Santalum album* (85.93%), while *Azadirachta indica* showed comparatively lower survival (77.68%).

In 10 Ha Kangundi plantation of Kuppam Range, all four species *Terminalia arjuna*, *Sterculia urens*, *Hardwickia binata*, and *Pterocarpus santalinus* showed good survival (85–90%), indicating favorable site conditions. Muthukur plantation of Punganur Range displayed high survival for *Hardwickia binata* (90.90%) and *Terminalia arjuna* (85.12%), while *Sterculia urens* was relatively lower at 71.90%, suggesting room for management improvement. Neredikonda plantation of Madanapalle Range showed moderate survival, with *Sterculia urens* and *Pongamia pinnata* at 86.77% and *Hardwickia binata* at 74.37%, indicating good but slightly variable site suitability.

Regarding growth, plantations like M.V. Giri and Marripadu showed the highest average heights and girths, reflecting optimal environmental conditions, whereas Pathikonda and Muthukur had comparatively lower growth ranges, likely due to site-specific soil and microclimatic factors. Overall, *Hardwickia binata* consistently performed well across most plantations, highlighting its adaptability and suitability for these regions, while *Pterocarpus santalinus* and *Sterculia urens* showed more variable performance depending on site conditions.

Verification of plantation area and boundaries

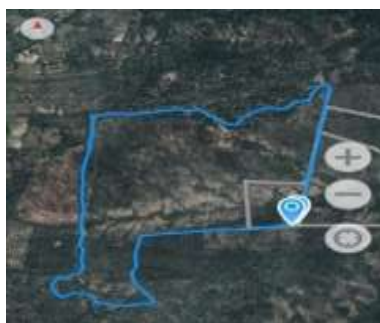
The plantation boundaries and areas were verified using KML files obtained for each site. These files were processed using GIS tools to generate accurate maps and to calculate the actual area covered under each plantation. This geospatial verification ensured consistency between recorded and actual field data.

Table 21 Details of plantations area enumerated in Chittoor West division

Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising of 20 Ha NTSH (SMM) plantation plot in M.V. Giri beat of M.V. Giri section (bit - I)	20 Ha	22.78 Ha
2	Raising of 20 Ha NTSH (SMM) plantation in Pathikonda RF, compartment no. 272 of Pathikonda	20 Ha	29.56 Ha
3	Raising of 10 Ha AR-SMM plot at Kangundi beat of Kuppam range	10 Ha	11.28 Ha
4	Raising of 10 Ha NTSH (SMM) plantation in Muthukur beat in compartment no.114 of Muthukur	10 Ha	10.87 Ha
5	Raising of 10 Ha. NTSH plantation (SMM) in Neredikonda RF and beat, compartment no. 3 of Thamballapalle section in Madanapalle range	10 Ha	15.07 Ha

6	Raising of 04 Ha. NTSH plantation (SMM) in Gundluru RF, compartment no. 54 of Marripadu beat of Valmikipuram section in Madanapalle range	04 Ha	4.51Ha
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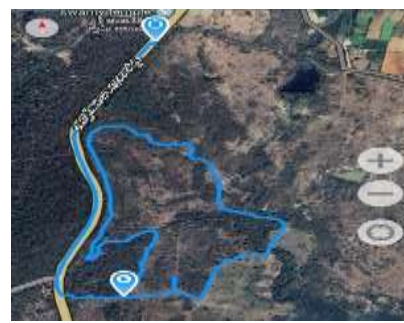
During the verification of plantation areas, the perambulated extents were consistently found to be larger than the officially recorded areas across multiple sites. Perambulation was conducted with the assistance of local forest beat officers, and in each case, dense jungle growth, trenches, and other natural obstructions surrounded the plantations. As a result, the field teams followed the outer boundary of these features rather than the precise recorded plantation limits. At M.V. Giri, the perambulated area exceeded the recorded area by 2.78 hectares. At Pathikonda, the excess was 9.56 hectares, while at Kangundi, the area was larger by 1.28 hectares. In the case of Muthukur, the perambulated area surpassed the records by 0.87 hectares. For the Neredikonda and Marripadu plantations, the excess areas were 5.07 hectares and 0.51 hectares, respectively. All measurements were carried out using QGIS software for spatial analysis and verified through physical perambulation with the Geo Tracker mobile application. Geotagged photographs and GIS mapping outputs were generated to provide evidence of the verification.



MV Giri 22.78 Ha



Pathikonda 29.56 Ha



Kangundi 11.28 Ha



Muthukur plantation 10.87 Ha



Neredikonda 15.07 Ha



Marripadu 4.51 Ha

Health Status of Plantations: Based on field visits, the health status of plantations varied across sites. In some plantations such as M.V. Giri, no incidences of insect or pest damage were observed, while in others like Kangundi, and Muthukur, visible pest infestations affecting leaves and stems were recorded, which could negatively impact plant health if not addressed.

Protection Measures: Protection measures were consistently implemented across all sites, including the creation and maintenance of fire lines, inspection paths, and the deployment of fire watchers, which contributed to a noticeable reduction in fire incidents.

Biotic Pressure: Biotic pressures such as grazing and browsing by cattle were reported at several plantations including M.V. Giri, Kangundi, and Muthukur. These pressures were partly mitigated through the construction of peripheral trenches and the engagement of plantation watchers, which reduced cattle intrusion from nearby villages.

Maintenance of Plantation Journals and Records: Plantation journals were generally well maintained across all ranges, though periodic updates of survival, growth, and other parameters were recommended to ensure accurate documentation. In most plantations, boundary boards and signage marking the plantation area were present, though their maintenance required attention in some cases. Plantations are inspected by the concerned forest officials, and their observations are duly recorded.

Vana Samrakshana Samithis (VSS): Community participation through Vana Samrakshana Samithis (VSS) was inconsistent. For instance, the M.V. Giri plantations had VSS involvement and thus Focus Group Discussions (FGDs) were conducted, while other sites such as Pathikonda, Kangundi, and Muthukur lacked VSS participation, and no FGDs were organized.



Plantation area of M.V. Giri in Chittoor west



Plantation area of Pathikonda in Palamaner range



Plantation area of Kangundi in Kuppam range



Plantation area of Muthukur in Punganur range



Plantation area of Marripadu in Madanapalle range

7. Monitoring and Evaluation of Maintenance Activities

There were 60 maintenance activities implemented across the division, making it the most common activity. Out of these, 14 were sampled. Chittoor west range: 16 activities implemented (3 sampled), Palamaner range: 13 activities implemented (3 sampled), Kuppam range: 11 activities implemented (3 sampled), Punganur range: 9 activities implemented (3 sampled), Madanapalle range: 11 activities implemented (2 sampled).

Table 22 Maintenance activities selected for evaluation in Chittoor west division

Sl. no.	Maintenance Activities	GPS Co-ordinates	SO no. and year
Chittoor west range			
1	First year maintenance of 20 Ha (2015) NTSH - LIM plantation plot in Keenatampalli beat of Chittoor section	N 13.113699 E 79.048188	DSO 92 (2016-17)
2	First year maintenance of 20 Ha (2015) NTSH - SMM plantation plot in M.V. Giri beat of M.V. Giri section	N 13.145704 E 78.88225	DSO 94 (2016-17)
3	Third year maintenance of 20 Ha NTSH -SMM plot in Bodabandla beat of M.V. Giri section	N 13.144015 E 78.974206	DSO 109 (2016-17)
Palamner range			
4	First year maintenance of 20 Ha NTSH plantation (LIM) in Allapalle RF, compartment no. 243 of Thotakanuma beat	N 13.13911 E 78.629094	DSO 103 (2016-17)
5	First year maintenance of 20 Ha NTSH plantation (SMM) in Melumai RF, compartment no. 317 of Keelapatla beat	N 13.275759 E 78.738932	DSO 99 (2016-17)
6	First year maintenance of 15 Ha NTSH plantation (SMM) in Pathikonda RF, compartment no. 272 of Pathikonda beat	N 13.17574 E 78.682467	DSO 100 (2016-17)
Kuppam range			
7	First year maintenance of 10 Ha plantation (SMM) in Kuppam beat of Kuppam range	N 12.800558 E 78.452478	DSO 117 (2016-17)

8	First year maintenance of 10 Ha plantation (SMM) in compartment no- 352 Kangundi beat of Kangundi section of Kuppam range	N 12.763335 E 78.397412	DSO 114 (2016-17)
9	First year maintenance of 5 Ha plantation (LIM) in Kangundhi beat of Kuppam range	N 12.79179 E 78.44933	RSO 01 (2016-17)
Punganur range			
10	First year maintenance of 20 Ha NTSH plantation (SMM) in Muthukur beat bit -I compartment no-113 Muthukur west	N 13.26056 E 78.624179	DSO 84 (2016-17)
11	First year maintenance of 20 Ha NTSH (SMM) plot at Muthukur beat bit-11 compartment no. 113 Muthukur west	N 13.2607075 E 78.627917	DSO 81 (2016-17)
12	Second year maintenance of 6 Ha NTSH(SMM) plot at Muthukur beat compartment no. 113 Muthukur west RF	N 13.253011 E 78.630096	SDSO 6 (2016-17)
Madanapalle range			
13	First year maintenance of 10 Ha NTSH plantation in Urakonda RF, of Nadimicherla beat of Gurramkonda section	N 13.860472 E 78.728051	DSO 89 (2016-17)
14	First year maintenance of 10 Ha NTSH plantation in Kukkarajupalle RF, Ramiganipalle beat of Thamballapalle	N 13.730415 E 78.55896	DSO 90 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. The works undertaken included casualty replacement, circular weeding and soil working, coppice management, pruning of lower branches, fertilizer application, creation and upkeep of fire lines, and other contingency measures. Verification showed that most of these activities had been properly executed in accordance with sanctioned orders. Circular weeding and soil working reduced weed competition and improved aeration, coppice cutting minimized competition from secondary shoots, and pruning promoted healthier plant structure. Fertilizer application was carried out in several plantations, though in some cases the dosage and distribution were not uniform. Fire lines were created or maintained, but at certain locations they required better clearance to remain effective in peak summer. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring.

Note: In 5 Ha plantation (LIM) in the Kangundi beat of the Kuppam range, maintenance activities were carried out as per the Forest Beat Officer (FBO) statement for the first-year maintenance during 2016-17 under the CAMPA scheme. However, during our team visit no plantation was seen in the marked and recorded area because of maintenance lacunae leading to over grazing, coppice cutting, and dense growth of lantana/weeds. Additionally, the plantation markers such as boundary stones and boards were missing, which hindered the tracking and monitoring of the plantation maintenance.

Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Regularly maintain fire lines by clearing overgrown vegetation to ensure effective firebreaks and protect plantations from wildfires.
- Install, repair, or replace plantation boards and boundary stones to improve site identification, demarcation, and monitoring visibility.

- Extend circular weeding operations for at least two additional years to control weed growth, reduce competition, and promote healthy plant development.
- Continue pruning activities over the next two years, focusing on the removal of coppice shoots to encourage straight and upright tree growth.
- Sustain the maintenance of soil and moisture conservation structures to enhance long-term plantation success.
- Implement targeted interventions such as improved soil care, irrigation (where feasible), and regular maintenance to support the recovery and growth of NTSH species.
- Strengthen monitoring and record-keeping practices to ensure timely updates of plantation parameters.
- Improve future plantation efforts through careful site selection, enhanced supervision, and by engaging protection watchers to reduce grazing and other biotic pressures.



Kuppam beat Kuppam range



Kangundhi beat Kuppam range



Nadimicherla beat of Madanapalle



Ramiganipalle beat of Madanapalle



Thotakanuma beat Palamaner, Keelapatla beat Palamaner, Pathikonda beat, Palamaner



Muthukur beat of Punganur range



Keenatampalli beat, Chittoor West range



Bodabandla beat, Chittoor West range

8. Monitoring and Evaluation of Protection Activities

Seven protection activities were recorded division-wide, with 2 sampled. Among them, Chittoor west: 1 activity implemented (none sampled), Punganur: 2 activities implemented (1 sampled), Madanapalle: 4 activities implemented (1 sampled). No protection activities were recorded in Palamaner and Kuppam range during 2016-17.

3.1 Creation of fire lines in natural forest of Kuruzulavaripalle beat

GPS location: N 13.490405 E 78.630381

SO no. and year: RSO 22 (2016-17)

A fire line was created and maintained in natural forest of Kuruzulavaripalle beat, Punganur range was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of new fire line are width – 10 m, and length – 1000 m. The field measurements matched those in the measurement book, indicating no deviations. The fire lines are well maintained, with no noticeable growth of grasses or weeds, ensuring clear visibility throughout. No fire incidences have been reported since the establishment of these fire lines, indicating their effectiveness in fire prevention.

3.2 Providing chain link mesh fencing around 5.5 Ha C.A. plantation (bit-I & bit-II) of M/s Siddhartha granites in Marripadu beat of Madanapalle range

GPS location: N 13.742821 E 78.769093

SO no. and year: DSO 302 (2016-17)

Chain link mesh fencing around 5.5 Ha C.A. plantation (bit-I & bit-II) of M/s Siddhartha granites in Marripadu beat of Madanapalle range was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of chain link fence is 970 rmt. The field measurements matched those in the measurement book, indicating no deviations. The fence is intact and covers only a portion of the planted area, primarily along the boundary with revenue land. Its main purpose is to reduce grazing of the planted seedlings



Marripadu beat of Madanapalle range



Kuruzulavaripalle beat, Punganur range

9. Monitoring and Evaluation of Soil and Moisture Conservation (SMC) Activities

There was only 1 SMC activity implemented in the entire division, and same was sampled. Kuppam: 1 activity implemented and same sampled; all other ranges were not having any SMC activities recorded during 2016-17.

4.1 Formation of new percolation tank at Damarakunta near Betrayaswamy temple in Nadimur beat of Kuppam range

GPS location: N 12.68850 E 78.30711

SO no. and year: DSO 353 (2016-17)

Percolation tanks located at Damarakunta near Betrayaswamy temple in Nadimur beat of Kuppam range was inspected and evaluated against the specifications recorded in the measurement book. Tank dimensions as per measurement book are; length: 30 m, width: 35 m, depth: 1.5 m and volume: 1575 cum. The field measurements were found to be consistent with the entries in the measurement book, confirming that the construction was carried out as per approved specifications, with no deviations observed. The percolation tank is well maintained and located in a catchment area, allowing all the rainfall water to accumulate. However, along with the water, there is a significant accumulation of silt, which reduces the tank's volume and storage capacity over time.



New percolation tank at Damarakunta near Betrayaswamy temple in Nadimur beat

10. Monitoring and Evaluation of Other activities

During the financial year 2016–17, a total of 83 "Other Activities" were implemented under the CAMPA scheme in the Chittoor West Forest Division. Out of these, 19 activities were selected for verification through a sample-based approach. The implementation was distributed across five ranges: Chittoor West (27 activities, 5 sampled), Palamaner (16 activities, 5 sampled), Kuppam (20 activities, 4 sampled), Punganur (6 activities, 2 sampled), and Madanapalle (14 activities, 3 sampled). The document verification and cross-checking were conducted in the presence of Division and Range Office staff to ensure transparency and accountability. Key documents such as sanction orders, estimation sheets, and work registers were reviewed. It was found that the sanctioned amounts were in alignment with the actual expenditures reported. All financial records were properly maintained and duly authenticated by the concerned officials, including the Divisional Forest Officer (DFO), Sub-Divisional Officer (SDO), and Forest Range Officer (FRO). The utilization of funds was appropriate and consistent with the approved estimates and guidelines of the CAMPA scheme. Furthermore, both internal audit (conducted by the Conservator of Forests) and external audit (by the Accountant General's office) were carried out, confirming compliance with financial and administrative protocols. Overall, the implementation of "Other Activities" demonstrated sound financial management, proper

documentation, and adherence to regulatory procedures, contributing to effective and transparent use of CAMPA funds in the Chittoor West Forest Division.

Key Findings

- Plantations achieved generally high survival, with *Hardwickia binata* and *Terminalia arjuna* emerging as the most consistently successful species, while *Pterocarpus santalinus* and *Sterculia urens* displayed site-specific variability.
- GIS verification revealed large and recurring discrepancies between recorded and actual plantation areas, indicating weak baseline record accuracy.
- Maintenance works were widespread but uneven; while most were effective, Kangundi suffered complete lacunae due to grazing and weeds.
- Protection activities were technically sound but too limited to counter broader threats such as fire and illicit felling.
- SMC works were almost absent, with only one percolation tank constructed, already compromised by siltation.
- Financial management was strong and audits confirmed compliance, but ecological monitoring through journals and plantation boards was inconsistent.
- Community participation through VSS was partial and irregular, reducing long-term ownership and sustainability.

Recommendations

- Strengthen plantation strategies by prioritising resilient species such as *Hardwickia binata* and *Terminalia arjuna*, while providing site-specific care for *Pterocarpus santalinus* and *Sterculia urens*.
- Reconcile plantation extents using GIS-based verification to resolve discrepancies and establish reliable baselines.
- Extend and intensify maintenance cycles, particularly in weed-prone and grazing-affected areas, with better monitoring of plantation boards and records.
- Scale up protection measures, especially fire lines, fencing, and watchers, to match the magnitude of biotic and anthropogenic pressures in the division.
- Introduce a stronger SMC component, with regular desilting of percolation tanks and expansion of contour trenches, bunds, and gully plugs.
- Institutionalise performance audits focusing on ecological outcomes alongside financial audits for more comprehensive evaluation.
- Expand VSS participation across all ranges, ensuring greater community involvement in plantation establishment, protection, and benefit-sharing to enhance sustainability.

3. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN RAJAMPET DIVISION

Introduction

In Rajampet Division encompasses an extensive forested landscape spread over 2,381.02 km², making it a significant ecological zone. The forest structure within the division presents a complex and diverse mosaic, reflecting various stages of canopy density and forest health. Of the total area, 28.48 km² is classified as Very Dense Forest (VDF), representing patches of relatively undisturbed and mature forest with closed canopies and rich biodiversity. A much larger portion, 1,294.69 km², falls under Moderately Dense Forest (MDF), forming the dominant forest type in the division and serving as a critical carbon sink and wildlife habitat. Complementing these are 1,057.85 km² of Open Forest (OF), which are characterized by sparse canopy cover and increased light penetration, indicating either naturally open forests or areas under varying degrees of anthropogenic pressure. However, despite this impressive forest wealth, the division faces mounting challenges. A net loss of 5.17 km² of forest cover has been recorded since 2021, a figure that is cause for concern given the ecological importance of the area. This decline points to ongoing and possibly accelerating pressures on forest resources. These degraded patches are often symptomatic of recurring threats such as shifting cultivation, frequent forest fires, encroachments for agriculture or settlements, and over-extraction of forest produce. Collectively, these trends highlight the urgent need for strengthened conservation measures, effective fire management, community participation in protection, and restoration initiatives aimed at halting further degradation and gradually improving canopy density across vulnerable areas.

In Rajampet division, a total of 79 CAMPA activities were carried out, of which 22 activities implemented (around 27 %) were selected for detailed monitoring and evaluation. In Rajampet range, 39 activities were implemented, and 9 were sampled. In Kodur range, 6 activities were implemented, and 3 were sampled. In Chitvel range, 19 activities were implemented, with 5 sampled. In Sanipaya range, 15 activities were implemented, and 5 were sampled. Among activity types, maintenance dominated with 34 activities (9 sampled), followed by others (26; 7 sampled), soil and moisture conservation (12; 2 sampled), plantation (7; 4 sampled) and none were selected from protection and construction activity.

1. Monitoring and Evaluation of Plantation Activities

In Rajampet division, a total of 7 plantation activities were carried out under CAMPA, of which 4 activities implemented (about 21 %) were selected for monitoring and evaluation. Among the ranges, Rajampet with 1 implemented (1 sampled), Kodur with 1 implemented (1 sampled), Chitvel with 3 implemented (1 sampled) and Sanipaya with 2 implemented (1 sampled).

1.1 Rajampet range

During 2016–17, a total of one plantation activity was carried out under the CAMPA scheme in Rajampet range. As part of the monitoring and evaluation process, this single plantation site effectively constituting 100 % of the total was selected for assessment.

Table 23 Details of plantation selected in Rajampet range

Sl. no.	Plantation	SO no. and year
1	Raising of 30 Ha. Red Sanders plantation (SMM) compt.No.899 of Vathaluru Beat of T. Bailu section of Rajampet Range during 2016-17	DSO 50 (2016-17)

The selected plantation site at Vathaluru beat are predominantly characterized by red, hard, and gravelly soils. These conditions pose challenges in terms of root penetration and moisture retention, indicating low soil fertility and poor water-holding capacity. To ensure successful plant establishment and growth under these constraints, specific soil management practices such as deep ploughing and mulching are recommended.

Survival Percentage: In the Rajampet range, the Vathaluru site, exhibited strong adaptability for *Pterocarpus santalinus*, with an average survival rate of 92.39 %. Additionally, the plantation has shown good overall growth in height and GBH.

Growth: In Vathaluru, average tree height ranged from 5.56 to 6.80 m, while girth ranged from 30.45 to 36.13 cm. These values reflect healthy physiological development.

Table 24 Details of plantation enumerated in Rajampet range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Vathaluru 30 Ha RS plantation	1	<i>Pterocarpus santalinus</i>	N 14.070073 E 79.131914	93.38	6.79 ±0.59	36.13 ±7.69
		2	<i>Pterocarpus santalinus</i>	N 14.069280 E 79.131393	95.04	6.38 ±0.86	34.28 ±8.15
		3	<i>Pterocarpus santalinus</i>	N 14.067423 E 79.131204	90.90	6.80 ±0.83	34.94 ±7.81
		4	<i>Pterocarpus santalinus</i>	N 14.065194 E 79.130530	92.56	5.99 ±0.89	30.45 ±7.33
		5	<i>Pterocarpus santalinus</i>	N 14.066870 E 79.130659	90.08	5.56 ±0.71	30.91 ±7.56
Plantation average					92.39	6.30	33.34

1.2 Kodur range

A total of one plantation project was implemented under the CAMPA scheme in Kodur Range during 2016–17. For evaluation purposes, this single plantation site constituting 100% of the total was selected for assessment using a random sampling method.

Table 25 Details of plantation selected in Kodur range

Sl. no.	Plantation	SO no. and year
1	Raising of 10.0 Ha SMM (NTSHW Species) Plantation in Chiyyavaram Beat, Balapalli Section of Kodur Range	DSO 71 (2016-17)

The selected site for the 10-hectare plantation at Chiyyavaram is characterized by red soil mixed with gravel, offering moderately suitable conditions for the establishment of dry deciduous species.

Survival Percentage: The plantation demonstrated good adaptability for multiple species, with the following average survival rates recorded: *Hardwickia binata*: 91.61 %, *Holoptelea integrifolia*: 90.32 %, *Azadirachta indica*: 84.92 %, *Syzygium cumini*: 90.90 %. These figures indicate effective species-site matching and successful maintenance practices.

Growth: The plantation recorded an average tree height ranging from 4.67 to 5.82 m, and average girth ranging from 32.90 to 38.06 cm, reflecting healthy growth across the species.

Table 26 Details of plantation enumerated in Kodur range

Sl. no.	Plantation / Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Chiyyavaram 10 Ha NTSH Plantation	1	<i>Hardwickia binata</i>	N 13.892714 E 79.405513	89.28	4.71 ±0.99	38.06 ±9.44
			<i>Azadirachta indica</i>		84.61	4.67 ±0.74	35.09 ±9.03
		2	<i>Azadirachta indica</i>	N 13.892358 E 79.405889	84.21	5.00 ±0.71	33.88 ±7.44
			<i>Hardwickia binata</i>		92.81	4.91 ±0.49	32.90 ±6.38
		3	<i>Hardwickia binata</i>	N 13.892267 E 79.406404	89.83	5.55 ±0.56	33.13 ±6.07
			<i>Holoptelea integrifolia</i>		90.32	5.81 ±0.53	34.29 ±5.74
		4	<i>Azadirachta indica</i>	N 13.892391 E 79.406942	85.96	5.68 ±0.60	35.78 ±6.05
			<i>Holoptelia integrifolia</i>		92.18	5.63 ±0.50	33.36 ±5.48
		5	<i>Hardwickia binata</i>	N 14.126729 E 79.085531	94.54	5.62 ±0.59	35.79 ±6.64
			<i>Syzygium cumini</i>		90.90	5.78 ±0.54	36.08 ±5.64
Plantation average					89.46	5.33	34.83

1.3 Chitvel range

A total of three plantation projects were implemented under the CAMPA scheme in Chitvel range during 2016–17. For evaluation purposes, one plantation site constituting approximately 33 % of the total was selected using a random sampling method.

Table 27 Details of plantation selected in Chitvel range

Sl. no.	Plantation	SO no. and year
1	Raising of 10.0 Ha. Red Sanders Plantation (SMM) in Compt.No.993 of Viplakona Locality of R. V. Palli Beat, R. V. Palli Section of Chitvel Range during 2016-17 Under CAMPA-NPV (NFM) Scheme	DSO 87 (2016-17)

The plantation site features red loamy soil of medium texture, with rocky patches and an underlying granite base. The soil is porous, shallow, and situated on a gentle slope, showing signs of moderate erosion. These conditions are moderately challenging but suitable for drought-tolerant species.

Survival Percentage: The plantation at R.V. Palli has shown excellent adaptability for *Pterocarpus santalinus*, achieving an average seedling survival rate of 95.20%, reflecting effective plantation and maintenance practices.

Growth: The growth assessment revealed: Average Tree Height: 6.45 – 6.92 meters and Average Girth (GBH): 33.17 – 38.31 cm. These figures indicate robust growth and healthy physiological development of the planted species.

Table 28 Details of plantation enumerated in Chitvel range

Sl. no.	Plantation / Village name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	R V Palli 10 Ha RS plantation	1	<i>Pterocarpus santalinus</i>	N 14.043936 E 79.377873	95.04	6.45 ±0.75	34.51± 6.23
		2	<i>Pterocarpus santalinus</i>	N 14.043775 E 79.378105	93.38	6.92 ±0.65	34.38± 5.10
		3	<i>Pterocarpus santalinus</i>	N 14.043661 E 79.378612	96.69	6.83 ±0.67	38.31± 6.67
		4	<i>Pterocarpus santalinus</i>	N 14.044234 E 79.378540	94.21	6.87 ±0.89	33.17± 6.08
		5	<i>Pterocarpus santalinus</i>	N 14.045026 E 79.378410	96.69	6.55 ±0.72	33.30± 7.31
Plantation average					95.20	6.72	34.73

1.4 Sanipaya range

A total of two plantation projects were implemented under the CAMPA scheme in Sanipaya range during 2016–17. For evaluation purposes, one plantation site constituting 50 % of the total was selected using a random sampling method.

Table 29 Details of plantation selected in Sanipaya range

Sl. no.	Plantation	SO no. and year
1	Raising of 10 Ha Red Sanders (LIM) Plantation in Natural Forest in Comp. No. 814 of Sanipaya Beat of Sanipaya Section of Sanipaya range	DSO 106 (2016-17)

The plantation sites at Guntharajupalli (10 ha) are situated in a southern tropical dry deciduous forest zone. The soil is primarily red loamy sandy with sandstone formations, presenting moderate challenges for root penetration and moisture retention. The region receives annual rainfall ranging from 600 mm to 700 mm, indicating a semi-arid climate that necessitates drought-tolerant species.

Survival Percentage: The species planted showed moderate adaptability to site conditions: Guntharajupalli, *Hardwickia binata* – 55.51 %, *Pterocarpus santalinus* – 54.26 %. These survival rates suggest partial success in plantation establishment, with scope for improvement through soil enrichment and moisture conservation techniques.

Growth: In Guntharajupalli average height ranges from 0.80 to 1.02 meters and Average girth: 10.29 to 16.42 cm. These measurements reflect early-stage growth, with relatively slow development possibly influenced by climatic and edaphic factors.

Table 30 Details of plantation enumerated in Sanipaya range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	Collar Girth (cm)
1	Sanipaya 10 Ha RS LIM plantation	1	<i>Hardwickia binata</i>	N 14.066767 E 78.852344	55.34	0.97 ±0.36	11.00 ±3.42
			<i>Pterocarpus santalinus</i>		49.23	1.05 ±0.40	12.13 ±4.03
		2	<i>Hardwickia binata</i>	N 14.065431 E 78.850544	63.15	1.03 ±0.41	13.29 ±4.31
			<i>Pterocarpus santalinus</i>		53.12	1.01 ±0.37	12.68 ±5.28
		3	<i>Hardwickia binata</i>	N 14.063076 E 78.851266	59.32	0.80 ±0.30	10.37 ±2.66
			<i>Pterocarpus santalinus</i>		59.60	0.85 ±0.37	9.76 ±3.06
		4	<i>Pterocarpus santalinus</i>	N 14.069925 E 78.848094	56.14	0.78 ±0.28	8.91 ±2.10
			<i>Hardwickia binata</i>		53.12	0.82 ±0.29	9.06 ±2.48
		5	<i>Hardwickia binata</i>	N 14.069192 E 78.852314	60.00	1.05 ±0.40	12.70 ±5.05
			<i>Pterocarpus santalinus</i>		51.51	0.97 ±0.40	12.21 ±5.34
Plantation average					56.03	0.93	11.21

Comparative assessment of plantations in Rajampet division during 2016-17

Rajampet plantations exhibited excellent survival and growth at Vathaluru (*Pterocarpus santalinus* – 92.39 %, height 5.56–6.80 m, GBH 30.45–36.13 cm) and R.V. Palli (*Pterocarpus santalinus* – 95.20 %, height 6.45–6.92 m, GBH 33.17–38.31 cm); good multi-species performance at another site (*Hardwickia binata* – 91.61 %, *Holoptelea integrifolia* – 90.32 %, *Azadirachta indica* – 84.92 %, *Syzygium cumini* – 90.90 %, height 4.67–5.82 m, GBH 32.90–38.06 cm); while Guntharajupalli showed only moderate survival (*Hardwickia binata* – 55.51 %, *Pterocarpus santalinus* – 54.26 %) with slow early growth (height 0.80–1.02 m, GBH 10.29–16.42 cm).

Verification of plantation area and boundaries

In Rajampet division during 2016-17 measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

Table 31 Details of plantation area perambulation in Rajampet division

Sl. no.	Plantation	Area as per records	Area as per field perambulation
1	Raising of 30 Ha. Red Sanders plantation (SMM) of Vathaluru Beat of T. Bailu section of Rajampet Range.	30 Ha	32.55 Ha

2	Raising of 10.0 Ha SMM (NTSHW Species) Plantation in Chiyyavaram Beat, Balapalli Section of Kodur Range.	10 Ha	16.70 Ha
3	Raising of 10.0 Ha. Red Sanders Plantation (SMM) in Compt.No.993 of Viplakona Locality of R. V. Palli Beat, R. V. Palli Section of Chitvel Range.	10 Ha	10.32 Ha
4	Raising of 10 Ha. Red Sanders (LIM) Plantation in Natural Forest in Sanipaya Beat of Sanipaya Section and Range.	10 Ha	10.36 Ha

Perambulation of selected plantations was carried out with the assistance of the local Forest Beat Officer. In these cases, the perambulated area was found to exceed in some plantation due to the presence of rocky terrain, trenches, and barren patches within plantation boundaries. Measurements were therefore taken along the outer boundary of these natural obstructions rather than the precise plantation limits. Plantation-wise Findings, Vathaluru Plantation (Rajampet range) (30 Ha): 32.55 Ha (exceeded by 2.55 Ha), Chiyyavaram Plantation (kodur range) (10 Ha): 16.7 Ha (exceeded by 6.7 Ha), R.V Palli Plantation (chitvel range) (10 Ha): 10.32 Ha (exceeded by 0.32 Ha), Sanipaya Plantation (sanipaya range) (10 Ha): 10.36 Ha (exceeded by 0.36 Ha).

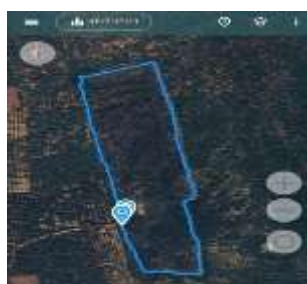
Verification was carried out with the assistance of the local Forest Beat Officer, using QGIS software and further confirmed through Geo Tracker application. Geotagged images were documented as evidence.



Vathaluru 32.55 Ha



Chiyyavaram 16.70 Ha



R V Palli 10.32 Ha



Sanipaya 10.36 Ha

Health Status of Plantation: Field observations confirmed that plantations were completely free from any visible damage caused by insects or pests. This indicates that the plantations are currently not under any significant pest pressure. However, pest-related damage was noted in the *Terminalia* species, in Rajampet range which requires further monitoring and remedial action.

Protection of plantations: In all four ranges, protective measures such as fire lines, inspection paths, and the deployment of fire watchers were established and properly maintained, ensuring protection from fire and related environmental threats.

Biotic Pressure on Plantations: Evidence of grazing and browsing by both wild and domestic herbivores was observed across several plantation sites. This biotic interference led to stunted apical growth in certain species, particularly in areas lacking adequate fencing or community oversight. These signs of pressure emphasize the need for stronger physical protection measures such as installation of protective barriers and increased community sensitization to ensure sustainable plantation development and seedling survival.

Maintenance of Plantation Journals and Records: Plantation journals are being maintained in all plantations. However, there is a need for regular updating of plantation parameters to ensure accuracy and facilitate effective monitoring. Plantation board was not seen only in Vathaluru plantation. Plantation is inspected by concerned forest official and entered the observations.

Vana Samrakshan Samithi (VSS): In Vathaluru and the R V palli plantation were implemented and maintained with the involvement of any Vana Samrakshana Samithi (VSS). Consequently, Focus Group Discussion (FGD) activities were conducted. In Chiyyavaram and Guntharajupalli plantations were implemented and maintained without the involvement of any Vana Samrakshana Samithi (VSS). Hence, Focus Group Discussion (FGD) activities were not conducted.



Vathaluru beat, Rajampet range



Chiyyavaram beat, Kodur range



R.V Palli, chitvel range



Guntharajupalli, Sanipaya range

2. Monitoring and Evaluation of Maintenance Activities

A total of thirty-four maintenance activities were carried out in Rajampet division during 2016-17, of which nine activities were selected for monitoring. Chitvel 11 implemented (3 sampled). Sanipaya accounted for the maximum with 11 activities implemented (3 sampled), Rajampet 10 implemented (2 sampled) and Kodur 2 implemented (1 sampled).

Table 32 Maintenance activities selected for evaluation in Rajampet division

Sl. no.	Maintenance Activities	GPS Co ordinates	SO no. and year
Rajampet range			
1	Maintenance of 50 Ha CA plantation tending and cultural operations, C C Kunta beat of T Bylu section	N 14.079687 E 79.129627	DSO 127 (2016-17)
2	Maintenance of 17 Ha CA plantation including tending and cultural operations, SMC works etc., under Gollavagu project SR Palem beat of SR Palem section	N 14.152033 E 79.097446	DSO 134 (2016-17)
Kodur range			
3	First year maintenance of 20.0 Ha red sanders LIM plantation in compartment no. 1123 of Komitivani Bhavi locality of M. Bhavi beat of Gadela section	N 13.962853 E 79.226895	DSO 93 (2016-17)
Chitvel range			
4	Maintenance of 19.0 Ha fodder plot at Kutalamarri compartment no.1020, Rajukunta beat of Chitvel section	N 14.23998 E 79.40847	DSO 101 (2016-17)
5	First year maintenance of 10.0 Ha red sander LIM plantation in compartment no. 1090 of Nagiripadu RF locality of VR Palli beat of RV Palli section	N 14.133922 E 79.362168	DSO 35 (2016-17)
6	Second year maintenance of 10.0 Ha NTSH SMM plantation in Chitvel beat, Chitvel section	N 14.126834 E 79.288761	DSO 41 (2016-17)
Sanipaya range			
7	First year maintenance of 20 Ha NTSHW plantation in natural forest in compartment no. 814 of Sanipaya beat of Sanipaya section	N 14.080075 E 78.901391	DSO 110 (2016-17)
8	Second year maintenance of 20 Ha. NTSHW plantation in natural forest in compartment no. 814 of Sanipaya beat of Sanipaya section	N 14.079688 E 78.901570	DSO 114 (2016-17)
9	Third year maintenance of 25 Ha red sanders plantation in natural forest in compartment no. 805 of T. Sundupalli beat of Rayavaram section	N 13.990554 E 78.872055	DSO 119 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. These activities include casualty replacement, formation of saucers, weeding operations, soil tilling (inter-ploughing), semi-lunar trenches coppice management, pruning of lower branches, fire line management, and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Intensify weeding operations, especially along plantation boundaries, to control Lantana and bushy grasses, minimizing competition and ensuring healthy plant growth.

- Continue maintaining clear and effective fire lines, with regular clearing before dry seasons to enhance visibility and effectiveness in preventing forest fires.
- Install and maintain plantation boundary stones and boards to ensure accurate demarcation, facilitate monitoring, prevent encroachments, and complement contingency records.
- Maintain accurate and updated plantation journals, markers, and records to support ongoing identification, monitoring, and accountability.
- Continue timely and appropriate fertilizer application, with special focus on weaker plants to promote uniform growth and ensure optimal nutrient support.
- Carry out timely replanting with healthy bagged seedlings to maintain uniform density, improve survival rate, and strengthen overall plantation health.
- Implement routine coppice management to reduce competition from secondary shoots.
- Improve the frequency and timing of pruning operations to promote healthy plant structure and better bole formation.



SR Palem beat, Rajampet range



M. Bhavi beat, Kodur range



Chitvel beat, Chitvel range



T. Sundupalli, Sanipaya range

3. Monitoring and Evaluation of Soil and Moisture Conservation (SMC) Activities

A total of twelve SMC activities were carried out during 2016-17, of which two were sampled. The Rajampet range reported 12 activity (2 sampled).

3.1 Construction of Saucer pits in CC Kunta beat of T. Bylu Section of Rajampet range.

GPS Location: N 14.069167 E 79.131148

SO no. and year: DSO 227 (2016-17)

Saucer pits constructed in CC Kuntabeat were monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of the saucer pits were: diameter- 2 m, depth- 0.10 m and volume- 5.783 cu mtr. The field measurements matched those in the measurement book, indicating no deviations. All the 6 saucer pits were in good condition and maintained well. However, removal of dirt and

plastering of cement need to be done to increase the storage capacity of the saucer pits. The concrete has withered and plastering is required.

3.2 Construction of check dam in maintenance of 47 Ha CA plantation in Annasamudram beat of BD Bhavi section of Rajampet range

GPS Location: N 14.09004 E 79.19644

SO no. and year: DSO 223 (2016-17)

Check dams constructed in Annasamudram beat were monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of the saucer pits were: length- 10 m, breadth- 0.50 m and depth- 1.15 cu mtr. Check dam is in good condition and ideal location of catchment of rain water. De-silting is to be done to increase the storage capacity. Total water holding capacity (total volume of the check dam) has been reduced due to the accumulation of silt and sediment.



CC Kunta beat, Rajampet range

4. Monitoring and Evaluation of Other activities

During 2016–17, a total of 26 activities were carried out under the “Others” category, of which seven were selected for verification. The maximum number of activities was recorded in Rajampet with 17, four of which were sampled, followed by Chitvel with five activities, one sampled, and Kodur and Sanipaya with two activities each, one sampled. Verification and cross-checking of documents were conducted in the presence of Division and Range office staff. The types of documents reviewed included sanction orders, estimation sheets, and work registers, and it was observed that sanctioned amounts were in alignment with actual expenditures. All financial records were properly maintained and duly authenticated by the concerned officials, including the DFO, SDO, and FRO, and fund utilization was appropriate and consistent with approved estimates and CAMPA guidelines. Internal audits were conducted by the Conservator of Forests, and external audits by the Accountant General’s office, ensuring transparency and compliance with financial and administrative protocols. However, in some instances, estimates were not presented for verification: in Chitvel Range (DSO 110, 2016–17), in Rajampet Range (DSO 27, DSO 24, DSO 29, DSO 18, 2016–17), and in Sanipaya Range (DSO 219, 2016–17).

Key Findings

- Plantations showed mixed results, with excellent survival and growth at Vathaluru and R.V. Palli, strong multi-species performance at Chiyavaram, but only moderate results at Guntharajupalli.

- Verification revealed that actual plantation areas exceeded recorded extents in all sampled sites.
- Maintenance activities were implemented but weakened by missing signage, incomplete record updating, and grazing pressures.
- SMC structures were functional but degraded by siltation and lack of plastering.
- No protection or construction activities were undertaken, reducing the ecological portfolio.
- Financial compliance was ensured in “other works,” though documentation gaps persisted.

Recommendations

- Consolidate successful Red Sanders plantation models at Vathaluru and R.V. Palli, while improving survival at challenging sites like Guntharajupalli through soil enrichment and moisture conservation.
- Strengthen plantation visibility and monitoring by mandating signage, boundary stones, and timely updating of journals.
- Expand maintenance efforts with intensive weeding, coppice regulation, pruning, and timely replanting.
- Institutionalize desilting and repair schedules for SMC structures to maintain functionality.
- Diversify the portfolio by introducing protection and construction activities for ecological resilience.
- Address gaps in documentation by ensuring that all estimates and registers are presented during verification.
- Ensure consistent VSS involvement across all plantations to strengthen community participation and accountability.

4. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN TIRUPATI DIVISION

Introduction

Tirupati Forest Division extends over a vast geographical area of 1,957.44 km², representing a significant portion of the forested landscape in the region. The forest cover is primarily composed of Open Forest (OF), which accounts for 1,138.90 km², indicating the predominance of sparsely vegetated woodland. This is followed by Moderately Dense Forest (MDF), spread over 816.94 km², which supports a relatively richer canopy and biodiversity. A comparatively small but ecologically vital area of Very Dense Forest (VDF), measuring 31.60 km², contributes to the division's role as a biodiversity refuge. Despite its rich natural heritage, the division has experienced a significant loss of forest cover, with a net reduction of 17.68 km², ranking among the highest losses recorded in the state. Additionally, the division includes 491.56 km² of scrubland, which provides habitat for diverse shrubland flora and fauna but remains susceptible to degradation if not properly managed. The Tirupati Division is of particular ecological and economic importance because it harbours highly fire-prone dry deciduous forests rich in red sanders (*Pterocarpus santalinus*), an endemic and globally valuable timber species. These forests require intensive monitoring and fire management measures to prevent large-scale losses during the dry season. Geographically, the division encompasses key hill tracts of the Eastern Ghats, which are ecologically significant for maintaining landscape connectivity and watershed health.

In Tirupati division, a total of 76 CAMPA activities were carried out, of which 19 activities (around 25 %) were selected for detailed monitoring and evaluation. In Tirupati range, 40 activities were implemented, and 9 were sampled. In Chamala range, 16 activities were implemented, and 4 were sampled. In Balapalli range, 19 activities were implemented, with 6 sampled. In WLM Tirupati range, one activity was implemented, and none were sampled. Among activity types, others dominated with 57 activities implemented (12 sampled), followed by protection (7 implemented; 2 sampled), construction (6 implemented; 1 sampled), plantation (3 implemented; 2 sampled), maintenance (2 implemented; 1 sampled), and soil and moisture conservation (1; 1 sampled).

1. Monitoring and Evaluation of Plantation Activities

In Tirupati division, a total of 3 plantation activities were carried out under CAMPA, of which 2 activities (about 21 %) were selected for monitoring and evaluation. Among the ranges, Tirupati with 2 (1 sampled) and Chamala with 1 (1 sampled).

1.1 Tirupati range

During 2016–17, a total of one plantation activity was carried out under the CAMPA scheme in Tirupati range. For monitoring and evaluation, this single plantation site constituting 100 % of the activities was randomly selected for assessment.

Table 33 Details of plantation selected in Tirupati range

Sl. No.	Plantation	SO no. and year
1	Raising of 25 Ha Red Sanders plantation under SMM with 3X3 escapement in Lakshmipuram (V) inside zoo area Perumalapalli beat	DSO 50 (2016-17)

Observations

GPS location: N 13.622955 E 79.342912 **SO no. and year:** DSO 50 (2016-17)

The plantation was evaluated on 23.07.2024 in the presence of the Forest Department staff. Following a detailed evaluation and perambulation of the entire plantation area, it was evident that the plantation had maintenance lacunae. The widespread presence of cattle throughout the plantation indicates that proper protection measures were not implemented to shield the plantation from biotic interference, and no protection watchers were engaged.

1.2 Chamala range

A total of one plantation project was implemented under the CAMPA scheme in Chamala range during 2016–17. For evaluation purposes, this single plantation site constituting 100 % of the total was selected using a random sampling method.

Table 34 Details of plantation selected in Chamala range

Sl. No.	Plantation	SO no. and year
1	Raising of 25 Ha Red Sanders plantation under SMM with 3 × 3 m escapement in Bhakarapet beat in SVNP Chamala range	DSO 48 (2016-17)

GPS location: N 13.64223 E 79.172442

SO no. and year: DSO 48 (2016-17)

Evaluation of Red Sander Plantation – Bhakarapet Beat, Chamala Section

A 25 Ha Red Sander plantation was taken up at *Polikimanugutta locality, Compartment No. 46, Bhakarapet beat, Chamala section* under the CAMPA-NPV scheme (2016–17). Prior to planting, advance operations such as soil preparation, clearing, and site readiness were completed during 2015–16. Subsequently, first-year maintenance works, including weeding, watering, and protection, were carried out in 2017–18 to support initial establishment.

On 27.07.2024, a detailed evaluation of the plantation was conducted in the presence of the concerned forest department staff. The evaluation involved a comprehensive perambulation of the entire 25 Ha area, assessing the plantation condition and documenting observations. The plantation was found to be in very low performance because of poor soil fertility, recurring forest fires, and insufficient rainfall. Surviving Red Sander seedlings exhibited stunted growth (height 15–25 cm; collar girth < 2 cm).

Verification of plantation area and boundaries

In Tirupati division during 2016-17 measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

Table 35 Details of plantation area perambulation in Tirupati division

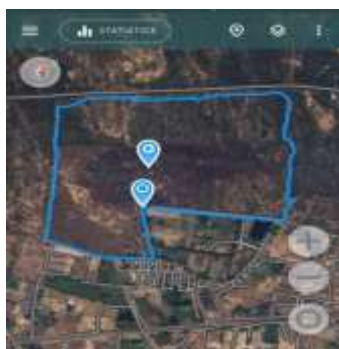
Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising of 25 Ha Red Sanders plantation under SMM with 3X3 espacement in Lakshmipuram (V) inside zoo area Perumalapalli beat in SVNP Tirupati range	25 Ha	41.42 Ha

2	Raising of 25 Ha Red Sanders plantation under SMM with 3 × 3 m escapement in Bhakarapet beat	25 Ha	29.86 Ha
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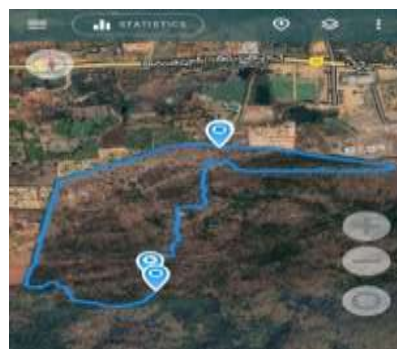
Perambulation of selected redsanders plantations was carried out with the assistance of the local Forest Beat Officer. In these cases, the perambulated area was found to exceed in some plantations due to the presence of rocky terrain, trenches, and barren patches within plantation boundaries. Measurements were therefore taken along the outer boundary of these natural obstructions rather than the precise plantation limits. Plantation-wise Findings.

- Lakshmipuram plantation (Tirupati range) (25 Ha): 41.42 Ha (exceeded by 16.42 Ha)
- Bhakarapet plantation (Chamala range) (25 Ha): 29.86 Ha (exceeded by 4.86 Ha)

Verification was carried out with the assistance of the local Forest Beat Officer, using QGIS software and further confirmed through Geo Tracker application. Geotagged images were documented as evidence.



Lakshmipuram 41.42 Ha



Bhakarapet 29.86 Ha

Health Status of Plantations: In both plantations, the overall survival rate and growth performance of the plants were found to be low. Due to poor establishment and limited development of the species, the general health condition of the plantations could not be assessed in detail.

Protection of Plantations: To safeguard plantations from fires and other environmental risks, protection measures such as the creation and maintenance of fire lines and the development of inspection paths were implemented. These interventions help reduce the vulnerability of plantations, particularly during the dry season.

Biotic Pressure on Plantations: Evidence of grazing and browsing by both wild and domestic herbivores was observed across both plantation sites. This biotic interference led to stunted apical growth in certain species, particularly in areas lacking adequate fencing or community oversight. These signs of pressure emphasize the need for stronger physical protection measures such as installation of protective barriers and increased community sensitization to ensure sustainable plantation development and seedling survival.

Maintenance of Plantation Journals and Records: During the field visit to Lakshipuram plantation, the plantation journal was not presented by the concerned beat officer. In contrast, plantation journals are being maintained in Bhakarapet plantation. However, there is a need for regular updating of plantation parameters to ensure accuracy and facilitate effective monitoring.

VanaSamrakshanSamithi (VSS): During monitoring and evaluation across plantation sites in the Tirupati and Chamala ranges, a consistent lack of community involvement was observed.

This highlights a significant gap in community participation, which is a critical component for the long-term sustainability and protection of forest assets under the CAMPA framework.



Lakshmipuram plantation, Tirupati



Bhakarapet plantation, Chamala

2. Monitoring and Evaluation of Maintenance Activities

A total of two maintenance activities were carried out in Tirupati division during 2016-17, of which one activity was selected for monitoring. Tirupati accounted for the maximum with two activities (1 sampled).

Table 36 Maintenance activities selected for evaluation in Tirupati division

Sl. no.	Maintenance Activity	GPS Co ordinates	SO no. and year
Tirupati range			
1	Second year maintenance of 20 Ha GAP plantation under ANR model at Papavinasanambeat in Tirumalasection of	N 13.724517 E 79.32254	DSO.55 2016-17

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. These activities include casualty replacement, weeding operations, fire line management, and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantation. However, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Install and maintain plantation boundary stones and boards to ensure accurate demarcation, facilitate monitoring, prevent encroachments, and complement contingency records.
- Continue timely and appropriate fertilizer application, with special focus on weaker plants to promote uniform growth and ensure optimal nutrient support.
- Carry out timely replanting with healthy bagged seedlings to maintain uniform density, improve survival rate, and strengthen overall plantation health.



Papavinasanam beat Tirupati range

3. Monitoring and Evaluation of Protection Activities

During 2016–17, Andhra Pradesh Forest Department undertook seven protection activities under the CAMPA scheme in the Tirupati and Balapalli ranges. For monitoring and evaluation, a representative sample of 20 %, comprising two protection activities, was selected for detailed assessment.

3.1 Creation of fire line from PeddaGartla to Kaliviletikona in Mamandur (N) beat of Mamandur section of S.V. National Park, Tirupati range

GPS location: N 13.739151 E 79.462087

SO no. and year: DSO 112 (2016-17)

A fire line was created and maintained in Mamandur beat under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of new fire line are width – 10 m, and length – 5000 rmt. The field measurements matched those in the measurement book, indicating no deviations. The visibility of the fire line was clear, as it was established along the inspection path. No dense grass/weed growth was observed, indicating fire line is well-maintained.

3.2 Creation of new fire line from Rekkamanu near Talakonabungalowgutta to Brahmagundalu in SVN, Papanasanam beat of Balapalli range

GPS location: N 13.812247 E 79.225744

SO no. and year: DSO 116 (2016-17)

A fire line was created and maintained in Papanasam beat under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of new fire line are width – 10 m, and length – 10000 rmt. The field measurements matched those in the measurement book, indicating no deviations. The visibility of the fire line was not clear, as it was established along the inspection path. Dense grass/weed growth was observed, indicating fire line is not well-maintained.



Mamandur beat Tirupati range



Papanasam beat Balapalli range

4 Monitoring and Evaluation of Soil and Moisture Conservation (SMC) Activities

A total of one SMC activity was carried out during 2016–17, and this was sampled for evaluation. In the Balapalli Range, one activity was reported and sampled.

4.1 Construction of rock fill dams (RFDs) in Papanasanam, Mogilipenta, and Gundampentabeats of SVN Balapalli range

GPS location: N 13.812368 E 79.220254

SO no. and year: DSO 67 (2016-17)

Rock-fill dams constructed in Papanasanam, Mogilipenta, and Gundampenta beats were monitored and evaluated against the specifications recorded in the measurement book and the

actual field measurements. The dimensions of the RFDs were: main dam length – 4 m, breadth – 0.9 m, and depth – 0.9 m. The field measurements matched those in the measurement book, indicating no deviations. However, Major repairs are required for the apron due to damage. Desilting is also necessary to restore the storage capacity. Additionally, seepage was observed from both the main dam and the apron, highlighting the need for immediate repair.



Rock fill dams in Papanasanam, Mogilipenta and Gundampenta beats of Balapalli range

5 Monitoring and Evaluation of Construction Activities

During 2016–17, one construction activity was undertaken in the Tirupati Division, of which the single activity was selected for sampling. The activity was carried out in the Tirupati Range, while no construction activities were reported from other ranges of the division.

5.1 Construction of reception counter at Nagaravanam in Alipiri beat of S.V. National Park

GPS location: N 13.651854 E 79.416273

SO no. and year: DSO 143 (2016-17)

Construction of reception counter at Nagaravanam in Alipiri beat was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements.

The dimensions of the reception counter enclosure are as follows;

Cement concrete wall: Length – 2.3 m, Breadth – 0.23 m, Height – 1.8

Pillars: Length – 0.35 m, Breadth – 0.23, Height-0.60 m

Door: Length – 0.85 m, Breadth – 0.23 m, Height-1.95 m

The field measurements matched those in the measurement book, indicating no deviations. The reception counter is well-maintained and located in an ideal spot within Nagaravanam of SV National Park. The counter room is well-constructed with good infrastructure and all necessary facilities. Regular maintenance of the counter should be carried out to ensure continued functionality.



Reception counter at Nagaravanam in Alipiri beat of SVNP, Tirupati range

6 Monitoring and Evaluation of Other activities

During 2016-17, a total of 57 activities were carried out under the “Others” category, of which 12 activities were selected for detailed verification. Tirupati accounted for the largest share with 24 activities (5 sampled), followed by Balapalli with 17 activities (4 sampled) and Chamala with 15 activities (3 sampled). No activities were recorded in WLM Tirupati during this period. Document verification and cross-checking were conducted in the presence of Division and Range office staff. The types of documents reviewed included sanction orders, estimation sheets, and work registers. Sanctioned amounts were found to be in alignment with actual expenditures, and all financial records were properly maintained and duly authenticated by the concerned officials, including the DFO, SDO, and FRO. Fund utilization was appropriate and consistent with approved estimates and CAMPA guidelines. Both internal audits conducted by the Conservator of Forests and external audits by the Accountant General’s office were completed, ensuring transparency and compliance with financial and administrative protocols.

During verification, some discrepancies were observed. In Balapalli Range, differences in amounts were noted for DSO 7a (2016–17) and RSO 11 (2016–17), where the work register was not presented for verification; this missing register was acknowledged by the range office. In Chamala Range, discrepancies were identified for DSO 27A and DSO 35 (2016–17). Overall, the verification confirmed that financial management under the “Others” category was largely compliant, with minor discrepancies duly noted and acknowledged by the respective ranges.

Key Findings

- Red Sanders plantations failed primarily due to inadequate protection, incidences of fire, and grazing pressures.
- Area mismatches, including an excess of 16 ha at Lakshmipuram, highlighted weaknesses in record-keeping.
- Fire protection measures were inconsistent, with some fire lines well maintained while others were ineffective.
- Water conservation assets were present across sites but exhibited structural weaknesses, reducing their overall effectiveness.

Recommendations

- Fire-prevention infrastructure should be strengthened through the establishment of community fire squads.
- Village Forest Societies (VSS) should be actively engaged in Red Sanders plantations to enhance protection and foster local ownership.
- GIS-based verification should be used to accurately monitor plantation extents and prevent record mismatches.
- Maintenance funds for Soil and Moisture Conservation (SMC) and construction works should be institutionalized to ensure timely upkeep.
- Resilient native species should be prioritized alongside redsanders when planting on fragile soils to improve survival and ecosystem stability.

5. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN NELLORE DIVISION

Introduction

Nellore division, located in Sri Potti Sriramulu Nellore district of Andhra Pradesh, encompasses a forest area of approximately 2,519 km² which accounts for about 19.26% of the division's total geographical area. The forests here fall under five major ecological types as per the Champion and Seth classification: Dry Red Sanders-bearing forests, Southern Tropical Dry Mixed Deciduous Forests, *Hardwickia binata* forests, Southern Tropical Thorn Forests and Southern Tropical Dry Evergreen Forests. This diversity reflects a landscape transitioning between dry deciduous and thorny scrub systems, typical of semi-arid eastern Andhra Pradesh. The region is ecologically significant, hosting major protected areas like the Penusila Narasimha Swami Wildlife Sanctuary, Pulicat Bird Sanctuary (a Ramsar site) and Nelapattu Bird Sanctuary which provide critical habitats for terrestrial and migratory bird species. The forest flora is dominated by hardy, drought-resistant species. The most common species by stem count include *Hardwickia binata*, *Albizia amara*, *Chloroxylon swietenia*, *Anogeissus latifolia* and *Gyrocarpus americanus*. In terms of growing stock, valuable species like *Pterocarpus santalinus* (Red Sanders), *Dalbergia paniculata*, *Eucalyptus camaldulensis* and *Anogeissus latifolia* contribute significantly, with the total estimated growing stock volume reaching around 1.51 million m³. This stock is distributed across dense forests (~0.80 million m³), open forests (~0.58 million m³), and scrub forests (~0.13 million m³) with average growing stock per hectare varying from 10 to 15 m³ depending on canopy density. In addition to its ecological value, the division supports 292 Vana Samrakshana Samithis (VSS) under the Joint Forest Management program, managing around 645.93 km² of forests. Despite pressures from deforestation, grazing and land conversion, Nellore Division's forests play a vital role in conservation, particularly due to the presence of endemic and endangered species like Red Sanders and support regional biodiversity across both dry deciduous and wetland ecosystems.

During the period 2016-17, a total of 306 CAMPA activities were carried out in Nellore Forest Division. Out of these, 64 activities (around 20 %) were selected for detailed monitoring and evaluation. Among the six forest ranges, Kavali implemented the highest number of activities with 69, of which 16 were sampled. Atmakur followed with 61 activities and 12 were sampled. Udayagiri carried out 52 activities with 10 evaluated, while Nellore implemented 49 activities, of which 10 were sampled. Venkatagiri undertook 46 activities and also had 10 sampled, whereas Rapur carried out 29 activities with 6 taken up for evaluation. In terms of activity type, Other works constituted the largest share with 153 activities implemented and 32 sampled. This was followed by maintenance activities (97 implemented; 20 sampled), plantation (26; 5), construction (11; 2), soil and moisture conservation or SMC (10; 2) and protection (9; 2). For activities implemented during the reporting period, sampling was fairly evenly distributed across both ranges and activity types, maintaining an approximate 20 percent evaluation rate.

1. Monitoring and Evaluation of Plantation Activities

During 2016-17, Nellore Forest Division carried out a total of 26 plantation activities under CAMPA, of which 5 activities (about 20 %) were selected for monitoring and evaluation. A range-wise distribution of plantation activities shows that Kavali range undertook the highest number with 9 plantation activities, of which 2 were sampled for monitoring and evaluation.

Atmakur range implemented 6 activities with 1 sampled. Nellore range carried out 2 activities also with 1 sampled. Venkatagiri range implemented 3 activities and had 1 activity sampled. Similarly, Udayagiri and Rapur ranges also carried out 3 activities; however, none were sampled.

1.1 Kavali range

A total of nine plantation activities were implemented under the CAMPA scheme in Kavali range. For monitoring and evaluation, 20 % of these activities, equivalent to two plantation sites, were randomly selected for assessment.

Table 37 Detail of plantations selected in Kavali range

Sl. no.	Plantation	SO no. and year
1	Raising of 2016 KM Palem 10 Ha RS plantation	DSO177 (2016-17)
2	Raising of 2016 Veliganda RF bit-I 20 Ha NTSH plantation	DSO175 (2016-17)

Veliganda bit-I 20 Ha plantation site is characterized by red soil, known for its fertility and good drainage which supports diverse tree species. However, effective moisture management is essential particularly during dry periods.

Survival Percentage: Veliganda bit-I plantation exhibited poor growth performance of *Hardwickia binata* with a survival rate of 52.88 %, while *Terminalia arjuna* showed good adaptability recording a survival rate of 86.36 %.

Growth Performance: In Veliganda bit-I, the average tree height ranged from 2.77 to 4.38 m with girth measurements between 19.39 and 28.96 cm.

Table 38 Details of plantation enumerated in Kavali range

Sl. no.	Plantation / Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Veliganda	1	<i>Hardwickia binata</i>	N 15.018722 E 79.621885	40.49	4.38 ±0.51	-	28.96 ±4.49
		2	<i>Hardwickia binata</i>	N 15.01837 E 79.621893	56.19	4.27 ±0.35	-	26.88 ±3.59
		3	<i>Hardwickia binata</i>	N 15.017777 E 79.621911	61.98	4.19 ±0.28	-	25.13 ±2.81
		4	<i>Terminalia arjuna</i>	N 15.014925 E 76.622272	87.60	2.96 ±0.42	20.04 ±1.91	-
		5	<i>Terminalia arjuna</i>	N 15.015533 E 79.62231	85.12	2.77 ±0.37	19.39 ±1.51	-
Plantation Average					66.27	3.71	19.71	26.99

Raising of KM Palem 10 Ha RS plantation: An extent of 10 Ha of redsanders plantation located at KM Palem, compartment no. 582, in Dagadatti beat of Kavali range was taken up under the CAMPA-NPV scheme during 2016-17 with advance operations carried out in the preceding year 2015-16. During the field inspection, encroachment by local villagers was observed posing a potential threat to the sustainability and long-term protection of the plantation.

Additionally, the absence of a plantation board at the site highlighted a lack of proper signage which is essential for site identification and raising awareness among the local community.

1.2 Atmakur range

A total of six plantation activities were implemented under the CAMPA scheme in Atmakur range. For monitoring and evaluation, 20 % of these activities, equivalent to one plantation site, was randomly selected for assessment.

Table 39 Details of plantation selected in Atmakur range

Sl. no.	Plantation	SO no. and year
1	Raising of 20 Ha NTSH for 2016 plantation of Marripadu location through Gandhijanasangam VSS	DSO 183 (2016-17)

Marripadu site spans 20 Ha of flat terrain with well-drained red soil of moderate fertility making it suitable for afforestation. The area showed minimal signs of erosion or waterlogging which supports its potential for long-term plantation activities under the CAMPA scheme.

Survival Percentage: Plantation at Marripadu exhibits poor growth performance of *Hardwickia binata* with a recorded survival rate of 49.25 %. This reflects suboptimal site conditions or possible issues related to species-site compatibility, soil fertility or post-plantation maintenance.

Growth Performance: The average tree height in Marripadu ranges from 1.22 m to 5.50 m while girth values range from 13.12 cm to 33.86 cm pointing to relatively slow growth performance.

Table 40 Details of plantation enumerated in Atmakur range

Sl. no.	Plantation /Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Marripadu	1	<i>Hardwickia binata</i>	N 14.661354 E 79.854327	54.54	5.20 ±0.96	-	33.86 ±4.28
		2	<i>Hardwickia binata</i>	N 14.661406 E 79.853142	51.23	4.22 ±0.97	-	28.56 ±4.74
		3	<i>Hardwickia binata</i>	N 14.661339 E 79.853586	54.54	5.50 ±1.80	-	30.39 ±4.96
		4	<i>Hardwickia binata</i>	N 14.661387 E 79.853189	45.45	1.99 ±0.62	18.03 ±3.21	-
		5	<i>Hardwickia binata</i>	N 14.66126 E 79.85541	40.49	1.22 ±0.60	13.12 ±2.50	-
Plantation Average					49.25	3.62	15.57	30.93

1.3 Venkatagiri range

A total of three plantation activities were implemented under the CAMPA scheme in Venkatagiri range. For monitoring and evaluation, 20 % of these activities, equivalent to one plantation site, was randomly selected for assessment.

Table 41 Details of plantation selected in Venkatagiri range

Sl. no.	Plantation	SO no. and year
1	Raising of Kothacheruvu 20 Ha NTSH plantation	DSO 131 (2016-17)

The 20-hectare site at Kothacheruvu is characterized by red soil rich in iron oxides which contributes to its fertility and distinct coloration. The soil offers excellent drainage reducing the risk of waterlogging, while the gentle slope of the terrain aids in natural water runoff and minimizes soil erosion. These features create favourable conditions for robust root development and support sustainable land use practices.

Survival Percentage: 20-hectare plantation at Kothacheruvu demonstrates moderate growth performance for *Hardwickia binata* with a recorded survival rate of 63.13%. This indicates a fair level of establishment under existing site conditions though there may be scope for improvement through enhanced management practices or site-specific interventions.

Growth Performance: Plantation at Kothacheruvu spanning 20 hectares recorded an average tree height ranging from 2.73 meters to 4.84 meters with girth measurements between 19.84 cm and 33.17 cm.

Table 42 Details of plantation enumerated in Venkatagiri range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Kothacheru vu	1	<i>Hardwickia binata</i>	N 13.871432 E 79.742752	77.68	4.80 ±0.59	-	25.52 ±5.93
		2	<i>Hardwickia binata</i>	N 13.872309 E 79.740786	61.15	2.73 ±0.31	19.84 ±3.77	-
		3	<i>Hardwickia binata</i>	N 13.87215 E 79.740791	52.06	3.97 ±0.67	-	24.78 ±3.80
		4	<i>Hardwickia binata</i>	N 13.87194 E 79.740631	59.50	4.09 ±1.13	-	33.17 ±6.23
		5	<i>Hardwickia binata</i>	N 13.872407 E 79.740881	65.28	4.84 ±0.64	-	28.85 ±4.05
Plantation Average					63.13	4.08	19.84	28.08

1.4 Nellore range

A total of two plantation activities were implemented under the CAMPA scheme in Nellore range. For monitoring and evaluation, one plantation site constituting 50 % of the total activities was randomly selected for assessment.

Table 43 Details of plantation selected in Nellore range

Sl. no.	Plantation	SO no. and year
1	Raising of 20 Ha 2016 South Mopuru NTSH plantation	DSO 207 (2016-17)

20-hectare plantation site at South Mopuru is characterized by rocky terrain with hard gravel and red loamy plains. The area experiences an annual rainfall ranging from 20 mm to 167 mm which influences soil moisture availability and vegetation growth.

Survival Percentage: 20-hectare plantation at South Mopuru demonstrates strong suitability for *Sterculia urens* with a high survival rate of 93.22% indicating favourable growth conditions and successful establishment.

Growth Performance: South Mopuru 20 Ha plantation recorded average tree height ranging from 3.47 to 4.54 m and girth ranging from 26.83 to 28.60 cm.

Table 44 Details of plantation enumerated in Nellore range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	South Mopuru	1	<i>Sterculia urens</i>	N 14.417779 E 79.823862	90.08	3.68 ±0.29	28.60 ±3.00
		2	<i>Sterculia urens</i>	N 14.417732 E 79.823029	94.21	3.69 ±0.30	28.28 ±3.09
		3	<i>Sterculia urens</i>	N 14.417494 E 79.822254	94.21	4.54 ±0.48	28.45 ±4.19
		4	<i>Sterculia urens</i>	N 14.417943 E 79.821278	95.04	3.47 ±0.43	26.83 ±3.02
		5	<i>Sterculia urens</i>	N 14.417184 E 79.820535	92.56	4.24 ±0.30	27.40 ±3.27
Plantation Average					93.22	3.92	27.91

Comparative Assessment of Plantations in Nellore Division during 2016-17

The assessment shows Nellore range performed best with *Sterculia urens* showing a high survival rate (93.22 %) and healthy growth indicating excellent site-species compatibility. Venkatagiri range showed moderate success for *Hardwickia binata* (63.13% survival), while Kavali range had mixed results- *Terminalia arjuna* performed well (86.36%) but *Hardwickia binata* lagged (52.88%). Red Sanders plantation in Kavali faces threats from encroachment and lack of signage. Atmakur range showed the poorest performance with *Hardwickia binata* having low survival (49.25%) and slow growth. Overall, Nellore leads, while Atmakur needs major improvement.

Verification of plantation area and boundaries

In Nellore division during 2016-17, measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

Table 45 Details of plantation area perambulation in Nellore division

Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising of 2016 KM Palem 10 Ha RS plantation	10 Ha	21.62 Ha
2	Raising of 2016 Veliganda RF bit-I 20 Ha NTSH plantation	20 Ha	21.49 Ha
3	Raising of 20 Ha NTSH for 2016 plantation of Marripadu location through Gandhijanasangam VSS	20 Ha	20.65 Ha
4	Raising of Kothacheruvu 20 Ha NTSH plantation	20 Ha	21.08 Ha
5	Raising of 20 Ha 2016 South Mopuru NTSH plantation	20 Ha	22.94 Ha

Perambulation of the plantation area was carried out in the presence of the designated Forest Officer and based on the demarcation indicated by the watcher/guard responsible for each site. During the verification process, it was observed that the perambulated area for all five plantations exceeded the officially recorded extent. This variance is primarily attributed to the inclusion of rocky terrain, trenches and barren patches within the plantation boundaries areas that were not accounted for in the original documentation. The actual extent of each plantation was measured using QGIS software, which confirmed the following deviations from the recorded area:

- 10 Ha RS KM Palem plantation (Kavali): Exceeded by 11.62 Ha
- 20 Ha NTSH Veliganda bit-I plantation (Kavali): Exceeded by 1.49 Ha
- 20 Ha NTSH Marripadu plantation (Atmakur): Exceeded by 0.65 Ha
- 20 Ha NTSH Kothacheruvu plantation (Venkatagiri): Exceeded by 1.08 Ha
- 20 Ha NTSH Mopuru plantation (Nellore): Exceeded by 2.94 Ha

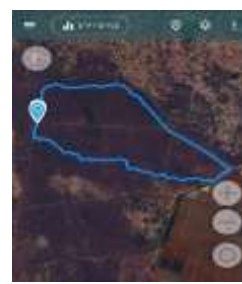
The verification was conducted through physical perambulation using the Geo Tracker mobile application, which facilitated the collection of geotagged photographs and GPS coordinates for accurate documentation. The visual and spatial records are provided below for reference.



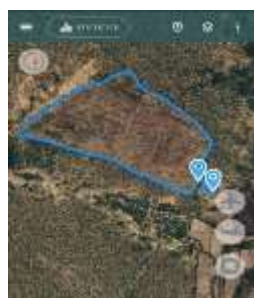
KM Palem 21.62 Ha



Veliganda bit-I 21.49 Ha



Marripadu 20.65 Ha



Kothacheruvu 21.08 Ha



South Mopuru 22.94 Ha

Health Status of Plantation: The overall health status of plantations in South Mopuru, Marripadu, KM Palem, Veliganda and Kothacheruvu was found to be satisfactory. Across all five sites, there were no observed incidences of insect or pest damage affecting any of the planted species. The plants appeared healthy, showing no visible signs of infestation or physiological stress. This indicates that the plantations are being well-maintained and that the environmental conditions at each site are favourable for healthy and sustained plant growth.

Protection Measures: To safeguard plantations from fire and other environmental threats, several protection measures were implemented, including the creation and maintenance of fire lines, development of inspection paths, and deployment of fire watchers. These measures have proven generally adequate in reducing plantation vulnerability, particularly during the dry

season. However, ongoing maintenance and clear visibility of these features are essential to ensure their continued effectiveness.

Biotic (human/cattle) Pressure on Plantation: Incidents of grazing and browsing pressure were noted in all five plantations including South Mopuru, Marripadu, KM Palem, Veliganda and Kothacheruvu. However, these pressures have been significantly reduced through the creation of peripheral trenches and the deployment of plantation watchers, which have helped restrict the entry of cattle from nearby villages.

Maintenance of Plantation Journals and Records: Plantation journals and records are generally well-maintained across all five plantations, with baseline information properly documented. However, there is a need for regular and timely updates of key plantation parameters such as survival rates, growth metrics, and maintenance activities to ensure that the records accurately reflect current field conditions and remain relevant for ongoing monitoring and evaluation. Each plantation is periodically inspected by the concerned forest official, and their observations are duly recorded. During the field visit, it was observed that plantation board was missing at the 20 Ha plantation site in Kothacheruvu (Venkatagiri range) and KM Palem (Kavali range). Plantation board was damaged at Marripadu (Atmakur range).

Vana Samrakshan Samithi (VSS): The involvement of Vana Samrakshan Samithi (VSS) or Joint Forest Management Committee (JFMC) was evident in all five plantations. Their participation reflects the integration of community-based forest management practices contributing to the protection, maintenance and monitoring of the plantation and supporting the overall objectives of sustainable forest regeneration.



Veliganda bit-I plantation



Marripadu plantation



Kothacheruvu plantation



South Mopuru plantation

2. Monitoring and Evaluation of Maintenance Activities

During 2016-17, a total of 97 maintenance activities were implemented across the Nellore Forest division, out of which 20 activities were selected for monitoring and evaluation. A range-wise analysis reveals that Kavali range had the highest number of activities with 27 implemented and

6 sampled. Atmakur range followed with 21 activities, of which 4 were sampled. Udayagiri and Venkatagiri ranges each carried out 17 activities, with 3 and 4 sampled respectively. Nellore range implemented 13 activities with 2 selected for evaluation, while Rapur range had the lowest with 2 activities, of which 1 was sampled.

Table 46 Maintenance activities selected for evaluation in Nellore division

Sl. no.	Maintenance Activities	GPS Co-ordinates	SO no. and year
Kavali range			
1	First year maintenance of 2015 Peddavaram 20 Ha RS plantation	N 14.975385 E 79.908785	DSO 94 (2016-17)
2	First year maintenance of 2015 Lakshmipuram 20 Ha RS plantation	N 14.014139 E 79.951727	DSO 98 (2016-17)
3	First year maintenance of 2015 Manubolupadu 20 Ha NTSH plantation	N 14.726728 E 79.859220	DSO 128 (2016-17)
4	Second year maintenance of 2014 Apparaothota 20 Ha NTSH plantation	N 14.932048 E 79.886795	DSO 105 (2016-17)
5	Third year maintenance of 2013 K. Bitragunta 20 Ha RS plantation in Kavali range	N 14.775139 E 79.968002	DSO 259 (2016-17)
6	Third year maintenance of 2013 Apparaothota 10 Ha NTSH plantation in Kavali range	N 14.926971 E 79.891146	DSO 255 (2016-17)
Venkatagiri range			
7	First year maintenance of 20 Ha Kothapalli RS plantation	N 14.131021 E 79.590452	DSO 136 (2016-17)
8	First year maintenance of 20 Ha Pakapudi RS plantation	N 14.028479 E 79.666382	DSO 141 (2016-17)
9	Second year maintenance of Dandavolu 70 Ha bit-I plantation	N 14.067919 E 79.649937	DSO 110 (2016-17)
10	Second year maintenance of 20 Ha Sanganapalli BC colony NTSH plantation	N 14.123683 E 79.587042	DSO 146 (2016-17)
Udayagiri range			
11	First year maintenance plantation of 2015 20 HA Yerukollu Gundemadakala RS plantation in Duthaluru beat	N 14.852426 E 79.484654	DSO 103 (2016-17)
12	First year maintenance of 2015 Peddireddypalli 20 Ha gap plantation in Arlapadia beat.	N 15.090669 E 79.260297	DSO 240 (2016-17)
13	Third year maintenance plantation of (2011) 20 HA Siddardhanagar NTSH	N 14.844804 E 79.602453	DSO 250 (2016-17)
Nellore range			
14	First year maintenance of 2015 Vadlapudi 20 Ha NTSH plantation	N 14.325159 E 79.808022	DSO 160 (2016-17)
15	Second year maintenance of 2014 Donthali 20 Ha NTSH plantation	N 14.400439 E 79.865191	DSO 167 (2016-17)
Rapur range			
16	Second year maintenance of 2014 Nallapalem-20 Ha Red Sanders plantation raised in semi mechanical method	N 14.480534 E 79.74233	DSO 156 (2016-17)
Atmakur range			
17	First year maintenance of 20 Ha NTSH Marripadu bit-II 2015 plantation	N 14.667889 E 79.847138	DSO 149 (2016-17)

18	Second year maintenance of 20 Ha NTSH Marripadu 2014 plantation	N 14.649713 E 79.83878	DSO 151 (2016-17)
19	Second year maintenance of 20 Ha NTSH Ponugodu 2014 plantation	N 14.712483 E 79.635497	DSO 192 (2016-17)
20	Third year maintenance of 20 Ha NTSH 2013 plantation of Ponugodu location in Atmakur range	N 14.686846 E 79.614288	DSO 244 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. These activities include casualty replacement, weeding operations, soil tilling (inter-ploughing), coppice management, pruning of lower branches, fire line management and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows:

General recommendations for maintenance activities

- Intensify weeding operations, especially along plantation boundaries, to control *Lantana* and bushy grasses, minimizing competition and ensuring healthy plant growth.
- Continue maintaining clear and effective fire lines with regular clearing before dry seasons to enhance visibility and effectiveness in preventing forest fires.
- Install and maintain plantation boundary stones and boards to ensure accurate demarcation, facilitate monitoring, prevent encroachments, and complement contingency records.
- Maintain accurate and updated plantation journals, markers, and records to support ongoing identification, monitoring, and accountability.
- Continue timely and appropriate fertilizer application, with special focus on weaker plants to promote uniform growth and ensure optimal nutrient support.
- Carry out timely replanting with healthy bagged seedlings to maintain uniform density, improve survival rate, and strengthen overall plantation health.
- Implement routine coppice management to reduce competition from secondary shoots.
- Improve the frequency and timing of pruning operations to promote healthy plant structure and better bole formation.



Lakshmipuram beat, Kavali



Pakapudi beat, Venkatagiri

**Duthaluru beat, Udayagiri****Marripadu beat, Atmakur****Vadlapudi beat, Nellore****Nallapalem beat, Rapur**

3. Monitoring and Evaluation of Protection Activities

During 2016-17, a total of 9 protection activities were undertaken in Nellore division, out of which 2 activities were selected for monitoring and evaluation. Nellore range implemented the highest number with 7 activities, of which one was sampled. Udayagiri and Venkatagiri ranges carried out one activity each with Udayagiri's activity being sampled, while Venkatagiri's was not. No protection activities were reported from Atmakur, Kavali and Rapur ranges.

1. Providing chain link mesh (260 mts.) at Nagaravanam, Konlapudi beat

GPS Location: N 14.411942 E 79.893455 **SO no. and year:** DSO 370 (2016-17)

2. Fire line creation 2.5 kms at SR Puram beat of SR Puram section

GPS Location: N 15.002499 E 79.087341 **SO no. and year:** RSO 17 (2016-17)

A chain-link mesh fence constructed at Nagaravanam, Konlapudi beat under the CAMPA-NPV (Forest Fire Management) scheme was monitored and evaluated against the specifications recorded in the measurement book (MB). The fence measured 1.5 m in height and 260 rmt in length. Field verification confirmed that the actual dimensions matched the MB records, indicating no deviations from the approved specifications. The installation was found to be well maintained with intact pillars and no visible damage along the entire stretch.

The fence was erected with the primary objective of preventing the entry of animals and unauthorized persons into Nagaravanam, thereby minimizing disturbance and potential damage to the area. A fire line constructed under the CAMPA-NPV (Forest Fire Management) scheme in SR Puram beat was monitored and evaluated against the specifications recorded in the measurement book (MB) and through on-site verification. The fire line measured 3 meters in width and 2,500 rmt in length, with field measurements matching the MB records, indicating no discrepancies in dimensions. It was laid out along and across the natural forest area, following the existing inspection path. However, the fire line's visibility was poor due to dense growth of grass and weeds, indicating inadequate post-creation maintenance. This compromises its

effectiveness as a fire prevention measure, highlighting the need for immediate clearing and regular upkeep to ensure functionality.



Chain-link mesh fencing Nagaravanam



Fire lines in SR Puram beat

4. Monitoring and Evaluation of Soil and Moisture Conservation Activities

During 2016-17, a total of ten Soil and Moisture Conservation (SMC) activities were implemented in Nellore Forest Division. Out of these, 2 activities were selected for monitoring and verification. Kavali and Udayagiri ranges each carried out 5 SMC activities, with 1 activity sampled from each range. No SMC works were reported from the other ranges including Nellore, Atmakur, Rapur and Venkatagiri during this period.

1. Construction of check dam 9.00 M long across Peddavagu at Kesavaram VSS area

GPS Location: N 14.900474 E 79.825762

SO no. and year: DSO 299 (2016-17)

A check dam constructed across Peddavagu in Kesavaram beat was monitored and evaluated against the specifications recorded in the measurement book (MB) and verified through field measurements. The dimensions of the check dam: length: 9.00 meters, width: 1.35 meters and depth: 0.45 meters. Field verification confirmed that the actual measurements matched the specifications in the measurement book, indicating no deviations from the approved design. The structure was found to be well maintained; however, the total water holding capacity has been reduced due to the accumulation of silt and sediment. In addition, minor repairs are required in the apron section. It is recommended that de-silting operations be carried out to restore the storage capacity and ensure the continued effectiveness of the check dam.

2. Formation of mini percolation no.4 Bhairavani konda RF Arlapadia beat

GPS Location: N 15.059418 E 79.24962

SO no. and year: RSO 21 (2016-17)

A mini percolation tank constructed at Arlapadia beat was monitored and evaluated against the specifications recorded in the measurement book (MB) and verified through field measurements. The dimensions of percolation tank: length: 24.00 meters, width: 20.00 meters and depth: 1.64 meters. Field verification confirmed that the measured dimensions matched the MB records, indicating no deviations from the approved specifications. However, due to inadequate maintenance, the percolation tank located in a low-lying area has experienced significant silt accumulation and weed growth. Additionally, overflow during the monsoon has caused displacement and distortion of the stone dry packing along the edges. To restore and maintain the tank's full storage capacity, regular de-siltation and repair of the stone packing are recommended.



Check dam at Peddavagu



Mini PT no.4 at Arlapadia beat

5. Monitoring and Evaluation of Construction Activities

During 2016-17, a total of eleven construction activities were implemented in Nellore Forest Division. Out of these, 2 activities were selected for monitoring and verification. All 11 activities were carried out in Nellore range, of which 2 were selected. No construction works were reported from other ranges including Atmakur, Kavali, Rapur, Udayagiri and Venkatagiri.

1. Formation of walking track in Nellore R.F for development of city forests

GPS Location: N 14.411634 E 79.892364

SO no. and year: SDSO 12 (2016-17)

A length of 290 m walking track was developed in Nellore Reserve Forest as part of urban greening and biodiversity conservation efforts. Constructed with eco-friendly materials, 3.5 m wide track offers a safe and scenic space for walkers and joggers. Located within a naturally rich forest area, the track is regularly maintained to ensure public accessibility and environmental sustainability.

2. Cost and supply of children's play equipment at Nagaravanam

GPS Location: N 14.411968 E 79.892535

SO no. and year: DSO 283 (2016-17)

Nagaravanam, a key urban green space, has enhanced its recreational appeal through the installation of well-designed children's play equipment. This initiative promotes physical activity, social interaction and provides a space for families to enjoy nature together. The equipment has been thoughtfully integrated into the natural landscape, maintaining ecological harmony. With an emphasis on quality, safety and regular maintenance, the play area is designed to remain a safe and enjoyable environment for children and families, significantly enriching the park's overall utility.



Walking track in Nellore RF



Childrens play equipment at Nagaravanam

6. Monitoring and Evaluation of Other Activities

During 2016-17, a total of 153 activities were implemented under the “Others” category in the Nellore Forest Division, of which 32 activities were selected for monitoring and evaluation. Range-wise, Atmakur recorded the highest number with 34 activities (7 sampled), followed by Kavali with 28 activities (6 sampled), Udayagiri with 26 activities (5 sampled), Venkatagiri with 25 activities (5 sampled), Rapur with 24 activities (5 sampled), and Nellore with 16 activities (4 sampled). Document verification and cross-checking were conducted in the presence of Division and Range Office staff. The types of documents reviewed included sanction orders, estimation sheets, and work registers. Sanctioned amounts were found to be in alignment with actual expenditures, and all financial records were properly maintained and duly authenticated by the concerned officials, including the DFO, SDO, and FRO. Fund utilization was appropriate and consistent with approved estimates and CAMPA guidelines. Both internal audits conducted by the Conservator of Forests and external audits by the Accountant General’s office were carried out, ensuring transparency and compliance with financial and administrative protocols.

Key findings

- Plantation outcomes were mixed, with *Sterculia urens* plantations performing well, while *Hardwickia binata* and redsanders plantations faced poor growth.
- Encroachment and grazing pressures remained persistent threats to plantation survival.
- Verification of plantation areas revealed consistent overestimation compared to official records.
- Maintenance works were implemented but their effectiveness was undermined by inadequate signage and insufficient weed control.
- Protection and Soil and Moisture Conservation (SMC) structures were generally functional but weakened due to siltation and poor upkeep.
- Construction works related to eco-tourism and urban forestry were well executed and met quality standards.
- Financial and administrative compliance was strong across all “Other Works” activities, with proper record-keeping and audits.

Recommendations

- Species-site matching should be improved by avoiding planting sensitive species like Red Sanders on unsuitable soils.
- Protection measures should be strengthened through fencing, trenches, and active patrolling to mitigate grazing and encroachment.
- Maintenance quality should be enhanced with intensified weed management, particularly of lantana, systematic casualty replacement, and regular pruning.
- Structural upkeep of Soil and Moisture Conservation (SMC) works should be addressed through scheduled de-silting and timely repairs.
- Visibility and transparency should be ensured by installing and maintaining plantation boards and boundary stones.
- Community engagement should be expanded by involving Village Forest Societies (VSS) in all phases and conducting focus group discussions for feedback.

- Eco-tourism projects, such as walking tracks and play areas, should be leveraged to foster public support for forest conservation.

6. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN KADAPA DIVISION

Introduction

Kadapa division, also known as YSR Kadapa, is in Rayalaseema region of Andhra Pradesh between 13°50'40"–14°40'37" N latitude and 78°13'9"–79°14'39" E longitude. It is bordered by Annamayya and Chittoor districts in the south, Anantapur in the west, Kurnool in the northwest, and Nellore and Nandyal in the east. The Eastern Ghats traverse the region, shaping its hills, valleys, and fragmented forests. The climate is semi-arid to dry tropical, with an annual rainfall of about 660 mm, hot summers, and mild winters. Major hill ranges include Seshachalam, Palakonda, Lankamala, Veligonda, and Nallamalai, rising to 750 m. According to ISFR, Kadapa's forests are predominantly dry deciduous with open canopies, scrub, and degraded patches. The district is globally known for *Pterocarpus santalinus* (Red Sanders), an endemic and highly valuable hardwood. Other common species include *Hardwickia binata*, *Sterculia urens*, *Diospyros chloroxylon*, *Strychnos nux-vomica*, and *Vitex altissima*. Undergrowth of shrubs and grasses supports biodiversity and soil stability. While forest cover forms a significant portion of the district, much of it is open or scrub due to degradation from grazing and fuelwood collection. However, afforestation, protection measures, and natural regeneration in hill areas are gradually improving forest health. Kadapa's forests hold strong ecological and economic significance with potential for sustainable development and restoration.

During 2016-17, a total of 121 CAMPA activities were carried out in Kadapa Forest Division. Out of these, 29 activities (around 23 %) were selected for detailed monitoring and evaluation. In terms of range-wise distribution, Kadapa range, accounted for the highest number with 35 activities implemented, of which 9 were sampled. This was followed by Sidhout with 32 activities with 8 taken up for evaluation. Vempalli range implemented 28 activities, of which 7 were sampled. Vontimitta range implemented 26 activities, of which 5 were sampled. With respect to type of activities, other works constituted the largest share with 91 activities implemented and 18 evaluated, while maintenance works accounted for 22 activities with 6 sampled. Plantation activities were relatively fewer, with 6 implemented and 4 sampled. While protection works included 2 activities with 1 sampled. Notably, no construction and SMC activities were implemented during this year.

1. Monitoring and Evaluation of Plantation Activities

During 2016-17, Kadapa division carried out a total of 6 plantation activities under CAMPA, of which 4 activities (about 66 %) were selected for monitoring and evaluation. Range-wise distribution shows that Kadapa implemented 2 plantation activities with 1 taken up for evaluation. Vempalli reported 3 activities, of which 2 were sampled. While Vontimitta had a single activity, which was also included in the sample. Sidhout range, however did not report any plantation activities.

1.1 Kadapa range

A total of two plantation activities were implemented under the CAMPA scheme in Kadapa range. For monitoring and evaluation, one plantation site constituting 50 % of the total activities was randomly selected for assessment.

Table 47 Details of plantation selected in Kadapa range

Sl. no.	Plantation	SO no. and year
1	Raising of 20 Ha SMM (R.S. species) plantation in Palakonda RF, in Mamillapalli beat of Kadapa range	DSO 65 (2016-17)

Mamillapalli plantation site located in a dry deciduous forest biome and characterized by flat terrain with red soil is well-suited for the growth of drought-tolerant and low-maintenance species. Red soil while well-drained tends to be low in essential nutrients; therefore, periodic soil enrichment is recommended to enhance plant health and productivity.

Survival Percentage: Plantation demonstrates excellent ecological compatibility for *Pterocarpus santalinus* evidenced by a high survival rate of 92.56%. This outcome reflects the strong alignment between the site's topographic and climatic conditions notably the flat terrain, red soil and dry deciduous environment and the natural habitat requirements of the species.

Growth Performance: *Pterocarpus santalinus* in Mamillapalli plantation has exhibited healthy and uniform growth with recorded tree height ranging from 5.56 to 6.94 m and girth measurements between 29.73 and 38.66 cm. These figures confirm the species robust adaptability and reinforce the overall suitability of the site for its cultivation.

Table 48 Details of plantation enumerated in Kadapa range

Sl. no.	Plantation/ village name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Mamillapalli 20 Ha RS plantation	1	<i>Pterocarpus santalinus</i>	N 14.43455 E 78.882466	92.56	6.94 ±0.86	38.63 ±6.48
		2	<i>Pterocarpus santalinus</i>	N 14.435209 E 78.882854	90.90	6.38 ±1.04	37.60 ±7.96
		3	<i>Pterocarpus santalinus</i>	N 14.43548 E 78.882343	85.12	5.56 ±1.11	29.73 ±8.44
		4	<i>Pterocarpus santalinus</i>	N 14.435635 E 78.88184	80.16	6.22 ±0.57	33.22 ±4.90
		5	<i>Pterocarpus santalinus</i>	N 14.436282 E 78.881689	92.56	6.68 ±0.97	38.66 ±9.80
Plantation Average					88.26	6.35	35.56

1.2 Vempalli range

During 2016–17, a total of four plantation activities were implemented under the CAMPA scheme in Vempalli range. For monitoring and evaluation, 20 % of these activities, equivalent to one plantation site, were randomly selected for assessment.

Table 49 Details of plantations selected in Vempalli range

Sl. no.	Plantations	SO no. and year
1	Raising of 8 Ha SMM (NTSH) plantation at Bogadammachelu locality (compartment no. 614) of Idupulapaya & Redlacheruvu RF,	DSO 81 (2016-17)
2	Raising of 10 Ha SMM (RS species) plantation at Darlavanka locality (compartment no. 571) of Ganganapalli RF, of Gorlapalli beat of	DSO 47 (2016-17)

Idupulapaya and Gorlapalli plantations share similar environmental and soil characteristics making them both highly suitable for plantation development. Located on flat terrain with red soil these areas are well-suited for cultivation in dry or semi-arid climates due to the soil's good drainage and moderate fertility. Both plantations fall within a dry deciduous forest biome, characterized by distinct wet and dry seasons and seasonal leaf shedding. This biome supports plant species that are drought-tolerant and adapted to fluctuating water availability. Given these shared features, both Idupulapaya and Gorlapalli offer favorable conditions for sustainable plantation activities, particularly for crops and tree species suited to dryland agriculture.

Survival Percentage: At Idupulapaya site, species-wise survival rates indicate strong adaptability to local conditions with *Hardwickia binata* showing the highest survival at 84.29% making it the best-adapted species in this location. Other species such as *Dolichandrone crispera* and *Sterculia urens* also performed well with survival rates of 80.99% and 76.03% respectively. These figures reflect good overall plantation performance while also highlighting opportunities for further site-specific optimization to improve species resilience and growth. In contrast, Gorlapalli site recorded a notably high survival rate of 95.04% for *Pterocarpus santalinus* suggesting exceptional compatibility between this species and the site's conditions. This outstanding result underscores Gorlapalli's potential for targeted plantation development with highly compatible species.

Growth Performance: The growth performance across the two plantation sites highlights notable differences in ecological suitability and species response. At Idupulapaya plantation, tree height ranges from 2.11 to 4.40 m and girth from 20.30 to 34.10 cm indicating moderate growth with variability likely influenced by micro-site conditions and species-specific traits. This suggests that while the site supports plantation activity, growth outcomes may benefit from targeted species selection and localized management strategies. In contrast, Gorlapalli plantation shows significantly superior growth with tree height ranging from 7.99 to 9.98 m and girth from 31.04 to 36.25 cm. These figures point to highly favourable ecological conditions and excellent species-site compatibility, reinforcing Gorlapalli's potential for high-performance plantations with optimized species selection.

Table 50 Details of plantations enumerated in Vempalli range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Coordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Idupulapaya 8 Ha NTSH plantation	1	<i>Hardwickia binata</i>	N 14.328847 E 78.493849	84.29	4.40 ±0.36	-	26.8 ±4.40
		2	<i>Dolichandrone crispa</i>	N 14.328616 E 78.494045	80.99	3.24 ±0.25	24.29 ±3.53	-
		3	<i>Sterculia urens</i>	N 14.328747 E 78.494864	73.55	2.11 ±0.62	20.30 ±3.23	-
		4	<i>Sterculia urens</i>	N 14.328336 E 78.496415	76.03	2.45 ±0.56	22.14 ±3.90	-
		5	<i>Hardwickia binata</i>	N 14.328789 E 78.495546	77.68	4.40 ±0.38	-	34.1 ±5.17
Plantation Average					78.50	3.32	22.24	30.45

2	Gorlapalli 10 Ha RS plantation	1	<i>Pterocarpus santalinus</i>	N 14.397594 E 78.710307	95.04	7.99 ±1.22	-	31.04 ±6.78
		2	<i>Pterocarpus santalinus</i>	N 14.397824 E 78.710184	91.73	9.98 ±3.54	-	35.29 ±4.67
		3	<i>Pterocarpus santalinus</i>	N 14.397709 E 78.709772	92.56	8.42 ±0.72	-	36.25 ±29.14
		4	<i>Pterocarpus santalinus</i>	N 14.397855 E 78.709709	93.38	8.63 ±0.73	-	34.07 ±4.23
		5	<i>Pterocarpus santalinus</i>	N 14.397295 E 78.709950	91.73	8.34 ±0.67	-	34.03 ±4.58
Plantation Average					94.87	5.99	22.24	33.08

1.3 Vontimitta range

During 2016-17, one plantation activity was implemented under the CAMPA scheme in Vontimitta range. For monitoring and evaluation, 20 % of these activities equivalent to one plantation site was randomly selected for assessment.

Table 51 Details of plantation selected in Vontimitta range

Sl. no.	Plantation	SO no. and year
1	Raising of 20 Ha NTSH species (SMM) plantation at compartment no. 495, Chintalakunta beat of Vontimitta range	DSO 55 (2016-17)

Chintalakunta plantation site is flat with red soil which offers moderate fertility and good drainage ideal for tree growth. The site is located within a dry deciduous forest biome, characterized by a hot climate and tree species that shed leaves during the dry season.

Survival Percentage: Plantation demonstrates strong ecological compatibility for both *Dalbergia latifolia* and *Hardwickia binata* with survival rates of 94.21% and 87.60% respectively. The higher survival rate of *Dalbergia latifolia* indicates it is particularly well-suited to the site. *Hardwickia binata* also exhibits good performance reflecting its drought-tolerant nature. Both species are observed to be thriving under the given site conditions.

Growth Performance: Tree growth in Chintalakunta varies with average height ranging from 2.71 m to 6.46 m and average girth (GBH) ranging from 23.53 cm to 39.57 cm. This variability is attributed to species characteristics, soil properties, climatic conditions, water and nutrient availability, tree age and interspecies competition.

Table 52 Details of plantation enumerated in Vontimitta range

Sl. no.	Plantation/ village name	Plot no	Species name	GPS Coordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Chintala Kunta 20 Ha NTSH plantation	1	<i>Dalbergia latifolia</i>	N 14.36753 E 79.18138	94.21	3.40 ±0.33	32.37 ±4.50	-
		2	<i>Dalbergia latifolia</i>	N 14.36716 E 79.18127	92.56	3.24 ±0.43	-	27.57 ± 6.19
		3	<i>Dalbergia latifolia</i>	N 14.36652 E 79.18150	89.25	2.71 ±0.45	23.53 ±3.46	-

	4	<i>Hardwickia binata</i>	N 14.36580 E 79.18172	86.77	5.74 ±0.62	-	34.60 ±5.79
	5	<i>Hardwickia binata</i>	N 14.36523 E 79.18200	87.60	6.46 ±0.37	-	39.57 ±4.56
Plantation Average				90.07	4.31	27.95	33.91

Comparative assessment of plantations in Kadapa division during 2016-17

Plantations in Kadapa, Vempalli and Vontimitta ranges show varied success based on site conditions and species. Kadapa's Mamillapalli site is highly suitable for *Pterocarpus santalinus* with strong survival and growth. Vempalli's Gorlapalli site also shows excellent results for the same species while Idupulapaya has moderate growth needing management improvements. Vontimitta supports *Dalbergia latifolia* and *Hardwickia binata* well reflecting good adaptability. These results emphasize the need for careful species-site matching to optimize outcomes.

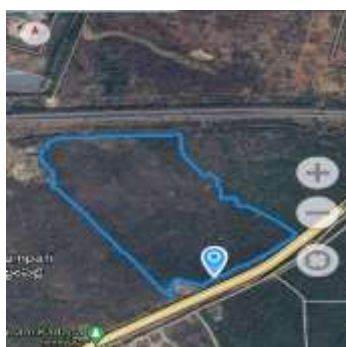
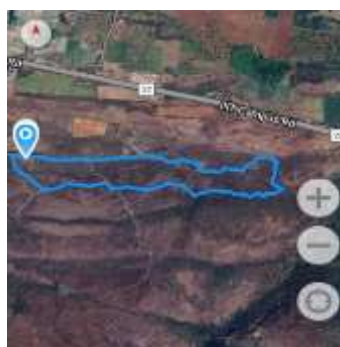
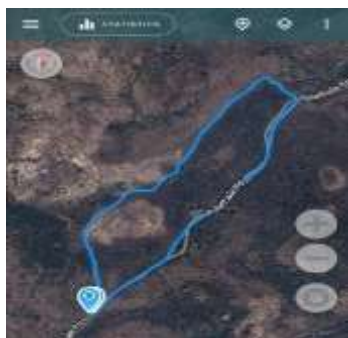
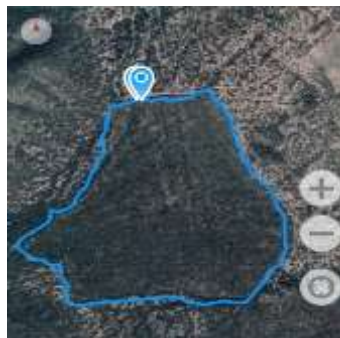
Verification of plantation area and boundaries

In Kadapa division during 2016-17, measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

Table 53 Details of plantation area perambulation in Kadapa division

Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising of 20 Ha SMM (R.S. Species) plantation in Sanramakula Penta locality of Palakonda RF, Mamillapalli beat of Mamillapalli section	20 Ha	20.32 Ha
2	Raising of 8 Ha SMM (NTSH) plantation at Bogadamachelu locality (compartment no. 614) of Idupulapaya & Redlacheruvu RF, of Idupulapaya beat	8 Ha	15.01 Ha
3	Raising of 10 Ha SMM (R.S. Species) plantation at Darlavanka locality (compartment no. 571) of Ganganapalli RF, of Gorlapalli beat of Vempalli range	10 Ha	16.17Ha
4	Raising of 20 Ha NTSH species (SMM) plantation at compartment no. 495, Chintalakunta beat	20 Ha	21.6 Ha

The Perambulation was done in presence of forest officer and as per the demarcation shown by the watcher/guard working as in-charge of the plantation. Among 4 plantations, the perambulated area was found to be slightly larger than the officially recorded extent. This variation resulted from natural field constraints such as rocky terrain, dense jungle growth, trenches and barren patches which necessitated traversing the outer accessible boundary rather than the exact demarcated limits. At Mamillapalli plantation, the perambulated area measured 20.32 hectares against the recorded 20 hectares, showing a marginal excess of 0.32 hectares. Similarly, the Idupulapaya plantation showed an excess of 7.01 hectares, while Gorlapalli plantation exceeded by 6.17 hectares and Chintalakunta plantation recorded an excess of 1.6 hectares. These findings were validated through spatial data analysis using QGIS software and further confirmed through complete boundary walks with the Geo Tracker mobile application. Photographic evidence collected during the exercise supports the observations.

**Mamillapalli 20.32 Ha****Idupulapaya 15.01 Ha****Gorlapalli 16.17 Ha****Chintalakunta 21.6 Ha**

Health Status of Plantations: The overall health status of plantation was found to be satisfactory across all four sites with no observed incidences of insect or pest damage affecting any of the species. All plants appeared healthy, with no visible signs of infestation or physiological stress. This indicates that the plantations are being well-maintained and that the environmental conditions at each site are favourable for healthy and sustained plant growth.

Protection Measures: To safeguard plantations from fire and other environmental threats, several protection measures were implemented, including the creation and maintenance of fire lines, development of inspection paths, and deployment of fire watchers. These measures have proven generally adequate in reducing plantation vulnerability, particularly during the dry season. However, ongoing maintenance and clear visibility of these features are essential to ensure their continued effectiveness.

Biotic Pressure on Plantations: All four plantation areas show no signs of grazing or browsing indicating effective protection from human and livestock interference. This absence of biotic pressure has likely contributed to improved survival rates and healthy plantation growth.

Maintenance of Plantation Journals and Records: Plantation journals and records are generally well-maintained at Mamillapalli, Idupulapaya and Chintalakunta plantations with baseline information properly documented. However, there is a need for regular and timely updates of key plantation parameters such as survival rates, growth metrics, and maintenance activities to ensure that the records accurately reflect current field conditions and remain relevant for ongoing monitoring and evaluation. Each plantation is periodically inspected by the concerned forest official and their observations are duly recorded. At Gorlapalli plantation, the journal was not presented during the inspection marking a lapse in documentation and limiting verification of maintenance activities and plantation history.

Vana Samrakshana Samithi (VSS): The involvement of the Vana Samrakshana Samithi (VSS) or Joint Forest Management Committee (JFMC) was evident at all four plantation sites indicating active community engagement in the protection, maintenance and monitoring of plantation activities. This reflects the core principles of Joint Forest Management (JFM) which emphasize participatory forest governance. In recognition of this involvement, Focus Group Discussions (FGDs) were conducted at Mamillapalli, Idupulapaya, Gorlapalli and Chintalakunta plantations to gather insights from community members regarding their roles, contributions and challenges in plantation management.



Mamillapalli plantation



Idupulapaya plantation



Gorlapalli plantation



Chintalakunta plantation

2 Monitoring and Evaluation of Maintenance Activities

A total of 22 maintenance activities were implemented in Kadapa Division, of which 6 activities were selected for monitoring and evaluation. Range-wise analysis indicates that Vempalli range recorded the highest number with 8 activities, of which 2 were sampled. This was followed by Vontimitta range with 7 activities, 1 of which was sampled. Kadapa range with 5 activities, of which 2 sampled and Sidhout with 2 activities, 1 sampled.

Table 54 Maintenance activities selected for evaluation in Kadapa division

Sl. no.	Maintenance Activities	GPS Co-ordinates	SO no. and year
Kadapa range			
1	Estimate for the first-year maintenance of 10 Ha (SMM) plantation at Palakonda RF of Madimadugu East beat	N 78.809864 E 14.360551	DSO 80 (2016-17)
2	Second year maintenance of 10 Ha (SMM) NTSH plantation in Ramaswamykonda of Mamillapalli beat of Mamillapalli section	N 78.884147 E 14.434796	SDSO 12 (2016-17)
Vempalli range			
3	Estimate for the first-year maintenance of 20 Ha SMM (RS Species) plantation at Pulikona locality of Bonagondhicheruvu	N 14.30714 E 78.495619	DSO 50 (2016-17)

4	Estimate for the second-year maintenance of 5 Ha SMM (NTSH) plantation in Gornumakulapalli beat of Vempalli sect	N 14.435914 E 78.495619	DSO 149 (2016-17)
Sidhout range			
5	Third year maintenance of 10 Ha LIM plantation in Muthukur beat of Kondur section in Sidhout	N 14.559131 E 79.098367	DSO 89 (2016-17)
Vontimitta range			
6	Estimate for the first-year maintenance of 20 Ha Red Sanders plantation (SMM) in Nandalur beat	N 14.287398 E 79.123816	DSO 56 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. These activities include casualty replacement, weeding operations, soil tilling (inter-ploughing), coppice management, pruning of lower branches, fire line management, and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Intensify weeding operations, especially along plantation boundaries, to control Lantana and bushy grasses, minimizing competition and ensuring healthy plant growth.
- Continue maintaining clear and effective fire lines, with regular clearing before dry seasons to enhance visibility and effectiveness in preventing forest fires.
- Install and maintain plantation boundary stones and boards to ensure accurate demarcation, facilitate monitoring, prevent encroachments, and complement contingency records.
- Maintain accurate and updated plantation journals, markers, and records to support ongoing identification, monitoring, and accountability.
- Continue timely and appropriate fertilizer application (DAP @ 20 g/plant), with special focus on weaker plants to promote uniform growth and ensure optimal nutrient support.
- Carry out timely replanting with healthy bagged seedlings to maintain uniform density, improve survival rate, and strengthen overall plantation health.
- Implement routine coppice management to reduce competition from secondary shoots.
- Improve the frequency and timing of pruning operations to promote healthy plant structure and better bole formation.



Maddimadugu beat, Kadapa



Gornumakulapalli beat, Vempalli



Muthukur beat, Sidhout



Nandalur beat, Vontimitta

3 Monitoring and Evaluation of Protection Activities

During 2016-17, a total of 2 protection activities were undertaken in Kadapa division, of which 1 was sampled. Sidhout reported 1 protection activity, which was selected for sampling. While Vontimitta also reported 1 protection activity, though it was not sampled. No protection activities were undertaken in Kadapa and Vempalli ranges during this period.

3.1 Creation of new fire lines at Rollabodu beat of Gollapalli section in Sidhout range

GPS location: N 14.562263 E 78.936783

SO no. and year: DSO 25 (2016-17)

A fire line was created and maintained in Rollabodu beat under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of new fire line are width - 6 m and length -1900 rmt. The field measurements matched those in the measurement book, indicating no deviations. The fire line was found to be well maintained with clear visibility along both the periphery and inspection path. Only minimal grass or weed growth was observed indicating regular upkeep. However, it was noted that the width of the fire line has reduced, which may affect its effectiveness in controlling the spread of fire.



Fire line at Rollabodu beat of Sidhout range

4 Monitoring and Evaluation of Other Activities

In 2016–17, ninety-one activities under the “Others” category were undertaken in Kadapa Division, of which eighteen were sampled for verification. Sidhout Range reported the highest number (29 activities, 6 sampled), followed by Kadapa (28 activities, 6 sampled), while Vempalli and Vontimitta recorded 17 activities each (3 sampled in each). Verification was conducted in the presence of Division and Range staff, covering sanction orders, estimation sheets, and work registers. Sanctioned amounts corresponded with actual expenditures, and financial records were properly maintained and authenticated by the DFO, SDO, and FRO. Fund

utilization was in line with approved estimates and CAMPA guidelines. Both internal audit (Conservator of Forests) and external audit (Accountant General's Office) confirmed transparency and compliance with prescribed financial and administrative protocols.

Key Findings

- Overall, plantations performed strongly, with notable success in *Pterocarpus santalinus* at Mamillapalli and Gorlapalli, and *Dalbergia latifolia* at Chintalakunta.
- Perambulation revealed consistent excess areas compared to recorded data, indicating gaps in documentation.
- Routine maintenance operations were implemented; however, deficiencies in plantation signage and record-keeping were frequently observed.
- Fire lines were effectively created and generally well maintained, though periodic clearing was required to maintain proper widths.
- No construction or Soil and Moisture Conservation (SMC) activities were undertaken, limiting overall ecological impact.
- Financial records for “other works” were well maintained, but some supporting documentation was incomplete.

Recommendations

- Consolidate species-site successes by replicating high-performing plantations, such as *Pterocarpus santalinus* in Gorlapalli, in suitable areas.
- Ensure plantation journals are updated regularly and consistently, including the installation and maintenance of plantation boards and boundary stones.
- Institutionalize practices such as coppice regulation, pruning, and replanting to maintain plantation density, health, and long-term productivity.
- Strengthen fire line upkeep through periodic widening, clearance of vegetation, and regular monitoring.
- Introduce Soil and Moisture Conservation (SMC) and construction work to enhance ecological resilience and overall forest health.
- Address gaps in record-keeping by mandating the complete submission of registers, estimates, and supporting documentation.
- Maintain and expand the involvement of Village Forest Support (VSS) committees to sustain participatory forest management and local stewardship.

7. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN PRODDATUR DIVISION

Introduction

Proddatur Forest Division, located in the western part of YSR Kadapa District, Andhra Pradesh covers an estimated 620 km² of notified forest area. The division falls within the semi-arid zone of the Rayalaseema region with terrain comprising low hill ranges, shallow valleys and plains influenced by the Penna River basin. The forests are primarily of the Southern Tropical Dry Deciduous and Tropical Thorn Forest types. The vegetation is dominated by species such as *Anogeissus latifolia*, *Hardwickia binata*, *Albizia amara*, *Chloroxylon swietenia* and *Terminalia* spp. In addition, pockets of the endemic and valuable Red Sanders (*Pterocarpus santalinus*) are present in suitable habitats. Teak plantations have also been established in parts of the division. The climate is semi-arid with annual rainfall averaging 700-800 mm, mostly from the southwest monsoon. Extended dry spells and high summer temperatures make the forests prone to fires, grazing and biotic pressures. Ecologically, the forests of Proddatur Division play a key role in soil and water conservation supporting the Penna River catchment and providing habitat for dryland biodiversity. Though wildlife is limited small mammals, reptiles and bird species are common. Management efforts focus on plantation development, soil and moisture conservation works, fire line maintenance, boundary demarcation and community participation through Vana Samrakshana Samithis (VSS). Special attention is given to the conservation of Red Sanders due to its ecological and economic significance. Overall, Proddatur Forest Division represents a fragile but vital dry deciduous landscape, requiring effective protection and sustainable management to maintain its ecological balance and support local livelihoods.

During the period 2016-17, a total of 146 CAMPA activities were implemented in Proddatur Forest Division. Of these, 35 activities, representing approximately 23%, were selected for detailed monitoring and evaluation. Among the five forest ranges, Badvel carried out the highest number of activities with 41, of which 9 were evaluated. Porumamilla followed closely with 36 activities selecting 8 for evaluation. Onipenta implemented 29 activities with 7 included in the evaluation sample. Proddatur carried out 23 activities with 7 sampled, while Muddanur conducted 17 activities, of which 4 were selected for evaluation. In terms of activity type, other works constituted the largest share with 102 activities implemented and 24 sampled. This was followed by maintenance activities (29 implemented; 6 sampled), plantation (9; 4) and protection (6; 1). Notably, no construction and SMC works were reported during this period.

1. Monitoring and Evaluation of Plantation Activities

During the period 2016-17, Proddatur Forest Division implemented a total of nine plantation activities under the CAMPA programme, of which four activities representing approximately 44 % were selected for monitoring and evaluation. At the range level, Porumamilla implemented the highest number of plantations with four activities, of which one was sampled. Badvel undertook two plantation activities, with one included in the evaluation sample. Proddatur, Muddanur and Onipenta each implemented two plantation activities as well; however, only Proddatur and Onipenta had one activity each selected for evaluation, while no plantation from Muddanur was sampled for monitoring.

1.1 Porumamilla range

A total of four plantation activities were implemented under the CAMPA scheme in

Porumamilla range during 2016–17. For monitoring and evaluation, 20 % of these activities, equivalent to one plantation site, was randomly selected for assessment.

Table 55 Details of plantation selected in Porumamilla range

Sl. no.	Plantation	SO no. and year
1	Raising of 20 Ha Red Sander plantation at Bodagaragu locality in compartment no. 1170, Siddavaram beat of Porumamilla range of Proddatur WL division under CAMPA (NPV)	DSO 42 (2016-17)

Siddavaram site falls under the tropical dry deciduous forest category characterized by seasonal leaf fall, dry climatic conditions and moderate annual rainfall ranging between 600-700 mm. The terrain is flat and the soil type is typical of dry deciduous regions. These site characteristics make it suitable for drought-tolerant species such as *Pterocarpus santalinus* and *Hardwickia binata* which are well-adapted to thrive under limited moisture conditions and prolonged dry spells.

Survival Percentage: Siddavaram plantation exhibited moderate to satisfactory growth performance with *Pterocarpus santalinus* achieving a survival rate of 59.32 % and *Hardwickia binata* recording a slightly higher survival rate of 65.03 %.

Growth Performance: In Siddavaram, the average tree height ranged from 0.96-4.72 m with girth measurements between 7.84 -37.20 cm.

Table 56 Details of plantation enumerated in Porumamilla range

Sl. no.	Plantation name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Siddavaram 20 Ha RS plantation	1	<i>Pterocarpus santalinus</i>	N 14.94130 E 79.054855	69.42	1.66 ±0.37	18.85 ±5.56	-
		2	<i>Pterocarpus santalinus</i>	N 14.94154 E 79.054724	66.11	1.37 ±0.38	16.06 ±4.14	-
		3	<i>Hardwickia binata</i>	N 14.941429 E 79.054956	68.59	4.72 ±0.60	-	35.47 ±4.42
		4	<i>Hardwickia binata</i>	N 14.941590 E 79.055352	60.60	4.05 ±0.39	37.20 ±3.29	-
			<i>Pterocarpus santalinus</i>		51.13	0.96 ±0.32	-	7.84 ±2.69
		5	<i>Hardwickia binata</i>	N 14.941195 E 79.055771	65.90	4.14 ±0.55	36.79 ±5.41	-
			<i>Pterocarpus santalinus</i>		50.64	1.05 ±0.46	-	9.95 ±5.28
		Plantation average					61.77	2.56

1.2 Badvel range

During 2016–17, a total of two plantation activities were implemented under CAMPA scheme in the Badvel range. For monitoring and evaluation, one plantation site constituting 50 % of the total activities was randomly selected for assessment.

Table 57 Details of plantation selected in Badvel range

Sl. no.	Plantation	SO no. and year
1	Raising of 20 Ha red sander plantation in Ganugapenta beat of Badvel range under CAMPA (NPV) scheme	DSO 32 (2016-17)

20 Ha RS plantation at Ganugapenta located on flat terrain with red soil in a dry deciduous forest, receives approximately 700 mm of rainfall annually. However, this plantation failed due to the aggressive spread of *Acacia pycnantha* which suppressed the growth of planted species. **Survival Percentage:** The 20 ha Raising of Seedlings (RS) plantation at Ganugapenta is assessed to have no surviving plants, as no live planted trees were observed during the field inspection. **Growth Performance:** 20 Ha RS plantation had no surviving trees and was not assessed for growth parameters.

GPS location: N 14.868938 E 79.065134

SO no. and year: DSO 32 (2016-17)

- The 20 Ha *Pterocarpus santalinus* plantation was established in 2016-17 and maintained for two years. However, the plantation was deemed unsuccessful due to the excessive proliferation of *Acacia pycnantha* which led to suppression and eventual poor growth of the planted tree species.
- During the site visit no surviving trees were observed and the overgrowth of *Acacia pycnantha* was prominent.

1.3 Onipenta range

During 2016–17, a total of one plantation activity was implemented under the CAMPA scheme in Onipenta Range. For monitoring and evaluation, this single plantation site constituting 100 % of the total activity was randomly selected for assessment.

Table 58 Details of plantation selected in Onipenta range

Sl. no.	Plantation	SO no. and Year
1	Raising of 20 Ha red sander plantation in Muddireddypalli beat of Onipenta range under CAMPA (NPV) scheme	DSO.29 (2016-17)

Plantation is located on a gentle slope with sedimentary soil, falling within a dry deciduous forest biome. The area receives an average annual rainfall of approximately 300 mm, classifying it as a low-rainfall zone.

Survival Percentage: Site showed high suitability for *Pterocarpus santalinus* with a recorded survival rate of 87.43 % indicating successful establishment under prevailing conditions.

Growth Performance: The plantation demonstrated healthy growth with average tree height ranging from 5.55 to 6.88 meters and girth (GBH) ranging from 30.08 to 33.63 cm reflecting strong vegetative performance of the species.

Table 59 Details of plantation enumerated in Onipenta range

Sl. no.	Plantation name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Muddi	1	<i>Pterocarpus santalinus</i>	N 14.875641 E 78.799163	91.73	6.05 ±1.11	30.16 ±5.45

	Reddypalli 20 Ha RS plantation	2	<i>Pterocarpus santalinus</i>	N 14.876095 N 78.799728	90.90	5.55 ±1.05	30.08 ±6.36
		3	<i>Pterocarpus santalinus</i>	N 14.877552 E 78.800423	85.12	6.78 ±5.80	32.13 ±2.90
		4	<i>Pterocarpus santalinus</i>	N 14.878078 E 78.800689	78.51	6.88 ±6.14	32.29 ±2.72
		5	<i>Pterocarpus santalinus</i>	N 14.87544 E 78.798561	90.90	6.21 ±0.77	33.63 ±6.40
Plantation average					87.43	6.29	31.65

1.4 Proddatur range

During 2016–17, a total of one plantation activity was implemented under the CAMPA scheme in Proddatur range. For monitoring and evaluation, this single plantation site constituting 100 % of the total activity was randomly selected for assessment.

Table 60 Details of plantation selected in Proddatur range

Sl. no.	Plantation	SO no. and year
1	Raising of 20.83 Ha at Nagasanipalle CA Block in Nagasanipalle beat of Proddatur range	DSO 26 (2016-17)

Plantation site at Nagasanipalle is characterized by flat terrain with sedimentary and gravelly soils, typical of a dry deciduous forest zone. The area receives an average annual rainfall of approximately 500 mm making it suitable for drought-tolerant and hardy native species.

Survival Percentage: Field evaluation indicated high survival rates confirming species suitability to the site conditions: *Hardwickia binata*: 83.05 %, *Azadirachta indica*: 82.64 % and *Dolichandra rispana*: 78.51 %.

Growth Performance: The plantation demonstrated healthy vegetative growth with average height ranging from 3.26 to 5.27 m and average girth ranging from 29.33 to 34.67 cm. These figures suggest successful establishment and favourable site-species compatibility.

Table 61 Details of plantation enumerated in Proddatur range

Sl. no.	Plantation /village name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth	
						Height (m)	Collar Girth (cm)
1	Nagasanip alle	1	<i>Hardwickia binata</i>	N 14.670471 E 78.819086	82.64	3.67 ±0.48	33.46 ±5.80
		2	<i>Hardwickia binata</i>	N 14.668668 E 78.818682	83.47	3.26 ±0.49	32.78 ±5.61
		3	<i>Azadirachta indica</i>	N 14.669541 E 78.818645	80.16	4.76 ±0.29	29.33 ±2.94
		4	<i>Dolichandran rispan</i>	N 14.668389 E 78.81899	78.51	5.27 ±0.25	29.81 ±2.87
		5	<i>Azadirachta indica</i>	N 14.667364 E 78.818916	85.12	4.35 ±0.37	34.67 ±4.78
Plantation average					81.98	4.26	32.01

Comparative assessment of plantations in Proddatur division during 2016-17

The comparative assessment of plantations across Porumamilla, Badvel, Onipenta and Proddatur ranges highlights significant differences in survival rates and growth performance particularly for native species such as *Pterocarpus santalinus*, *Hardwickia binata* and others. In Porumamilla range (Siddavaram plantation), the performance was moderate to satisfactory with *Pterocarpus santalinus* achieving a survival rate of 59.32% and *Hardwickia binata* slightly higher at 65.03%. Growth performance showed wide variability with tree height ranging from 0.96 to 4.72 m and girths from 7.84 to 37.20 cm, indicating a mix of stunted and healthy trees. In stark contrast, Badvel range (Ganugapenta plantation) was not having any trees, with no surviving trees observed during field inspections. Consequently, no growth data could be collected highlighting poor site-species compatibility or significant management issues. On the other hand, Onipenta range demonstrated excellent suitability for *Pterocarpus santalinus* recording a high survival rate of 87.43%. Growth performance was strong with tree height between 5.55 and 6.88 m and girths from 30.08 to 33.63 cm indicating robust vegetative development and ideal site conditions. Similarly, Proddatur range also showed high survival rates confirming good species-site compatibility. *Hardwickia binata* (83.05%), *Azadirachta indica* (82.64%) and *Dolichandra rispana* (78.51%) all exhibited healthy establishment. Growth parameters were promising with average height ranging from 3.26 to 5.27 m and girths between 29.33 and 34.67 cm reflecting consistent and favourable growth across species. Overall, Onipenta and Proddatur ranges demonstrated the best plantation performance in terms of both survival and growth indicating successful site selection and species suitability. Porumamilla range showed moderate results with some potential while the Badvel range clearly requires intervention due to complete let-down of establishment.

Verification of plantation area and boundaries

In Proddatur division during 2016-17, measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

Table 62 Details of plantation area perambulation in Proddatur division

Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising of 20 Ha red sander plantations at Bodagaragu locality in compartment no. 1170, Siddavaram beat of Porumamilla range of Proddatur WL	20 Ha	26.81 Ha
2	Raising of 20 Ha red sander plantation in Ganugapenta beat of Badvel range under CAMPA (NPV) scheme	20 Ha	25.12 Ha
3	Raising of 20 Ha Red sander plantations in Muddireddypalli beat of Onipenta range	20 Ha	20.82 Ha
4	Raising of 20.83 Ha at Nagasanipalli CA block in Nagasanipalle beat of Proddatur range	20.83 Ha	23.16 Ha

Perambulation of the plantation area was carried out in the presence of the designated Forest Officer and based on the demarcation indicated by the watcher/guard responsible for each site. During the verification process, it was observed that the perambulated area for all four plantations exceeded the officially recorded extent. This variance is primarily attributed to the

inclusion of rocky terrain, trenches and barren patches within the plantation boundaries areas that were not accounted for in the original documentation. The actual extent of each plantation was measured using QGIS software, which confirmed the following deviations from the recorded area:

- 20 Ha RS Siddavaram plantation (Porumamilla): Exceeded by 6.81 Ha
- 20 Ha RS Ganugapenta RS plantation (Badvel): Exceeded by 5.12 Ha
- 20 Ha RS Muddireddypalli RS plantation (Onipenta): Exceeded by 0.82 Ha
- 20.83 Ha NTSH Nagasanipalli plantation (Proddatur): Exceeded by 2.33 Ha

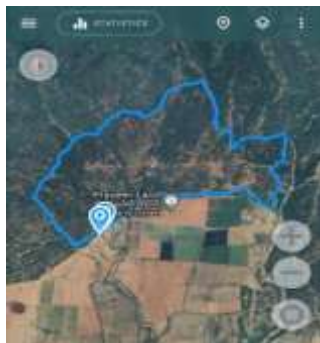
The verification was conducted through physical perambulation using the Geo Tracker mobile application, which facilitated the collection of geotagged photographs and GPS coordinates for accurate documentation. These visual and spatial records are provided below for reference.



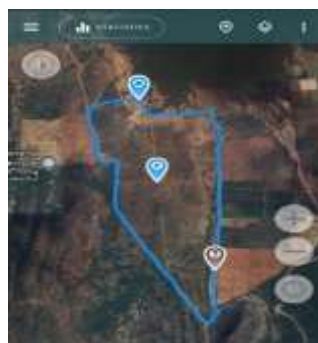
Siddavaram 26.81 Ha



Ganugapenta 25.12 Ha



Muddireddypalli 20.82 Ha



Nagasanipalli 23.16 Ha

Health Status of Plantation: Based on field observations across the Siddavaram, Ganugapenta and Nagasanipalli plantations the planted species showed no visible signs of insect or pest damage. The plantations were generally found to be in healthy condition. However, at the Muddireddypalli plantation, evidence of insect-related damage was observed indicating the presence of pest activity within the area. This highlights the need for regular pest monitoring and the implementation of timely control measures to prevent further impact on plantation health.

Protection Measures: To safeguard plantations from fire and other environmental threats, several protection measures were implemented, including the creation and maintenance of fire lines, development of inspection paths, and deployment of fire watchers. These measures have proven generally adequate in reducing plantation vulnerability, particularly during the dry

season. However, ongoing maintenance and clear visibility of these features are essential to ensure their continued effectiveness.

Biotic Pressure on Plantations: Incidents of grazing and browsing pressure were noted in all four plantations. However, these pressures have been significantly reduced through the creation of peripheral trenches and the deployment of plantation watchers, which have helped restrict the entry of cattle from nearby villages.

Maintenance of Plantation Journals and Records: Plantation journals and records are generally well-maintained in all four plantations with baseline information properly documented. However, there is a need for regular and timely updates of key plantation parameters such as survival rates, growth metrics, and maintenance activities to ensure that the records accurately reflect current field conditions and remain relevant for ongoing monitoring and evaluation. Each plantation is periodically inspected by the concerned forest official and their observations are duly recorded.

Vana Samrakshana Samithi (VSS): The involvement of the Vana Samrakshana Samithi (VSS) or Joint Forest Management Committee (JFMC) was evident in three of four plantation sites indicating active community engagement in the protection, maintenance and monitoring of plantation activities. This reflects the core principles of Joint Forest Management (JFM) which emphasize participatory forest governance. In recognition of this involvement, Focus Group Discussions (FGDs) were conducted to gather insights from community members regarding their roles, contributions, and challenges in plantation management. However, at the Muddireddypalli plantation, no such involvement was recorded; therefore, a Focus Group Discussion (FGD) was not conducted at that site.



Siddavaram plantation



Ganugapenta plantation



Muddireddypalli plantation



Nagasanipalli plantation

2. Monitoring and Evaluation of Maintenance Activities

A total of 29 maintenance activities were implemented across Proddatur Division, of which 6 activities were selected for monitoring and evaluation. A range-wise analysis shows that both

Badvel and Porumamilla ranges had the highest number of activities with 9 each and 2 activities sampled from each. Muddanur and Onipenta ranges followed with 5 activities each with 1 activity sampled from both. The Proddatur range carried out 1 activity but none were selected for evaluation.

Table 63 Maintenance activities selected for evaluation in Proddatur division

Sl. no.	Maintenance Activities	GPS Co-ordinates	SO no. and year
Muddanur range			
1	Second year maintenance of 25 Ha NTSH plantation in B.K. Mala beat of Muddanur range	N 14.654766 E 78.289172	DSO 75 (2016-17)
Onipenta range			
2	First year maintenance of 20 Ha NTSH plantation in Kothapalli beat of Onipenta range	N 14.883966 E 78.772282	DSO 92 (2016-17)
Badvel range			
3	Second year maintenance of 25 Ha RS plantation in Lothuvanka beat of Badvel range under CAMPA Scheme	N 14.71677 E 78.984421	DSO 151 (2016-17)
Porumamilla range			
4	First year maintenance of 3.224 Ha plantation under CAMPA-CA (diversion of 3.224 Ha of forest land for laying of road to B.K. Mala temple from Mallela Lavanur road)	N 14.994734 E 78.868141	DSO 161 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. These activities include casualty replacement, weeding operations, soil tilling (inter-ploughing), fire line management and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Prioritize weeding, especially along plantation boundaries. Focus on controlling Lantana and bushy grasses to reduce competition and support healthy plant growth.
- Regularly clear fire lines, particularly before the dry season. Ensure visibility and effectiveness in preventing and managing forest fires.
- Place plantation boundary stones and boards for accurate demarcation. This facilitates monitoring, prevents encroachments and complements contingency records.
- Keep plantation journals, markers and records updated and accurate. This supports identification, tracking progress and accountability.
- Replant promptly using healthy, bagged seedlings. Helps maintain uniform density, improves survival rates and strengthens plantation health.



B.K. Mala beat, Muddanur



Ramapuram beat, Badvel

3. Monitoring and Evaluation of Protection Activities

During 2016-17, Proddatur Forest Division undertook a total of six protection activities across various ranges. Out of these, only one activity was selected for monitoring and evaluation. The distribution of these activities was as follows: Onipenta range implemented two protection activities but neither was selected for evaluation. Proddatur, Muddanur, Badvel and Porumamilla each implemented one activity. Among these, only the activity from the Muddanur range was chosen for monitoring and evaluation.

3.1 Creation of new fire line in Settivaripalli beat of Muddanur range

GPS location: N 14.793913 E: 78.271981

SO no. and year: RSO 09 (2016-17)

The fire line established under the CAMPA-NPV scheme in Settivaripalli beat measures 3 m in width and 2843 rmt in length consistent with official records. During monitoring, it was found that dense growth of grasses and weeds especially in hilly terrain had reduced its visibility and effectiveness. Poor maintenance was noted limiting the fire line's ability to prevent or control forest fires.



Fire line at Settivaripalli beat

4. Monitoring and Evaluation of Other Activities

In Proddatur division during the year 2016-17, a total of 102 activities were implemented under the "Others" category, out of which 24 were selected for monitoring and evaluation. Among the ranges, Badvel reported the highest number of activities with 29, of which 6 were sampled. This was followed by Porumamilla with 22 activities (5 sampled), Onipenta with 21 activities (5 sampled), Proddatur with 20 activities (6 sampled), and Muddanur with the lowest at 10 activities (2 sampled). Document verification and cross-checking of these activities were carried

out in the presence of the Division and Range Office staff. The types of documents reviewed included sanction orders, estimation sheets, and work registers. It was found that the sanctioned amounts were in alignment with the actual expenditures, and all financial records were properly maintained and duly authenticated by the concerned officials, including the Divisional Forest Officer (DFO), Sub-Divisional Officer (SDO) and Forest Range Officer (FRO). The utilization of funds was appropriate and consistent with the approved estimates and guidelines. Additionally, both internal and external audits were conducted internally by the Conservator of Forests and externally by the Accountant General's Office. This multi-level audit approach ensured transparency and compliance with financial and administrative protocols under the CAMPA scheme. However, during the verification of records for the year 2016-17, discrepancies in expenditure amounts were noted across several ranges. In the Onipenta range, mismatches were observed for DSO numbers 48, 68, and 96. Similar inconsistencies were found in the Porumamilla range for DSO numbers 49, 55, 87, and 95. In Proddatur range, mismatches were identified for DSO 97 and RSO 24. These discrepancies were primarily attributed to typographical errors in the lists of activities provided by the Kadapa Divisional Office and were acknowledged by the respective range offices in their records.

Key findings

- Plantations exhibited mixed outcomes: strong performance at Muddireddypalli and Nagasanipalle contrasted with no surviving tree at Ganugapenta and only moderate results at Siddavaram.
- Verification of plantation areas consistently revealed higher actual extents than recorded, exposing weaknesses in documentation.
- Maintenance activities were generally implemented, but plantation boards were frequently missing or damaged.
- Fire lines under protection works were constructed but poorly maintained, reducing their effectiveness.
- No construction or SMC activities were implemented, limiting ecological impact.
- Financial compliance in “other works” was strong, though record discrepancies were observed.

Recommendations

- Strengthen species-site matching and avoid areas prone to invasive species like *Acacia pycnantha*.
- Enhance plantation visibility through consistent installation and upkeep of plantation boards and boundary stones.
- Improve maintenance through timely weeding, pruning, and soil management, with particular attention to invasive control.
- Establish systematic upkeep of fire lines to ensure their functional role in fire prevention.
- Expand portfolio to include SMC and construction works for ecological resilience.
- Correct and reconcile financial documentation errors to ensure accuracy and transparency in reporting.

8. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN ANANTHAPURAMU DIVISION

Introduction

Ananthapuramu Division in Andhra Pradesh, spanning 10,184.85 sq.km, has one of the lowest forest covers in the state with only 245.45 sq.km (2.41 %) under forest cover. The area lacks any Very Dense Forests, with just 22.55 sq.km of Moderately Dense Forests and 222.90 sq.km of Open Forests, reflecting widespread degradation and fragmentation. Compared to ISFR 2021, the district recorded a net loss of 0.68 sq.km in forest cover. Major challenges include overgrazing, agricultural encroachments, dependence on fuelwood, poor regeneration, and recurrent forest fires though fire alerts dropped from 261 (2022–23) to 138 (2023–24). Vegetation is dominated by drought-tolerant species such as *Acacia nilotica*, Neem, *Prosopis juliflora*, and *Hardwickia binata*, along with shrubs and medicinal plants that sustain fragile ecosystems. Strengthening afforestation, soil and moisture conservation, fire management, and community-driven eco-restoration through programs like CAMPA and NREGA is critical to improving forest health and resilience in this arid region.

In Ananthapuramu division, a total of 222 CAMPA activities were carried out, of which 47 activities (around 21 %) were selected for detailed monitoring and evaluation. In Ananthapuramu range, 30 activities were implemented, and 7 were sampled. In Bukkapatnum range, 21 activities were implemented, and 4 were sampled. In Kadiri range, the highest number of activities (84) were implemented, with 18 sampled. In Gooty range, 19 activities were implemented, and 3 were sampled. In Kalyandurg range, 52 activities were implemented, and 11 were sampled. In Penukonda range, 16 activities were implemented, and 4 were sampled. Among activity types, maintenance works dominated with 127 activities (25 sampled), followed by others (56; 11 sampled), plantations (31; 7 sampled), soil and moisture conservation (3; 2 sampled), construction (3; 1 sampled) and protection (2; 1 sampled).

1. Monitoring and Evaluation of Plantation Activities

In Ananthapuramu division, a total of 31 plantation activities were carried out under CAMPA, of which 7 activities (about 21 %) were selected for monitoring and evaluation. Among the ranges, Kadiri reported the highest with 19 activities (4 sampled), followed by Kalyandurga with 6 (1 sampled), Ananthapuramu with 4 (1 sampled) and Bukkapatnum with 2 (1 sampled). No plantation activities were reported from Gooty and Penukonda ranges during 2016-17.

1.1 Ananthapuramu range

During 2016–17, a total of four plantation activities were carried out under the CAMPA scheme in Ananthapuramu range. As part of the monitoring and evaluation process, one plantation site constituting 25 % of the total activities was randomly selected for assessment.

Table 64 Details of plantation selected in Ananthapuramu range

Sl. no.	Plantation	SO no. and year
1	Raising of 26 Ha in Yellutla RF & beat in Tadimarri section of Ananthapuramu range	DSO 57 (2016-17)

The selected plantation site exhibits optimal conditions for plant growth, including favourable soil characteristics. Despite receiving scanty rainfall and lacking irrigation facilities, the plants have shown a remarkably high survival rate.

Survival percentage: In Ananthapuramu range, the Yellutla plantation site proved to be adequate given the circumstances for *Hardwickia binata*, achieving a survival rate of 83.12 % on an average and ranged between 76.56 % to 87.5 %. Additionally, the plantation has shown good overall growth in height and GBH.

Growth: In Yellutla plantation, average tree height ranging from 2.99 to 4.09 m and average girth ranging from 34.28 to 41.89 cm. The Variation in tree height and girth among plots can be attributed to differences in soil conditions and environmental factors.

Table 65 Details of plantation enumerated in Ananthapuramu range

Sl. no.	Plantation/ Village name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	26 Ha Yellutla	1	<i>Hardwickia binata</i>	N 14.63618 E 77.985379	82.81	3.92 ±0.7	41.89 ±7.02
		2	<i>Hardwickia binata</i>	N 14.63617 E 77.98558	76.56	4.09 ±0.74	38.42 ±7.14
		3	<i>Hardwickia binata</i>	N 14.635999 E 77.986501	84.37	3.69 ±0.54	34.28 ±5.77
		4	<i>Hardwickia binata</i>	N 14.636008 E 77.984482	84.37	2.99 ±0.59	34.44 ± 5.82
		5	<i>Hardwickia binata</i>	N 14.635817 E 77.984855	87.5	3.58 ±0.57	36.13 ±5.83
Plantation average					83.20	3.59	35.82

1.2 Kadiri range

A total of nineteen plantation projects were implemented under the CAMPA scheme in Kadiri range during 2016–17. For evaluation purposes, 20 % of these projects amounting to four plantation sites were selected using a random sampling method.

Table 66 Details of plantations selected in Kadiri range

Sl. no.	Plantations	SO no. and year
1	Raising of 2 Ha CA plantation adjacent to Eswaramala RF in Edurudona beat near P. Kothapalli (V)	RSO 07 (2016-17)
2	Raising of 25 Ha bit - 5 CA plantation near Myrada (V) in Peddannavaripalli beat of Kadiri range under CAMPA-CA (AVR HNSS phase - II) scheme	DSO 129 (2016-17)
3	Spill over advance operation works of 25 Ha bit - 1 CA land in HNSS phase - II at Myrada (V) in Peddannavaripalli beat in Kadiri range under CAMPA-CA (HNSS) scheme	DSO 34 (2016-17)
4	Spill over advance operation works of 25 Ha bit - 6 CA land in HNSS phase - II at Myrada (V) in Peddannavaripalli beat in Kadiri range under CAMPA-CA (HNSS) scheme	DSO 38 (2016-17)

During the monitoring and evaluation of CAMPA plantation activities in the Kadiri range, four plantation sites were selected for detailed review: the 2-hectare Kadiri P. Kothapalli plantation

and Peddavaripalli plantations (Bit-1, Bit-5, and Bit-6). All selected sites were found to be characterized by red sandy soil, which is well-suited for the species planted under the CAMPA scheme. This soil type was consistently observed across all locations, indicating appropriate site selection based on edaphic suitability for afforestation efforts.

Survival Percentage: The survival rate of seedlings varied across the plantation sites. At the Kadiri P. Kothapalli plantation, 140 trees were planted, with a high survival rate of 86.77%. In the Peddavaripalli Bit-5 plantation, *Hardwickia binata* showed a survival rate of 80.73%, while *Sterculia urens* in Bit-1 recorded a lower survival percentage of 59.74%. Peddavaripalli Bit-6 had mixed results, with 71.60% survival for *Sterculia urens* and 61.72% for *Pongamia pinnata*.

Growth Performance: Growth assessments across the selected plantations provided insights into the health and development of the species. At Kadiri P. Kothapalli, the average tree height was 1.0 meter and the average girth was 16.04 cm. In Peddavaripalli Bit-5, trees showed promising development with heights ranging from 3.01 to 3.49 meters and girths from 20.77 to 24.5 cm. Bit-1 displayed more variability, with heights between 1.60 and 4.22 meters and girths from 19.83 to 29.35 cm. Bit-6 reported height ranges of 1.86 to 3.46 meters and girth measurements of 22.00 to 30.78 cm.

Table 67 Details of plantations enumerated in Kadiri range

Sl. no.	Plantation/ Village name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth	
						Height (m)	Collar Girth (cm)
1	2 Ha Kadiri P. Kothapalli RF	1	<i>Pongamia pinnata</i>	N14.024175 E 78.380174	86.77	1.00 ±0.38	16.04 ±3.83
2	25 Ha Bit-5 Myrada RF	1	<i>Hardwickia binata</i>	N14.215573 E 78.377105	76.54	3.41 ±0.43	24.53 ±3.18
		2	<i>Hardwickia binata</i>	N14.215536 E 78.376899	79.01	3.01 ±0.38	21.77 ±1.91
		3	<i>Hardwickia binata</i>	N14.215345 E 78.376808	76.54	3.08 ±0.34	20.77 ±2.25
		4	<i>Hardwickia binata</i>	N14.215201 E 78.376571	82.71	3.25 ±0.25	21.66 ±2.42
		5	<i>Hardwickia binata</i>	N14.214956 E 78.376464	88.88	3.49 ±0.38	23.13 ±2.47
Plantation average					80.74	3.25	22.37
3	25 Ha Bit-1 Myrada RF	1	<i>Sterculia urens</i>	N14.223037 E 78.37838	66.66	1.60 ±0.34	19.83 ±3.44
		2	<i>Sterculia urens</i>	N14.222573 E 78.378035	59.25	1.65 ±0.36	19.94 ±3.03
		3	<i>Sterculia urens</i>	N14.222392 E 78.377942	58.02	2.13 ±0.40	21.34 ±2.08
		4	<i>Sterculia urens</i>	N14.221181 E 78.377908	54.32	4.22 ±0.31	29.05 ±2.59
		5	<i>Sterculia urens</i>	N14.221056 E 78.377924	60.49	3.99 ±0.35	29.35 ±2.24
Plantation average					59.75	2.72	23.90

4	25 Ha Bit-6 Myrada RF	1	<i>Sterculia urens</i>	N14.227396 E 78.368366	72.83	2.97 ±0.63	30.78 ±7.02
		2	<i>Sterculia urens</i>	N14.227368 E 78.368182	76.54	3.46 ±0.38	28.44 ±4.70
		3	<i>Sterculia urens</i>	N14.227231 E 78.367964	71.60	2.82 ±0.49	25.10 ±4.80
		4	<i>Sterculia urens</i>	N14.22708 E 78.367641	65.43	1.86 ±0.50	22.00 ±4.75
		5	<i>Pongamia pinnata</i>	N14.226457 E 78.366802	61.72	2.30 ±0.53	25.64 ±6.91
Plantation average					69.62	2.68	26.39

1.3 Kalyandurga range

Under the CAMPA scheme, the Forest Department of Andhra Pradesh undertook six plantation activities in Kalyandurg range during 2016–17. As part of the monitoring and evaluation process, one plantation site constituting approximately 20 % of the total was randomly selected for assessment.

Table 68 Details of plantation selected in Kalyandurg range

Sl. no.	Plantation	SO no. and year
1	AO and raising of 20 Ha NTSH plot in Setturu RF Kalyandurg range	DSO 14 (2016-17)

The 20 Ha plantation site in Setturu is characterized by red soil and experiences minimal rainfall with no irrigation. Nevertheless, the planted tree species exhibit good survival and growth rates.

Survival percentage: In the 20 Ha plantation in Setturu, the suitability for *Azadirachta indica* and *Hardwickia binata* is 85.18 % and 82.71 %, respectively.

Growth: In the 20 Ha plantation in Setturu, the average tree height ranges from 3.18 to 4.28 m, and the average girth ranges from 24.40 to 34.24 cm.

Table 69 Details of plantation enumerated in Kalyandurg range

Sl. no.	Plantation/ Village name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Setturu 20 Ha	1	<i>Azadirachta indica</i>	N 14.47981 E 77.01859	91.35	4.28 ±0.64	-	34.24 ±5.49
		2	<i>Hardwickia binata</i>	N14.479893 E 77.018672	81.48	3.52 ±0.42	27.30 ±3.62	-
		3	<i>Hardwickia binata</i>	N 14.48228 E 77.018395	82.71	3.62 ±0.46	25.43 ±4.36	-
		4	<i>Hardwickia binata</i>	N 14.48017 E 77.018229	83.95	3.95 ±0.55	-	24.40 ±2.71
		5	<i>Azadirachta indica</i>	N14.479405 E 77.018238	79.01	3.18 ±0.24	-	26.52 ±4.46
Plantation average					83.70	3.71	26.37	28.39

1.4 Bukkapatnam range

A total of two plantation activities were undertaken under the CAMPA scheme in Bukkapatnam range. As a sample, 20 % of the activities equivalent to one plantation site was selected for assessment.

Table 70 Details of plantation selected in Bukkapatnam range

Sl. no.	Plantation	SO no. and year
1	Raising of 5.83 Ha (bit. no .1,3,6,7) CA plantation of CA land of M/s JPBC adjacent to Yerlampalli RF in Yerlampalli beat of Bukkapatnam	DSO 99 (2016-17)

The selected plantation site offers optimal conditions for plant growth, characterized by favorable soil properties. Among the mixed species planted, *Sterculia urens* demonstrated the highest survival rate, whereas *Hardwickia binata* recorded the lowest.

Survival percentage: In the Bukkapatnam range, the Yerlampalli plantation is well suited for *Sterculia urens* and *Acacia ferruginea*, with survival percentages of 88.88 % and 83.33 %, respectively. The plantation shows moderate growth for *Pongamia pinnata* (69.44 %), and poor growth for *Sterculia urens* (61.11 %) and *Hardwickia binata* (58.33 %).

Growth: In the Bukkapatnam range at the Yerlampalli plantation, the average tree height ranges from 1.27 to 4.71 m, and the girth from 13.64 to 19.56 cm. The GBH was high for *Acacia ferruginea* and *Hardwickia binata* at around 29.35 cm. Variations in tree height and girth among plots can be attributed to differences in soil conditions, species and environmental factors.

Note: In Yerlampalli bit-6 plantation only 40 trees with weak growth were observed within a 1 Ha plot, with a survival rate of less than 20 %. The main reasons for plantation let-down in some locations are grazing, inappropriate site selection (such as remote and inaccessible areas), repeated fire damage, vehicle movement, difficulty in deploying manpower, and challenges in monitoring and maintenance.

Table 71 Details of plantation enumerated in Bukkapatnam range

Sl. no.	Plantation/ Village name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	5.83 Ha Yerlampalli	1	<i>Sterculia urens</i>	N 14.206592 E 77.959888	88.88	1.80 ±0.25	19.56 ±2.61	-
		2	<i>Pongamia pinnata</i>	N 14.206465 E 77.958765	69.44	1.54 ±0.35	13.64 ±2.63	-
		3	<i>Sterculia urens</i>	N 14.206468 E 77.957387	61.11	1.27 ±0.25	15.45 ±2.24	-
		4	<i>Acacia ferruginea</i>	N 14.203598 E 77.954655	83.33	2.68 ±0.58	-	29.43 ±3.74
		5	<i>Hardwickia binata</i>	N 14.203588 E 77.954677	58.33	4.71 ±0.83	-	29.29 ±3.62
Plantation average					72.22	2.40	16.22	29.36

Comparative assessment of plantations in Ananthapuramu division during 2016-17

Highest in Yerlampalli (*Sterculia urens*, 88.88%) and Kadiri P. Kothapalli (86.77 %); lowest in Yerlampalli (*Hardwickia binata*, 58.33%). Growth (Height & Girth): Strongest at Yellutla and Setturu (heights >3 m and girths >30 cm); weakest at Kadiri P. Kothapalli (height ~1 m, girth ~16 cm). *Hardwickia binata* consistently showed good adaptability in Yellutla and Setturu, but poor establishment at Yerlampalli. *Sterculia urens* and *Acacia ferruginea* were more successful in Bukkapatnam.

Verification of plantation area and boundaries

In Ananthapuramu division during 2016-17 measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

Table 72 Details of plantation area perambulation in Ananthapuramu division

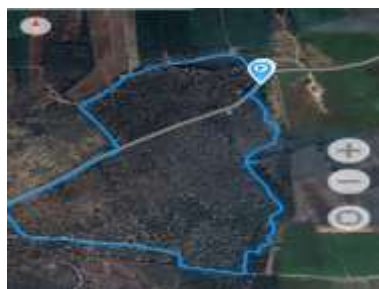
Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising of 26 Ha in Yellutla RF & beat in Tadimarri section of Ananthapuramu range during 2016-17	26 Ha	18.92 Ha
2	Raising of 2 Ha. CA plantation adjacent to Eswaramala RF in Edurudona beat near P. Kothapalli (V).	2 ha	1.82 ha
3	Raising of 25 Ha. Bit - 5 CA plantation near Myrada (V) in Peddannavaripalli beat of Kadiri range under CAMPA-CA (AVR HNSS phase - II) scheme.	25 ha	23.33 ha
4	Spill over advance operation works of 25 Ha. Bit - 1 CA land in HNSS phase - II at Myrada (V) in Peddannavaripalli eat in Kadiri range.	25 ha	17.19 ha
5	Spill over advance operation works of 25 Ha. Bit - 6 CA land in HNSS phase - II at Myrada (V) in Peddannavaripalli beat in Kadiri range.	25 ha	25.13 ha
6	AO & raising of 20 Ha NTSH plot in Setturu RF Kalyandurg range.	20 Ha	22.66 Ha
7	Raising of 5.83 Ha (bit.no.1,3,6,7) CA plantation of CA land of M/s JPBC adjacent to Yerlampalli RF in Yerlampalli beat of Bukkapatnam range during 2016-17 under CAMPA - CA - M/s JPBC	5.83 Ha	Bit-1 (1.80 Ha) Bit-3 (11.33 Ha) Bit-6 (1.13 Ha) Bit-7 (1.50 Ha) Total = 15.76 Ha

Perambulation of selected NTSH plantations was carried out with the assistance of the local Forest Beat Officer. In these cases, the perambulated area was found to exceed in some plantations and in some shortfall has been noted due to the presence of rocky terrain, trenches, and barren patches within plantation boundaries. Measurements were therefore taken along the outer boundary of these natural obstructions rather than the precise plantation limits. Plantation-wise Findings

- Yellutla Plantation (Ananthapursamu range) (26 Ha): 18.92 Ha (lesser by 7.08 Ha)
- P Kothapalli Plantation (Kadiri range) (2 Ha): 1.82 Ha (lesser by 0.18 Ha)
- Peddannavaripalli Bit-5 Plantation (Kadiri range) (25 Ha): 23.33 Ha (lesser by 1.67 Ha)

- Peddannavaripalli Bit-1 Plantation (Kadiri range) (25 Ha): 17.19 Ha (lesser by 7.81 Ha)
- Myrada Bit-6 Plantation (Kadiri range) (25 Ha): 25.13 Ha (exceeded by -0.13 Ha)
- Setturu Plantation (Kalyandurga range) (20 Ha): 22.66 Ha (exceeded by -22.66 Ha)
- Yerlampalli plantation (Bukkapatnam range) (5.83 Ha): 15.76 Ha (exceeded by - 9.93 Ha)

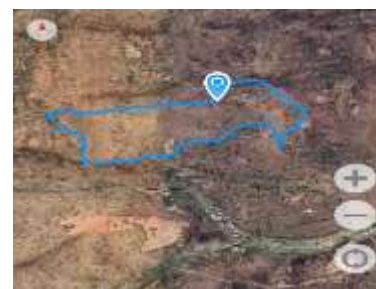
Verification was carried out with the assistance of the local Forest Beat Officer, using QGIS software and further confirmed through Geo Tracker application. Geotagged images were documented as evidence.



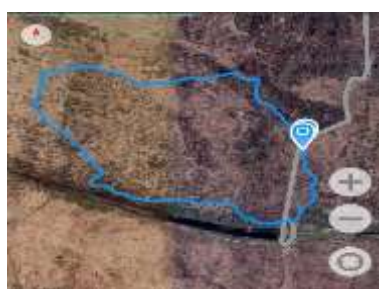
Yellutla 18.92 Ha



Kothapalli 1.82 Ha



Peddannavaripalli Bit-5 23.13



Peddannavaripalli Bit-1 17.19 Ha



Myrada Bit-6 25.13 Ha



Setturu 22.66 Ha



1.80 Ha Bit -1 Yerlampalli



11.33Ha Bit -3



1.13 Ha Bit -6



1.50 Ha Bit -7

Health Status of Plantations: During the field visit, signs of insect and pest damage were specifically observed in the 25-hectare Bit-6 plantation located in Myrada (V). Other plantation sites did not show significant biotic stress from pest activity. Although the infestation is not widespread, the observed damage in Bit-6 Yerlampalli plantation in Bukkapatnam range stresses the need for timely pest management interventions and regular monitoring to maintain overall plantation health.

Protection Measures: To safeguard plantations from fire and other environmental threats, several protection measures were implemented, including the creation and maintenance of fire lines, development of inspection paths, and deployment of fire watchers. These measures have proven generally adequate in reducing plantation vulnerability, particularly during the dry

season. However, ongoing maintenance and clear visibility of these features are essential to ensure their continued effectiveness.

Biotic Pressure on Plantations: Evidence of grazing and browsing by both wild and domestic herbivores was observed across several plantation sites. This biotic interference led to stunted apical growth in certain species, particularly in areas lacking adequate fencing or community oversight. These signs of pressure emphasize the need for stronger physical protection measures such as installation of protective barriers and increased community sensitization to ensure sustainable plantation development and seedling survival.

Maintenance of Plantation Journals and Records: Plantation journals and records are generally well-maintained, with baseline information properly documented. However, there is a need for regular and timely updates of key plantation parameters such as survival rates, growth metrics, and maintenance activities to ensure that the records accurately reflect current field conditions and remain relevant for monitoring and evaluation purposes. Plantations are inspected by the concerned forest officials, and their observations are duly recorded.

Vana Samrakshan Samithi (VSS): During monitoring and evaluation across plantation sites in the Kadiri and Kalyandurga ranges, a consistent lack of community involvement was observed. This highlights a significant gap in community participation, which is a critical component for the long-term sustainability and protection of forest assets under the CAMPA framework. However, in Ananthapuramu and Bukkapatnam ranges VSS involvement was evident.



Yellutla plantation, Ananthapuramu range



P. Kothapalli 2 Ha plantation, Kadiri



Bit-6 Myrada 25 Ha, Kaidiri



Setturu 20 Ha, Kalyandurga

2. Monitoring and Evaluation of Maintenance Activities

A total of 127 maintenance activities were carried out in Ananthapuramu division during 2016-17, of which 25 activities were selected for monitoring. Kadiri accounted for the maximum with 44 activities (9 sampled), followed by Kalyandurga with 26 (6 sampled), Ananthapuramu with 20 (4 sampled), Bukkapatnam with 14 (2 sampled), Gooty with 12 (2 sampled), and Penukonda with 11 (2 sampled).

Table 73 Maintenance activities selected for evaluation in Ananthapuramu division

Sl. No.	Maintenance Activities	GPS Co-ordinates	SO no. and year
Ananthapuramu range			
1	Second year maintenance of 20 Ha. (bit -1) NTSH plot Marutla (S) beat	N 14.765746 E 77.499858	DSO 82 (2016-17)
2	Second year maintenance of CA plantation for 13 Ha (22.40) additional block-1 Ramagiri (W) beat.	N 14.304105 E 77.450546	DSO 89 (2016-17)
3	Third year maintenance of CA plantation for 5.50 Ha in (bit-1) adjoining to Bhadrapuram RF of Baddalapuram beat	N 14.443878 E 77.427436	RSO 07 (2016-17)
4	Third year maintenance of 20 Ha. (bit -1) NTSH plot Marutla (S) beat	N 14.765746 E 77.499858	DSO 84 (2016-17)
Gooty range			
5	Third year maintenance of 20 Ha (bit-1) NTSH plantation in Molakathalla RF in Gooty range	N 14.959559 E 77.75166	DSO 92 (2016-17)
6	Third year maintenance of 5.75 Ha (bit-2), NTSH plot in Molakathalla RF in Gooty range	N 14.96863 E 77.750789	RSO 03 (2016-17)
Kadiri range			
7	First year maintenance of 14.09 Ha bit - 1 of 3.90 Ha. (4 Ha) CA plantation adjacent to Kokkanti RF near Malameedapalli(V) in Kokkanti beat	N 14.013594 E 78.268485	RSO 04 (2016-17)
8	First year maintenance of 6.36 Ha (7 ha) CA plantation at Motukupalli beat near Joggannapeta (V)	N 14.037335 E 78.207564	RSO 21 (2016-17)
9	First year maintenance of 15 Ha (16.96 Ha.) bits - 2 CA plantation adjacent to Gorivikanuma RF of Talupula beat near Udumulakurthy (V) in Kadiri range	N 14.292752 E 78.275113	DSO 106 (2016-17)
10	Third year maintenance of 5 Ha CA Plantation adjacent to Errappakonda RF of Charupalli beat near Reddivaripalli(V)	N 14.181104 E 78.058599	RSO 40 (2016-17)
11	Third year maintenance of 15 Ha (3 bits) CA plantation adjacent to Oruvai RF in Kokkanti beat of Kadiri range	N 13.946622 E 78.232037	DSO 70 (2016-17)
12	Fourth year maintenance of 4 Ha CA plantation in Marrikommadinne block of Tallakalva beat	N 14.128126 E 78.446139	RSO 49 (2016-17)
13	First year maintenance of 14.09 Ha bit - 3 of 3.89 Ha. (4 Ha) CA plantation adjacent to Kokkanti RF near Malameedapalli(V) in Kokkanti beat	N 14.009683 E 78.269025	RSO 05 (2016-17)
14	Third year maintenance of 5 Ha CA Plantation adjacent to Errappakonda RF of Charupalli beat near Reddivaripalli(V)	N 14.181103 E 78.058621	RSO 41 (2016-17)
15	First year maintenance of 6.36 Ha (7 ha) CA plantation at Motukupalli beat near Joggannapeta (V)	N 14.037453 E 78.207504	RSO 75 (2016-17)
Penukonda range			
16	Second year maintenance of 100 Ha plantation at s.no. 669, Kogira of Penukonda range	N 14.136963 E 77.547432	DSO 121 (2016-17)
17	Second year maintenance of 20 Ha (bit-2) plot in Chalakuru block of Y.K. beat	N 13.929704 E 77.580343	DSO 78 (2016-17)
Kalyandurga range			
18	First year maintenance of 20 Ha NTSH plot in Beluguppa RF of Kalyandurg range	N 14.68892 E 77.074262	DSO 111 (2016-17)
19	First year maintenance of 20 Ha NTSH plot in Rayadurgam RF of Kalyandurg range	N 14.704922 E 76.791036	DSO 115 (2016-17)

20	Second year maintenance of 20 Ha LIM plot in Khairevu RF	N 14.451199 E 77.125733	DSO 141 (2016-17)
21	Second year maintenance of 1.86 Ha CA plot in Kalyandurg South RF of Kalayandurg range	N 14.558879 E 77.103911	RSO 26 (2016-17)
22	Third year maintenance of 30 Ha SMM Plantation in Pillalapalli RF	N 14.550418 E 77.003645	DSO 194 (2016-17)
23	Third year maintenance of 20 Ha bit II in Dharmapuri RF of Kalyandurg range	N 14.733276 E 76.905211	DSO 199 (2016-17)
Bukkapatnam range			
24	First-year maintenance of 8.88 Ha (Bit No. 1, 2) CA land of M/s Balaji Aqua Agro Pvt. Ltd., adjacent to Thummalamala RF in Nallamada beat, Bukkapatnam range	N 14.163923 E 77.98122	DSO 102 (2016-17)
25	Second-year maintenance of 4.55 Ha (Bit No. 1, 2) CA land of M/s JPBC Haul Road adjacent to Jonnavulapalli RF in Gunipalli beat, Bukkapatnam range	N 14.246728 E 77.923735	RSO 14 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. The works undertaken included casualty replacement, circular weeding and soil working, coppice management, pruning of lower branches, fertilizer application, creation and upkeep of fire lines, and other contingency measures. Verification showed that most of these activities had been properly executed in accordance with sanctioned orders. Circular weeding and soil working reduced weed competition and improved aeration, coppice cutting minimized competition from secondary shoots, and pruning promoted healthier plant structure. Fertilizer application was carried out in several plantations, though in some cases the dosage and distribution were not uniform. Fire lines were created or maintained, but at certain locations they required better clearance to remain effective in peak summer. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth are as follows;

General recommendations for maintenance activities

- Intensify weeding operations, especially along plantation boundaries, to control Lantana and bushy grasses, minimizing competition and ensuring healthy plant growth.
- Continue maintaining clear and effective fire lines, with regular clearing before dry seasons to enhance visibility and effectiveness in preventing forest fires.
- Install and maintain plantation boundary stones and boards to ensure accurate demarcation, facilitate monitoring, prevent encroachments, and complement contingency records.
- Maintain accurate and updated plantation journals, markers, and records to support ongoing identification, monitoring, and accountability.
- Continue timely and appropriate fertilizer application (DAP @ 20 g/plant), with special focus on weaker plants to promote uniform growth and ensure optimal nutrient support.
- Carry out timely replanting with healthy bagged seedlings to maintain uniform density, improve survival rate, and strengthen overall plantation health.
- Implement routine coppice management to reduce competition from secondary shoots.
- Improve the frequency and timing of pruning operations to promote healthy plant structure and better bole formation.



Marutla beat of Ananthapuramu range



Molakathalla beat of Gooty range



Kogira beat of Penukonda range



Rayadurgam beat of Kalyandurg range



Tallakaluva beat of Kadiri range



Nallamada beat of Bukkapatnum range

3. Monitoring and Evaluation of Protection Activities

A total of 2 protection activities were carried out in Ananthapuramu division during 2016-17. The Kadiri range reported 2 activity (1 sampled). No protection works were recorded in other ranges of Ananthapuramu division.

3.1 Creation of new fire lines in Eswaramala RF of Edurudona beat under CAMPA-NPV (forest fire management) scheme of Kadiri range

GPS location: N 13.997766 E 78.327266

SO no. and year: DSO 282 (2016-17)

A fire line was created and maintained in Eswaramala RF of Edurudona beat under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of new fire line are width – 6 m, and length – 3000 m. The field measurements matched those in the measurement book, indicating no deviations. The visibility of the fire line was clear, as it was established along the inspection path. No dense grass or weed growth was observed, indicating well-maintained.



Fire line in Eswaramala RF of Edurudona beat

4. Monitoring and Evaluation of Soil and Moisture Conservation (SMC) Activities

A total of 3 SMC activities were carried out during 2016-17, of which 2 were sampled. The Ananthapuramu range reported 1 activity (1 sampled), while Penukonda range reported 2 activities (1 sampled). No SMC works were recorded in other ranges of division.

4.1 Digging of CCTs in Chillavaripalli additional block in Dadithota beat (M/s. Jaypee Balaji Cement project) of Ananthapuramu range

GPS location: N 14.605724 E 77.933938

SO no. and year: RSO 20 (2016-17)

Eighty Continuous Contour Trenches (CCTs) dug in Chillavaripalli additional block in Dadithota beat was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of the CCTs were: length – 10 m, width – 0.50 m, and depth – 0.50 m with volume of 200 m³. Total number of Continuous Contour Trenches (CCTs) and their cumulative volume exceed the figures recorded in official records. The field measurements matched those in the measurement book, indicating no deviations. The CCTs were found to be well maintained. These structures were primarily constructed using locally available boulders in the form of dry-stone masonry walls. In some of the lower trenches within the reserve forest, only a negligible reduction in depth has been observed due to the accumulation of silt and stony gravels.



CCTs in Chillavaripalli additional block in Dadithota beat

4.2 Construction of check dam across Jammikunta Vanks in CA area of Sy. no-669 under GLIS in Penukonda range

GPS location: N 14.13987 E 77.560993

SO no. and year: DSO 281 (2016-17)

One check dam constructed across Jammikunta Vanks in CA area in Penukonda range was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of the check dams; length – 10 m, width – 0.5 m, and depth – 2.00 m. The field measurements matched those in the measurement book, indicating

no deviations. The check dam structure is well maintained, and its measurements align with the recorded specifications. It demonstrates good water storage capacity during the monsoon season. However, regular de-siltation is recommended to enhance its storage capacity, improve water infiltration, and maintain soil moisture levels effectively.



Check dam across Jammikunta Vanks in CA area of Sy.no 669 under GLIS

5. Monitoring and Evaluation of Construction Activities

There were three construction activities in the division during 2016-17, of which one was sampled. All these were taken up in the Kadiri range. No construction activity was recorded in other ranges of Ananthapuramu division.

5.1 Construction of bird enclosures at Thimmamma Marrmanu of Gandlapenta section in Kadiri range

GPS location: N 14.027243 E 78.3261

SO no. and year: SDSO 55 (2016-17)

One construction of bird enclosures at Thimmamma Marrmanu of Gandlapenta section was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of the bird enclosure is as follows;

Cement concrete wall: Length – 16 m, Width – 0.6 m, Depth – 0.6

Chain-link mesh: Length – 12 m, Width – 2 m

Roof Sheet: Length – 5 m, Width – 6 m,

Iron door: Length – 0.9 m, Width – 0.6 m

The field measurements matched those in the measurement book, indicating no deviations. Enclosure is in a good condition but water drainage facility to given in the enclosure and cement plastering to be done for the basement. A bird enclosure is a large cage constructed to safely confine birds while providing adequate ventilation. It is built with concrete cement walls and enclosed with chain-link mesh to ensure airflow. The enclosure is well maintained and in good condition, providing a secure and suitable environment for the birds housed within.



Bird enclosures at Thimmamma Marrmanu of Gandlapenta section in Kadiri range

6. Monitoring and Evaluation of Other Activities

Under the “Others” category, a total of 56 activities were carried out during 2016–17, of which 11 were sampled for verification. The maximum number of activities was in Kalyandurga (20, with 4 sampled), followed by Kadiri (16, with 3 sampled), Gooty (7, with 1 sampled), Ananthapuramu (5, with 1 sampled), Bukkapatnum (5, with 1 sampled), and Penukonda (3, with 1 sampled). Document verification and cross-checking were conducted in the presence of Division and Range Office staff. The review covered sanction orders, estimation sheets, and work registers. It was observed that the sanctioned amounts were in alignment with actual expenditures, and all financial records were properly maintained and duly authenticated by the concerned officials including the DFO, SDO, and FRO. The utilization of funds was appropriate and consistent with approved estimates and CAMPA guidelines. In addition, internal audit was conducted by the Conservator of Forests and external audit by the Accountant General’s Office. Overall, the verification confirmed transparency, accountability, and compliance with financial and administrative protocols under the CAMPA scheme.

Key Findings

- Plantation survival was generally satisfactory, though area discrepancies between records and field were common.
- Grazing and browsing pressures from cattle and wild herbivores affected some sites, causing stunted growth.
- Pest infestations were localized but underscored the need for continuous monitoring.
- Maintenance operations were effective but weakened by poor record-keeping and missing boards.
- SMC works and fire lines were well constructed and maintained, providing ecological stability.
- Financial systems were transparent and supported by regular internal and external audits.
- Community participation through VSS was minimal, limiting long-term sustainability.

Recommendations

- Strengthen record accuracy by reconciling plantation areas with GIS-based mapping and ensuring regular journal updates.
- Enhance community participation by actively involving VSS/JFMCs in plantation protection and maintenance, ensuring shared responsibility.
- Control grazing and browsing pressures through fencing, community awareness, and regulated access to plantations.
- Introduce pest monitoring protocols to detect infestations early and apply timely remedies.
- Intensify weeding operations along boundaries to control *Lantana camara* and other invasive weeds, improving plant growth.
- Maintain and expand fire lines, ensuring seasonal clearance and visibility to mitigate summer fire risks.
- Ensure desilting and upkeep of SMC structures like CCTs and check dams for sustained effectiveness.
- Upgrade infrastructure works (e.g., adding drainage and plastering to enclosures) to enhance longevity.

9. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN GIDDALUR DIVISION

Introduction

Giddalur Forest Division, located in the southern part of Prakasam district, Andhra Pradesh, forms part of the Eastern Ghats and is ecologically classified as Southern Tropical Dry Deciduous Forests (ISFR). The division covers 1,944.51 sq.km, constituting 18.68% of its geographical area. The climate is hot and dry with temperatures ranging between 19°C and 38°C, and annual rainfall averaging 871 mm, largely from the southwest monsoon. The terrain is undulating with rocky outcrops, sandstone, and quartzite soils that influence vegetation. Forest types include dry deciduous, open, and scrub forests, showing adaptations like seasonal leaf shedding and deep root systems. Dominant tree species are *Wrightia tinctoria*, *Albizia amara*, *Anogeissus latifolia*, *Acacia chundra*, and *Dalbergia paniculata*. The division's growing stock is about 7.02 million cubic meters, mainly from *Terminalia tomentosa*, *Pterocarpus marsupium*, *Hardwickia binata*, and *Dalbergia paniculata*. The flora represents a transitional zone between moist and arid ecosystems, with shrubs, herbs, climbers, and grasses such as *Ziziphus*, *Lantana*, *Dodonaea*, and *Cassia* providing fodder and ground cover. Ecologically, the forests act as biodiversity buffers and carbon sinks while socio-economically they support livelihoods through NTFPs like gums, fodder, and medicinal plants. Despite pressures from deforestation, overgrazing, and encroachments, Giddalur Division retains significant ecological and economic value, warranting focused conservation and restoration measures.

During the period 2016-17, a total of 53 CAMPA activities were undertaken in Giddalur Forest Division, reflecting the division's commitment to afforestation and ecological restoration. Out of these, 12 activities, constituting approximately 22%, were selected for detailed monitoring and evaluation to assess their implementation quality and ecological impact. In terms of range-wise distribution, Turimella range accounted for the highest number of activities implementing 29, out of which 7 were sampled for evaluation. Giddalur range executed 13 activities with 2 selected for evaluation, while Gundlakamma range carried out 11 activities, of which 3 were sampled. This distribution highlights the higher activity concentration and ecological interventions in Turimella range during the year. With respect to type of activities, other works formed the largest share with 36 activities, of which 7 were evaluated. Soil and Moisture Conservation (SMC) works accounted for 6 activities (1 sampled), followed by plantation activities with 4 implementations (1 sampled), protection measures with 4 (2 sampled) and maintenance activities numbering 3 (1 sampled). Notably, no construction-related activities were reported during this period indicating a focus on ecological over infrastructural interventions. This pattern of implementation and evaluation provides insights into the prioritization of ecological restoration in the division, with a major focus on miscellaneous ecological tasks and moisture conservation supported by selective monitoring to ensure accountability and effectiveness.

1. Monitoring and Evaluation of Plantation Activities

During 2016-17, Giddalur division carried out a total of 4 plantation activities under CAMPA, of which 1 activity (about 25 %) was selected for monitoring and evaluation. Range-wise distribution shows that all plantation activities were implemented in Turimella range, with one

activity sampled for evaluation. While Giddalur and Gundlakamma ranges did not report any plantation activities during this period.

1.1 Turimella range

A total of four plantation activities were implemented under the CAMPA scheme in Turimella range. For monitoring and evaluation, 20 % of these activities equivalent to one plantation site was randomly selected for assessment.

Table 74 Details of plantation selected in Turimella range

Sl. no.	Plantation	SO no. and year
1	Raising of 20 Ha gap planting in Rallavagu reservoir of Papinenipalli beat section of Turimella range (bit-1) Ankabhupalem VSS	DSO 43 (2016-17)

The plantation follows the ANR (Assisted Natural Regeneration) gap plantation model, where degraded natural forest areas are improved by supporting natural regeneration and planting trees in open or degraded patches. This method helps restore forest cover by combining natural growth with targeted planting. A total of 400 trees were planted per hectare under this approach. A 20-hectare plantation site at Papinenipalli was selected for implementation, characterized by sandy loamy soil that provides favourable conditions for the growth of planted species. The site exhibits good soil texture and drainage which are essential for healthy root development and moisture retention. These conditions significantly support the successful establishment and growth of the plantation making it well-suited for ecological restoration efforts.

Survival Percentage: In Turimella, Papinenipalli gap plantation of *Hardwickia binata* demonstrated moderate growth with a survival rate of 69%. Overall, the plantation reflects good growth performance indicating that the site conditions are favourable and that the management practices implemented were effective in supporting the development of the trees.

Growth Performance: In Papinenipalli gap plantation, the average tree height ranges from 2.8 to 2.96 m while the collar girth varies between 20.18 and 21.89 cm. The observed variation in tree height and girth across different plots is likely due to differences in soil conditions and environmental factors.

Table 75 Details of plantation enumerated in Turimella range

Sl. no.	Plantation name	Plot no.	Species Name	GPS Coordinate	Survival (%)	Average Growth	
						Height (m)	Collar Girth (cm)
1	Papineni-palli 20 Ha Gap plantation	1	<i>Hardwickia binata</i>	N 15.617696 E 78.922828	61.11	2.91 ±0.33	20.18 ±2.77
		2	<i>Hardwickia binata</i>	N 15.617042 E 78.922893	69.44	2.84 ±0.31	20.84 ±2.25
		3	<i>Hardwickia binata</i>	N 15.617075 E 78.924319	75.00	2.96 ±0.36	21.89 ±3.73
		4	<i>Hardwickia binata</i>	N 15.616821 E 78.924938	61.11	2.80 ±0.30	20.23 ±2.25
		5	<i>Hardwickia binata</i>	N 15.616384 E 78.926054	83.33	2.80 ±0.43	20.27 ±3.84
Plantation Average					69.99	2.86	20.68

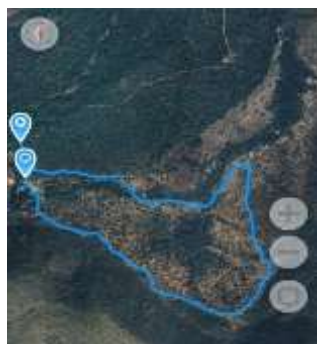
Verification of plantation area and boundaries

In Giddalur division during 2016-17 measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

Table 76 Details of plantation area perambulation in Turimella range

Sl. no.	Plantation	Area as per records	Area as per field perambulation
1	Raising of 20 Ha gap planting Papinenipalli beat section of Turimella range	20 Ha	47.20Ha

The Perambulation was done in presence of forest officer and as per the demarcation shown by the watcher/guard working as in-charge of the plantation. The perambulated area of the plantation was found to be larger than the officially recorded extent, primarily due to the inclusion of rocky terrain, trenches and barren patches within the plantation boundary. The plantation is divided into two bits, of which only bit-1 was assessed during this evaluation. Based on perambulation along the outer boundary, the area of bit-1 was estimated at 47.20 hectares which may not precisely represent the actual plantation limits. Further spatial analysis using QGIS software confirmed that the perambulated area exceeds the recorded area by 27.2 hectares indicating a significant variation likely due to natural topographical features and boundary estimation methods. The verification of the plantation area was carried out by perambulating the entire plantation using the Geo Tracker application and supporting images are provided below.



Papinenipalli 47.20 Ha



Papinenipalli plantation

Health status of plantation: The overall health status of plantation in Papinenipalli was found to be satisfactory. There were no observed incidences of insect or pest damage affecting any of the planted species. All plants appeared healthy showing no visible signs of infestation or physiological stress which indicates that the sites were well-maintained and provided a favourable environment for healthy and sustained plant growth.

Protection Measures: To safeguard plantations from fire and other environmental threats, several protection measures were implemented, including the creation and maintenance of fire lines, development of inspection paths, and deployment of fire watchers. These measures have proven generally adequate in reducing plantation vulnerability, particularly during the dry season. However, ongoing maintenance and clear visibility of these features are essential to ensure their continued effectiveness.

Biotic (human/cattle) Pressure on Plantation: Incidents of grazing and browsing pressure were observed in the plantation areas, primarily due to the entry of cattle from nearby villages. However, this pressure has been partially mitigated through the creation of peripheral trenches and the deployment of plantation watchers to monitor and protect the sites. Despite these efforts, the presence of grazing activity highlights the continued need for stronger physical protection measures such as the installation of protective barriers (e.g., fencing) and greater community sensitization. Engaging local communities and raising awareness about the importance of plantation protection will be crucial to ensuring sustainable plantation development and improving seedling survival rates.

Maintenance of Plantation Journals and Records: Plantation journals and records are generally well-maintained with baseline information properly documented. However, there is a need for regular and timely updates of key plantation parameters such as survival rates, growth metrics and maintenance activities to ensure that the records accurately reflect current field conditions and remain relevant for monitoring and evaluation purposes. Plantation is inspected by concerned forest official and entered the observations.

Vana Samrakshan Samithi (VSS): The involvement of Vana Samrakshan Samithi (VSS) or Joint Forest Management Committee (JFMC) was evident in Papinenipalli plantation located in Turimella range among the selected plantation sites. Their participation reflects the integration of community-based forest management practices contributing to the protection, maintenance and monitoring of the plantation and supporting the overall objectives of sustainable forest regeneration.

2. Monitoring and Evaluation of Maintenance Activities

During 2016-17, a total of 3 maintenance activities were implemented in Giddalur Division, of which one activity was selected for monitoring and evaluation. Range-wise analysis indicates that all 3 activities were carried out in Turimella range with one activity sampled. While Giddalur and Gundlakamma ranges did not report any maintenance activities during this period.

Table 77 Maintenance activity selected for evaluation in Giddalur division

Sl. no.	Maintenance Activity	GPS Co-ordinates	SO no. and year
Turimella range			
1	Second year maintenance of 13 Ha Madhavapuram CA miscellaneous plantation in JBK Puram beat of Turimella section of Turimella range, through Narsireddypalli VSS	N 15.524959 E 79.022404	DSO 58 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. These activities include weeding operations, soil tilling (inter-ploughing), coppice management, pruning of lower branches, fire line management and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. Plantation board was also found to be properly maintained. To further enhance the growth and sustainability of the plantation, the following general recommendations are suggested:

General recommendations for maintenance activities

- Intensify weeding operations, especially along plantation boundaries, to control *Lantana* and bushy grasses, minimizing competition and ensuring healthy plant growth.
- Continue maintaining clear and effective fire lines with regular clearing before dry seasons to enhance visibility and effectiveness in preventing forest fires.
- Implement routine coppice management to reduce competition from secondary shoots.
- Improve the frequency and timing of pruning operations to promote healthy plant structure and better bole formation.



JBK Puram beat, Turimella range

3. Monitoring and Evaluation of Protection Activities

During 2016-17, a total of 4 protection activities were undertaken in Giddalur division, of which 2 were sampled. Turimella reported 3 protection activities with 2 selected for sampling, while Gundlakamma reported with 1 protection activity, which was not sampled. No protection activities were undertaken in Giddalur range during this period.

3.1 Creation of new fire lines in A.V. Kota beat and section of Turimella range through Kothuru VSS

GPS location: N 15.597971, E 78.915246

SO no. and year: RSO 12 (2016-17)

In A.V. Kota beat of Turimella range, stretch-wise fire lines were established to enhance forest fire prevention and control. A total of five major fire line stretches were created and documented along with their GPS coordinates:

- The first fire line extends from Lingamayya Karuva to Yarrakurava Dova (N 15.597971, E 78.915246) covering 4200 meters.
- The second runs from Tettukurava Dari to Tettukurava Konda Sikharam (N 15.605110, E 78.922710) spanning 1000 meters.
- The third stretches from Pedda Shila to Pedda Shila Sikharam (N 15.598381, E 78.915372) covering 900 meters.
- The fourth connects Nallabanda Dari to Palgarusu Sikharam (N 15.605220, E 78.927750) with a length of 700 meters.
- The fifth fire line also starting at N 15.605220, E 78.927750 runs from Pothukurava Dari to Pothukurava Bungalow measuring 700 meters.

These fire lines play a critical role in preventing the spread of forest fires and protecting the biodiversity of the region. All five stretches were monitored and evaluated against the specifications recorded in the measurement book. Each fire line maintained a uniform width of 3 meters and the total combined length of 7500 running meters matched the field measurements exactly indicating no deviations. Field inspections confirmed that the fire lines were clearly visible marked by fire-burnt litter and tree stumps and well-maintained with no dense grass or weed growth. This demonstrates effective fire management practices contributing significantly to forest fire control and ecosystem protection in the area.

3.2 Maintenance of fire lines at PSVGP CA land) in Velagalapaya beat and section of Turimella range through Velagalapaya VSS

GPS location: N 15.784062 E 78.953243

SO no. and year: RSO 18 (2016-17)

A fire line in Velegalapaya beat created under the CAMPA-NPV (forest fire management) scheme was found to match the recorded dimensions of 5 m width and 9300 rmt length with no deviations observed. While the fire line remains visible, weed and shrub growth along its path poses a fire risk especially during dry months. Though some maintenance is evident, more frequent and thorough clearing is recommended to ensure its continued effectiveness in preventing forest fires.



Fire line in A.V. Kota beat



Fire line in Velagalapaya beat

4. Monitoring and Evaluation of Soil and Moisture Conservation Activities

A total of six Soil and Moisture Conservation (SMC) activities were carried out during 2016-17, all of which were reported in Turimella range of Giddalur Division. Of these, one activity was sampled for verification. No SMC works were reported from the other ranges within the division during this period.

4.1 Construction of check dam no. 2 at Thallapaya location in compartment no.756, ENB-II RF of Turimella beat and section of Turimella range

GPS location: N 15.583541 E 78.989873

SO no. and year: DSO 189 (2016-17)

A check dam constructed at Thallapaya in Turimella beat was monitored and evaluated against the specifications recorded in the measurement book with field measurements confirming no deviations. The structure measures 4 m in length, 1.3 m in width and 0.45 m in depth. However, the check dam is not well maintained. Minor repairs are needed for the apron and de-silting is required to restore its storage capacity. Additionally, water seepage was observed from both the

body wall and core wall indicating the need for immediate repair to maintain the structural integrity and ensure effective functioning of the dam.



Check dam in Turimella beat

5. Monitoring and Evaluation of Other Activities

In 2016–17, thirty-six activities under the “Others” category were undertaken in Giddalur Forest Division, of which eight were sampled for verification. The highest number of activities were reported in Giddalur and Turimella ranges with thirteen each (three and two sampled respectively), followed by Gundlakamma with ten activities (three sampled). Verification and cross-checking of records were carried out in the presence of Division and Range staff. The examination of sanction orders, estimation sheets, and work registers confirmed that sanctioned amounts were consistent with actual expenditures. Financial records were properly maintained and duly authenticated by the DFO, SDO, and FRO. Utilization of funds was in line with approved estimates and CAMPA guidelines. Internal audit by the Conservator of Forests and external audit by the Accountant General’s Office validated the financial and administrative processes. The findings confirm that implementation was transparent and compliant with prescribed protocols.

Key findings

- Plantations exhibited moderate survival and good growth, though grazing and wildlife browsing affected regeneration.
- Discrepancies in plantation boundaries highlight the need for GIS-based validation.
- SMC structures and fire lines exist but require maintenance and clearing in certain areas.
- Silvicultural operations and monitoring were inconsistent, impacting plantation health.
- Strengthened protection, community involvement, and systematic follow-up are needed to ensure sustainable growth.

Recommendations

- Strengthen grazing control through fencing, livestock regulation, and community awareness.
- Reconcile plantation records with GIS mapping for accurate boundaries and monitoring.
- Maintain fire lines by clearing vegetation, removing weeds, and reinforcing existing lines.
- Repair, maintain, and de-silt SMC structures to enhance soil and water conservation.
- Update plantation journals regularly to track survival, growth, and silvicultural operations.

10. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN KURNOOL DIVISION

Introduction

Kurnool Forest Division, located in western Andhra Pradesh spans about 12,904 sq.km, of which 1,202.55 sq.km (9.58%) is notified as forest area. However, actual forest cover is much lower, with only 75.98 sq.km (0.39%) identified via remote sensing, including 5.18 sq.km of moderately dense forest and 70.80 sq.km of open forest. Around 767.27 sq.km is scrubland indicating significant degradation. Forests here are mainly Tropical Dry Deciduous and Tropical Thorn types adapted to the region's hot, dry climate (temperatures >45°C, 523 mm annual rainfall). Dominant tree species include *Anogeissus latifolia*, *Albizia amara*, *Hardwickia binate* and Red Sanders (*Pterocarpus santalinus*) found in limited areas. The shrub layer features species like *Ziziphus*, *Lantana camara* and *Acacias* with sparse drought-resistant grasses forming the undergrowth. Endemic and conservation-important species like *Syzygium alternifolium*, *Terminalia pallida* and *Cycas beddomei* survive in isolated, undisturbed patches but are threatened by habitat loss, encroachment and illegal activities. Forest management involves 281 Vana Samrakshana Samitis (VSS) managing over 628.35 sq.km through joint forest management efforts focused on afforestation, fire control, and biodiversity conservation. Despite these efforts, forest health remains fragile due to low canopy density and ongoing human pressures. Strengthening conservation, restoration and community engagement is vital to safeguarding forest ecosystems.

During 2016-17, a total of 85 CAMPA activities were undertaken in Kurnool division, of which 20 activities approximately 23 % were selected for detailed monitoring and evaluation. Among the three ranges, Dhone had the highest number of activities implemented with 38 in total, of which 8 were sampled for evaluation. This was followed by the Kurnool range, where 24 activities were implemented and 6 were sampled. Adoni range had the lowest number of activities, with 23 implemented and 6 sampled. Among activity types, maintenance works dominated with 38 activities (8 sampled), followed by other activities (35 implemented; 8 sampled), construction (8 implemented; 2 sampled), and plantations (3 implemented; 1 sampled). Minimal activity was recorded under protection (1; 1 sampled) and there were no SMC activities implemented.

1. Monitoring and Evaluation of Plantation Activities

During 2016-17, Kurnool Forest Division implemented a total of three plantation activities under the CAMPA programme, out of which one activity approximately 33% was selected for monitoring and evaluation. Among the three ranges, Adoni reported all three plantation activities with one selected for sampling. No plantation activities were reported from either Kurnool or Dhone ranges during this period.

1.1 Adoni range

A total of three plantation activities were implemented under the CAMPA scheme in Adoni range. In this monitoring and evaluation process, 20 % of these activities equivalent to one plantation site was randomly selected for assessment.

Table 78 Details of plantation selected in Adoni range

Sl. no.	Plantation	SO no. and year
1	Raising of 20 Ha (bit-I) plantation in Tuggali beat (compartment. no: 55), Pathikonda section of Adoni range under CAMPA NPV	DSO 19 (2016-17)

The selected plantation site is characterized by flat terrain with red soil, and falls within a dry deciduous forest biome making it well-suited for species adapted to seasonal dry conditions.

Survival Percentage: At Tuggali site, high survival rates were recorded for several native species indicating strong adaptability to the local soil and climatic conditions. *Hardwickia binata* showed the highest survival at 91.73%, followed closely by *Soymida febrifuga* at 90.08% and *Azadirachta indica* at 89.80 %.

Growth Performance: At Tuggali plantation, tree growth varied with average height ranging from 2.24 to 3.02 m and girth from 21.02 to 27.83 cm. This variation may be attributed to differences in soil fertility, water availability, species-specific traits and microclimatic influences.

Table 79 Details of plantation enumerated in Adoni range

Sl. no.	Plantation name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Tuggali 20 Ha Bit-I NTSH plantation	1	<i>Azadirachta indica</i>	N 15.377674 E 77.596573	90.9	2.72 ±0.48	23.53 ±4.62
		2	<i>Hardwickia binata</i>	N 15.377394 E 77.596982	91.73	3.02 ±2.16	25.7 ±4.84
		3	<i>Soymida febrifuga</i>	N 15.376925 E 77.597035	90.08	2.97 ±0.50	26.52 ±3.45
		4	<i>Azadirachta indica</i>	N 15.377325 E 77.595926	88.42	2.24 ±0.36	21.02 ±3.00
		5	<i>Azadirachta indica</i>	N 15.377379 E 77.596439	90.08	3.02 ±0.41	27.83 ±3.54
Plantation Average					90.24	2.79	24.92

Verification of plantation area and boundaries

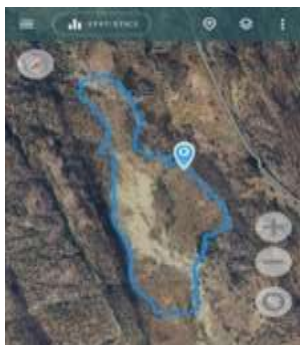
In Kurnool division during 2016-17, measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

Table 80 Details of plantation area perambulation in Kurnool division

Sl. no.	Plantation	Area as per records	Area as per field perambulation
1	Raising of 20 Ha (bit-I) plantation in Tuggali beat (compt. no: 55), Pathikonda section of Adoni range	20 Ha	30.7 Ha

Perambulation of Tuggali plantation area was conducted in the presence of the designated Forest Officer, following the site demarcation indicated by the plantation watcher/guard in charge. The verification involved a complete physical walk-through using the Geo Tracker mobile application, which enabled accurate boundary mapping and the collection of GPS coordinates

along with geotagged photographs. The spatial data collected during the field visit was subsequently analysed using QGIS software. The analysis revealed that the actual plantation area is 10.7 hectares larger than the area recorded in official documents. This discrepancy is primarily due to the inclusion of rocky terrain, trenches, and barren patches within the plantation boundaries areas that were previously excluded or overlooked during initial documentation. The detailed visual and spatial records obtained during the perambulation are provided below for reference ensuring transparency and accuracy in area verification.



Tuggali 30.7 Ha



Tuggali plantation

Health status of plantation: The overall health status of plantation in Tuggali was found to be satisfactory. There were no observed incidences of insect or pest damage affecting any of the planted species. All plants appeared healthy showing no visible signs of infestation or physiological stress which indicates that the sites were well-maintained and provided a favourable environment for healthy and sustained plant growth.

Protection Measures: To safeguard plantations from fire and other environmental threats, several protection measures were implemented, including the creation and maintenance of fire lines, development of inspection paths, and deployment of fire watchers. These measures have proven generally adequate in reducing plantation vulnerability, particularly during the dry season. However, ongoing maintenance and clear visibility of these features are essential to ensure their continued effectiveness.

Biotic (human/cattle) Pressure on Plantations: Incidents of grazing and browsing pressure were not observed in the plantation areas indicating effective protection measures and minimal biotic interference from humans or livestock. The absence of such pressures is likely to have contributed positively to the overall health and survival of the plantation.

Maintenance of Plantation Journals and Records: Plantation journals and records are generally well-maintained with baseline information properly documented. However, there is a need for regular and timely updates of key plantation parameters such as survival rates, growth metrics and maintenance activities to ensure that the records accurately reflect current field conditions and remain relevant for monitoring and evaluation purposes. Plantation is inspected by concerned forest official and entered the observations.

Vana Samrakshan Samithi (VSS): The involvement of Vana Samrakshan Samithi (VSS) or Joint Forest Management Committee (JFMC) was evident in Tuggali plantation located in Adoni range among the selected plantation sites. Their participation reflects the integration of community-based forest management practices contributing to the protection, maintenance and

monitoring of the plantation and supporting the overall objectives of sustainable forest regeneration.

2. Monitoring and Evaluation of Maintenance Activities

During 2016-17, a total of 38 maintenance activities were carried out in Kurnool division, of which 8 activities were selected for monitoring. Dhone accounted for the maximum with 22 activities (4 sampled), followed by Adoni with 14 (3 sampled) and Kurnool with 2 (1 sampled).

Table 81 Maintenance activities selected for evaluation in Kurnool Division

Sl. no.	Maintenance Activities	GPS Co-ordinates	SO no. and year
Kurnool range			
1	First year maintenance of 5 Ha NTSH plantation in Veldurthy beat of Kurnool range	N 15.522765 E 77.937804	DSO 18 (2016-17)
Dhone range			
2	Second year maintenance of 7 Ha SMM plantation in Owk beat Dhone range	N 15.244792 E 78.072226	DSO 14 (2016-17)
3	Third year maintenance of Nereducherla block plantation (2.63 Ha) CA area given by the user agency for extracting of mines in the Resrve Forest	N 15.203263 E 77.893726	RSO 08 (2016-17)
4	Third year maintenance of 30 Ha SMM plantation in Owk beat Dhone range	N 15.101917 E 77.206587	DSO 36 (2016-17)
5	Third year maintenance of Nereducherla block plantation (2.66 Ha) (CA area given by the user agency for extracting of mines in the resrve forest)	N 15.206158 E 77.892944	RSO 9 (2016-17)
Adoni range			
6	First year maintenance of 20 Ha plantation at Aravani kunta locality in Kuppagal beat of Adoni section	N 15.750776 E 77.222026	DSO 23 (2016-17)
7	Second year maintenance of 20 Ha plantation in Pathikonda beat of Pathikonda section of Adoni range	N 15.420053 E 77.536675	DSO 25 (2016-17)
8	Second year maintenance of 20 Ha plantation in Gundlakonda beat of Pathikonda section of Adoni range	N 15.750776 E 77.222026	DSO 26 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. These activities include casualty replacement, weeding operations, soil tilling (inter-ploughing), coppice management, pruning of lower branches, fire line management and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Intensify weeding operations, especially along plantation boundaries, to control *Lantana* and bushy grasses, minimizing competition and ensuring healthy plant growth.

- Continue maintaining clear and effective fire lines with regular clearing before dry seasons to enhance visibility and effectiveness in preventing forest fires.
- Install and maintain plantation boundary stones and boards to ensure accurate demarcation, facilitate monitoring, prevent encroachments and complement contingency records.
- Maintain accurate and updated plantation journals, markers and records to support ongoing identification, monitoring, and accountability.
- Continue timely and appropriate fertilizer application, with special focus on weaker plants to promote uniform growth and ensure optimal nutrient support.
- Carry out timely replanting with healthy bagged seedlings to maintain uniform density, improve survival rate, and strengthen overall plantation health.
- Implement routine coppice management to reduce competition from secondary shoots.
- Improve the frequency and timing of pruning operations to promote healthy plant structure and better bole formation.



Nereducherla beat, Dhone range



Gundlakonda beat, Adone range

3. Monitoring and Evaluation of Protection Activities

During 2016-17, only one protection activity was undertaken in Kurnool division, which was sampled. This activity was implemented in Dhone range, while no protection activities were recorded in other ranges of Kurnool division during this period.

3.1 Creation of fire lines in GA Bad beat of the Dhone range

GPS location: N 15.346946 E 78.088742

SO no. and year: RSO 24 (2016-17)

A fire line was created and maintained in hills of the reserve forest in the GA Bad beat under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of fire line are width - 3 m and length - 4839 rmt. The field measurements matched those in the measurement book indicating no deviations. No dense grass or weed growth was observed indicating that the fire line has been well-maintained.



Fire lines in GA Bad beat

4. Monitoring and Evaluation of Construction Activities

During 2016-17, a total of eight construction activities were carried out in Kurnool division, of which 2 were sampled. All eight construction activities were recorded in Kurnool range, while no construction works were recorded in other ranges of Kurnool division during this period.

4.1 Construction of vehicle parking at city forest in Gargeyapuram beat of Kurnool range

GPS location: N 15.792299 E 78.113265

SO no. and year: DSO 106 (2016-17)

One construction activity related to vehicle parking at city forest in Gargeyapuram beat was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of the vehicle parking are as follows: length - 100 m, width - 12.40 m and depth - 1.6 m. The field measurements matched those in the measurement book indicating no deviations. Vehicle parking facility is in good condition and provides adequate space to accommodate visitor's vehicles at the City Forest. The parking area is spacious; however, grass growth was observed indicating a need for routine maintenance.

4.2 Construction of open-air theatre and paving in the vicinity of open-air theatre in city forest of Gargeyapuram beat of Kurnool range

GPS location: N 15.802759 E 78.117581

SO no. and year: DSO 150 (2016-17)

The second construction activity, involving the open-air theatre in Gargeyapuram beat was monitored and evaluated against the specifications recorded in the measurement book and actual field measurements. The structure was found to be consistent with the documented dimensions-6.15 meters in length and 2.9 meters in width with three seating benches provided. The theatre located within the City Forest is in good condition and serves as a venue for extracurricular activities such as traditional dance performances and singing concerts for visitors. However, vegetation growth was observed over and around the seating stands and theatre area indicating the need for cleaning and regular maintenance



Vehicle parking at city forest



Open-air theatre in Gargeyapuram beat

5. Monitoring and Evaluation of Other Activities

Under the "Others" category, a total of 35 activities were carried out in Kurnool Forest Division during the year 2016-17, out of which 8 were selected for sampling. The highest number of activities was reported in Dhone range with 15 activities, of which 3 were sampled. This was followed by Kurnool range with 14 activities (3 sampled) and Adoni range with 6 activities (2 sampled). Document verification and cross-checking of the sampled activities were conducted in the presence of Division and Range Office staff. The types of documents reviewed included

sanction orders, estimation sheets, and work registers. It was found that the sanctioned amounts were in alignment with the actual expenditures, and all financial records were properly maintained and duly authenticated by the concerned officials, including the Divisional Forest Officer (DFO), Sub-Divisional Officer (SDO), and Forest Range Officer (FRO). The utilization of funds was appropriate and consistent with the approved estimates and CAMPA guidelines. Furthermore, both internal and external audits were conducted internally by the Conservator of Forests and externally by the Accountant General's Office. This multi-tiered audit process ensured transparency and compliance with financial and administrative protocols under the CAMPA scheme.

Key Findings

- The plantations demonstrated excellent survival rates; however, discrepancies in the recorded and actual plantation areas were significant and recurring.
- Maintenance activities effectively supported healthy plant growth, though inadequate signage limited transparency and accountability in the field.
- Construction assets contributed positively to eco-tourism development, but their long-term utility was undermined by insufficient maintenance and upkeep.

Recommendations

- Recurring mismatches between recorded and actual plantation areas highlight the need for a robust verification mechanism. Integrating GIS-based mapping and periodic spatial audits will help accurately delineate plantation boundaries, prevent reporting inconsistencies, and improve long-term monitoring and accountability.
- Ensuring that plantations are established using species suited to local soil and climatic conditions is critical for survival and growth. Emphasis should be placed on native dry deciduous species that align with the ecological profile of the region, enhancing resilience and minimizing maintenance costs over time.
- Weak or missing signage continues to hinder field verification and public accountability. Installing durable, standardized plantation boards with essential details—such as year of planting, species, area, and funding source—alongside comprehensive digital records will promote transparency and traceability across administrative levels.
- While construction assets such as watchtowers, check dams, and rest houses contribute to protection and eco-tourism, their benefits decline rapidly without regular upkeep. Establishing dedicated maintenance funds and assigning responsibility to specific units or committees will ensure the sustained functionality of these assets.
- Active participation of Village Forest Committees (VSS) is essential for effective forest protection. Expanding community involvement through awareness programs, incentive-based participation, and joint monitoring mechanisms can strengthen local ownership and reduce the recurrence of fire and grazing incidents.

11. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN NANDYAL DIVISION

Introduction

Nandyal division encompasses a total forest area of 1,109.66 km², with its composition dominated by Moderately Dense Forest (797.10 km²), followed by Open Forest (266.14 km²) and smaller but ecologically significant patches of Very Dense Forest (46.42 km²). Despite this, the division has recently witnessed a forest loss of 2.84 km², reflecting ongoing anthropogenic and ecological pressures. Of particular concern is the vast expanse of 442.63 km² of scrubland, which underscores the fragile and shifting boundary between stable forest cover and degraded open land typical of this semi-arid landscape. Ecologically, Nandyal is characterized by teak-dominated woodlands that are highly fire-prone and interspersed with extensive open forests vulnerable to grazing and degradation. These forests provide critical support to the livestock-based rural economy, serving as a vital source of fodder and fuelwood. However, this dependence also places immense pressure on the ecosystem, leading to recurring challenges of overgrazing, soil erosion, and regeneration lacunae. Central to these interventions is the role of community-based protection programs, which strengthen local stewardship and ensure that conservation outcomes are aligned with livelihood needs. Collectively, these strategies aim to restore ecological resilience while sustaining the socio-economic fabric of the region.

In Nandyal division, a total of 10 CAMPA activities were carried out, of which 5 activities (around 25 %) were selected for detailed monitoring and evaluation. In Panyam range, 5 activities were implemented, and 2 were sampled. In Baniganapalli range, 5 activities were implemented, and 3 were sampled. Among activity types, maintenance dominated with 9 activities (4 sampled), followed by protection (1; 1 sampled), none of the activities were implemented or sampled construction from plantation, maintenance, and soil and moisture conservation.

1. Monitoring and Evaluation of Maintenance Activities

During 2016-17, a total of nine maintenance activities were carried out in Nandyala division during 2016-17, of which four activities were selected for monitoring. In Panyam 5 activities implemented and 2 sampled, Baniganapalli accounted for the maximum four activities (2 sampled).

Table 82 Maintenance activities selected for evaluation in Nandyal division

Sl no.	Maintenance Activities	GPS Co ordinates	SO no. and year
Panyam range			
1	Third year maintenance of 20 Ha (bit-I) SMM (NTSH) plantation at Panayam RF of Konidedu beat	N 15.531016 E 78.230319	DSO 53 (2016-17)
2	Third year maintenance of 20 Ha (bit-II) plantation at Panayam RF (Compt.no:138) of Konidedu beat	N 15.531007 E 78.230283	DSO 54 (2016-17)
Banaganapalli range			
3	Third year maintenance of safety zone plantation (0.81 Ha) lease unit of Y. Balathimma Reddy	N 15.311995 E 78.187179	RSO 12 (2016-17)

4	Third year maintenance of safety zone plantation (0.83 Ha) lease unit of G. Maddilety Reddy	N 15.311807 E 78.188258	RSO13 (2016-17)
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As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. These activities include weeding operations, soil tilling (inter-ploughing), fire line management, and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantation. However, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Intensify weeding operations, especially along plantation boundaries, to control Lantana and bushy grasses, minimizing competition and ensuring healthy plant growth.
- Continue maintaining clear and effective fire lines, with regular clearing before dry seasons to enhance visibility and effectiveness in preventing forest fires.
- Install and maintain plantation boundary stones and boards to ensure accurate demarcation, facilitate monitoring, prevent encroachments, and complement contingency records.



Konidedu beat panyam range



G. Maddilety Reddy banaganapalli range

2. Monitoring and Evaluation of Protection Activities

During 2016-17 Andhra Pradesh Forest Department undertook one protection activities under the CAMPA scheme in the Baniganapallirange. For monitoring and evaluation, a representative sample of 20 %, comprising one protection activities, was selected for detailed assessment.

2.1 Creation of Fire Lines in GA Bad beat of Banaganapalli range

GPS location: N 15.34536 E 78.085469

SO no. and year: RSO 24 (16-17)

A fire line was created and maintained in GA Bad beat under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of new fire line are width – 10 m, and length – 5000rmt. The field measurements matched those in the measurement book, indicating no deviations. Visibility is prominent, particularly as it runs along the mountain slope within the Reserve Forest. Moderate growth of grasses and weeds was observed along the fire line, indicating the need for regular maintenance. Additionally, certain patches require periodic trimming to maintain the recommended width and effectiveness of the fire line.



GA Bad RF and beat Banaganapalli range

Key Findings

- Implementation was limited in scale, with only ten activities undertaken.
- Activities were confined to maintenance and fire protection, with no plantation or soil and moisture conservation (SMC) works implemented.
- Execution quality was satisfactory, though signage and record-keeping were found to be weak.
- The fire line was effective; however, its location on a slope made it susceptible to weed regrowth.
- Continued grazing pressure and forest loss highlighted the ecological vulnerability of the area.

Recommendations

- Expand the scope of CAMPA activities to include plantations and soil and moisture conservation (SMC) works for long-term ecological benefits.
- Replace and maintain plantation boards and boundary stones to ensure effective monitoring and accountability.
- Carry out seasonal clearance and maintenance of fire lines, with special attention to slope areas.
- Strengthen community participation through Vana Samrakshana Samithis (VSS) in fire prevention and grazing regulation efforts.

12. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN ATMAKUR DIVISION

Introduction

Atmakur Division, as per historical ISFR / AP State Forest Reports, covers a geographical area of approximately 2,154 km², of which about 1,288.81 km² (~ 59.8%) was notified forest area. The forests are typified by Tropical Dry Deciduous, Tropical Moist Deciduous, and Tropical Thorn types, with the bulk (~ 93.5%) under Reserved or Un-classed Forest categories. Earlier canopy density assessments indicated small patches of Very Dense Forest, more significant portions of Moderately Dense and Open Forest, while scrub areas were also large. Comparatively, recent updated data for the Atmakur Division shows a forest cover of 977.25 km², with 703.10 km² in Moderately Dense Forest, 234.58 km² Open Forest, and 39.57 km² Very Dense Forest. This indicates a shrinkage relative to older notified forest area figures and reflects ongoing environmental pressures including a recorded decline of 3.13 km². Scrubland in the division is now about 86.05 km², signaling degraded or recovering land. These forests are crucial for groundwater recharge, soil and microclimate regulation, and providing essential livelihood resources for forest-dependent communities. At the state level, Andhra Pradesh had ~ 29,784 km² of forest cover in ISFR 2021, about 18.28% of its geographical area, with a net gain of ~ 647 km² over the two-year period 2019-2021. However, ISFR 2023 shows a slight dip in forest cover, underscoring the fragility of gains and the need for sustained conservation effort.

In Atmakur Division during 2016-17, a total of 120 CAMPA activities were carried out, of which 29 activities (around 24 %) were selected for detailed monitoring and evaluation. In Atmakur range, 31 activities were implemented, and 6 were sampled. In Nagaluty range, 28 activities were implemented, and 7 were sampled. In Bairluty range, 22 activities were implemented, with 6 sampled. In Velgode range, 21 activities were implemented, and 5 were sampled. In Srisailam range, 18 activities were implemented, and 5 were sampled. Among activity types, other works dominated with 99 activities (22 sampled), followed by plantations (14; 5 sampled), maintenance (6; 1 sampled), soil and moisture conservation (1; 1 sampled), there were no protection and construction activities implemented.

1. Monitoring and Evaluation of Plantation Activities

In Atmakur division, a total of 14 plantation activities were carried out under CAMPA, of which 5 activities (about 35 %) were selected for monitoring and evaluation. Among the ranges maximum works were in Bairluty range with 5 reported activities (2 sampled), Nagaluty range with 4 activities and 1 sampled and Velgode range with 3 activities (1 sampled), Srisailam with 2 activities (1 sampled). No plantation activities were reported from Atmakur range.

1.1 Bairluty range

During 2016–17, a total of five plantation activities were carried out under the CAMPA scheme in Bairluty range. In this monitoring and evaluation process, approximately 40 % of these activities equivalent to two plantation sites were randomly selected for assessment.

Table 83 Details of plantation selected in Bairluty range

Sl. no.	Plantation	SO no. and year
1	Advance cum raising of 5 Ha bamboo plantation in P.A. Puram (S) beat	DSO 53 (2016-17)

2	Advance cum raising of 10 Ha Siddapuram bamboo plantation in Bairluty beat	DSO 51 (2016-17)
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In P A Puram plantation assessed was an Assisted Natural Regeneration (ANR) gap plantation, undertaken in degraded natural forest areas selected for ecological restoration. Plantation activities involved supporting the natural regeneration of vegetation within these forest patches. A total of 3,125 seedlings were planted in the identified degraded areas using the gap plantation method.

Survival Percentage: In P.A. Puram plantation, the site showed moderate suitability for *Dendrocalamus strictus* (bamboo), with an average survival rate of 65.55%. In contrast, at the Siddapuram 10 Ha bamboo plantation, the planted *Dendrocalamus strictus* seedlings were found to moderate survived during the assessment only three sample plots were laid. However, the presence of naturally regenerated bamboo clumps was observed in the area.

Growth: At P.A. Puram plantation, the following average growth parameters were recorded for *Dendrocalamus strictus*: Height: 8.00 to 10.54 m, Clump Girth: 2.79 to 3.67 m, Culm Girth: 14.00 to 14.58 cm.

Note: In Siddapuram 10 Ha bamboo plantation (GPS location: N 15.865265 E 78.753237 SO no. and year: DSO 51(2016-17)), located in the Bairluty Range, was established during the year 2016–17. The plantation site was selected within a natural forest area, and a total of 6,250 seedlings of *Dendrocalamus strictus* were planted in degraded patches through the gap plantation method. During the field visit, the plantation area was fully perambulated, and enumeration activities were conducted. However, no traces of the planted *Dendrocalamus strictus* seedlings were found. Only naturally grown bamboo clumps were observed across the site. According to the Forest Department journal entry dated 2017, only 29 % of the planted bamboo seedlings had survived at that time.

Table 84 Details of plantation enumerated in Bairluty range

Sl. no.	Plantation/ Village name	Plot no	Species name	GPS Coordinates	Average growth			Survival (%)
					Avg. Clump Height (m)	Avg. Clump GBH (m)	Avg. Culm GBH (cm)	
1	PA Puram 5 Ha ANR Bamboo plantation	1	<i>Dendrocalamus strictus</i>	N 15.820348 E 78.657507	8.82 ±0.42	2.79 ±0.51	14.00 ±2.29	70.00
		2	<i>Dendrocalamus strictus</i>	N 15.821256 E 78.657994	10.04 ±0.94	3.58 ±0.56	14.25 ±2.38	60.00
		3	<i>Dendrocalamus strictus</i>	N 15.821039 E 78.657986	10.54 ±0.96	3.67 ±0.54	14.58 ±1.83	66.66
Plantation average					9.80	3.34	14.27	65.55

1.2 Nagaluty range

A total of four plantation projects were implemented under the CAMPA scheme in Nagaluty range during 2016–17. For evaluation purposes, 20 % of these activities equivalent to one plantation site was randomly selected for assessment.

Table 85 Details of plantation selected in Nagaluty range

Sl. no.	Plantation	SO no. and year
1	Raising of 7 Ha ANR Bamboo plantation in compartment no.748, Venkatapuram beat in Nagaluty section of Nagaluty range	SDSO 1 (2016-17)

The enumerated plantation was an ANR (Assisted Natural Regeneration) gap plantation, where degraded natural forest areas were identified and taken up for regeneration. In these areas, gap planting was carried out to assist natural regeneration in the degraded patches. The site for planting was selected within a natural forest area, and a total of 4,375 seedlings were planted in the degraded patch through gap plantation activities.

Survival Percentage: In Nagaluty Range, Venkatapuram plantation recorded an average survival rate of 42.08 % for the *Dendrocalamus strictus* species. The site chosen for the plantation was found to be suboptimal due to poor soil quality and unfavourable environmental conditions, which adversely affected the growth of bamboo. Hence, only two sample plots were laid. The primary cause of the low survival rate and stunted growth was overgrazing by wild herbivores from the adjoining forest areas. The intense grazing pressure severely impacted the young bamboo plants, restricting their establishment and growth. This highlights the urgent need for effective protection measures, such as fencing or herbivore control strategies, to ensure better survival and growth outcomes in future plantations.

Growth: In Venkatapuram plantation, the bamboo plants exhibited the following average growth metrics: height ranged from 6.58 to 7.64 meters, clump girth ranged from 2.71 to 2.75 meters, and culm girth ranged from 19.33 to 22.86 centimetres. These figures indicate a moderate level of growth for *Dendrocalamus strictus*. However, improved site conditions and enhanced protection from biotic pressures could further support better growth. These parameters are crucial for evaluating the plantation's success in terms of vertical growth, clump formation, and culm development.

Table 86 Details of plantation enumerated in Nagaluty range

Table 86 Details of plantation enumerated in Nagarky Range								
Sl. no.	Plantation/ Village name	Plot no	Species name	GPS Coordinates	Average growth			Survival (%)
					Avg. Clump Height (m)	Avg. Clump GBH (m)	Avg. Culm GBH (cm)	
1	Venkata puram 7 Ha ANR plantation	1	<i>Dendrocalamus strictus</i>	N 15.89804 E 78.705653	6.58 ±0.38	2.75 ±0.27	19.33 ±1.75	70
		2	<i>Dendrocalamus strictus</i>	N 15.898047 E 78.705807	7.64 ±0.38	2.71 ±0.27	22.86 ±2.12	60
Plantation average					7.11	2.73	21.09	65

1.3 Velgode range

A total of three plantation projects were implemented under the CAMPA scheme in Velgode range during 2016–17. For evaluation purposes, 20 % of these activities equivalent to one plantation site was randomly selected for assessment.

Table 87 Details of plantation selected in Velgode range

Sl. no.	Plantation	SO no. and year
1	Advance cum raising of 10 Ha Bamboo plantation in Pangidi section of Velgode range	DSO 57 (2016-17)

The enumerated plantation was carried out under the Assisted Natural Regeneration (ANR) model, wherein degraded natural forest areas were selected for ecological restoration. Under this approach, gap planting was adopted to support natural regeneration by introducing appropriate species in degraded or sparsely vegetated patches.

Specifically, 6,250 seedlings were planted within identified gaps across the natural forest area as part of this intervention.

Survival Percentage: In Velgode Range, Pangidi plantation site exhibited a promising survival rate for the species *Dendrocalamus strictus*, with an average survival percentage of 65.98%, indicating moderate establishment success under prevailing site conditions.

Growth: At Pangidi plantation: The average species height ranged between 4.04 m to 8.60 m. The average clump girth was recorded between 2.15 m and 3.09 m. The average culm girth ranged from 16.17 cm to 21.64 cm. These parameters suggest satisfactory vegetative growth and clump formation, characteristic of healthy bamboo development.

Table 88 Details of plantation enumerated in Velgode range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Coordinates	Average growth			Survival (%)
					Avg. Clump Height (m)	Avg. Clump GBH (m)	Avg. Culm GBH (cm)	
1	Pangidi 10 Ha ANR Bamboo plantation	1	<i>Dendrocalamus strictus</i>	N 15.722142 E 78.661859	4.04 ±0.62	2.75 ±0.40	16.17 ±2.12	66.60
		2	<i>Dendrocalamus strictus</i>	N 15.721246 E 78.662148	8.50 ±0.45	3.09 ±0.38	21.64 ±1.96	64.70
		3	<i>Dendrocalamus strictus</i>	N 15.722409 E 78.66154	8.60 ±0.39	2.15 ±0.47	18.80 ±1.62	66.66
Plantation average					7.04	2.66	18.87	65.98

1.4 Srisailam range

During the monitoring and evaluation of CAMPA plantation activities, a total of two plantation projects were implemented under the CAMPA scheme in Srisailam range during 2016-17. For evaluation purposes, 20 % of these activities equivalent to one plantation site was selected randomly for assessment of the plantation.

Table 89 Details of plantation selected in Srisailam range

Sl. no.	Plantation	SO no. and year
1	Raising of 5 Ha ANR Bamboo plantation at Pecheruvu (W) beat	DSO 61 (2016-17)

Note: GPS Location: N 15.96437, E 78.817943 SO No. and Year: DSO 61 (2016–17)

The enumerated plantation was an ANR (Assisted Natural Regeneration) gap plantation, wherein a degraded natural forest area was selected for regeneration by assisting the natural regrowth process through plantation activities. In the Srisailam Range, a 5-hectare Bamboo plantation at Pecheruvu was established in the year 2016–17. The site selected was a degraded patch within a natural forest, and a total of 3,125 Bamboo seedlings were planted. However, only 4 to 5 Bamboo seedlings were observed to have survived across the entire plantation area. The surviving seedlings exhibited height ranging from 0.4 to 1 meter and clump girth ranging from 10 to 12 cm, indicating very low survival and stunted growth. The primary reason for the downfall of the plantation was intense overgrazing by herbivores from the adjacent forest areas.

Comparative assessment of plantations in Atmakur division during 2016-17

The bamboo plantations established during 2016–17 in Atmakur Division exhibited varying levels of success. Plantations at P.A. Puram (65.55%) and Pangidi (65.98%) demonstrated moderate survival with satisfactory growth performance, indicating relatively favourable site conditions. In contrast, Venkatapuram plantation (42.08%) recorded poor survival, largely attributed to suboptimal soil quality and heavy grazing pressures. The plantations at Siddapuram (29%) and Pecheruvu (negligible survival) almost completely failed, reflecting the severe impact of unsuitable site factors and uncontrolled biotic interference. This assessment underscores the need for improved site selection, stronger protection measures, and adaptive management practices to enhance bamboo plantation success in the division.

Verification of plantation area and boundaries

In Atmakur division during 2016-17 measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

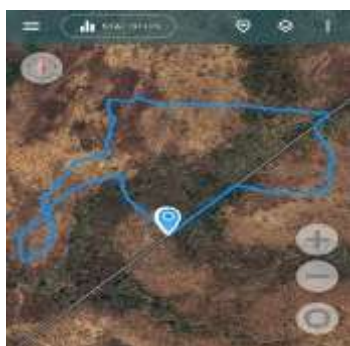
Table 90 Details of plantation area perambulation in Atmakur division

Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Advance cum raising of 5 Ha bamboo plantation in P.A. Puram (S) beat in Bairluty range	5 Ha	7 Ha
2	Advance cum raising of 10 Ha Siddapuram bamboo plantation in Bairluty range	10 Ha	12 Ha
3	Raising of 7 Ha ANR Bamboo plantation in compartment no.748 Venkatapuram beat in Nagaluty section of Nagaluty range	7 Ha	Bit I- 5 Ha Bit II- 3.5 Ha Total = 8.5Ha
4	Advance cum raising of 10 Ha Bamboo plantation in Pangidi section of Velgode range	10 Ha	11.26 Ha
5	Raising of 5 Ha. ANR Bamboo plantation at Pecheruvu (W) beat in Srisailam range	5 Ha	5 Ha

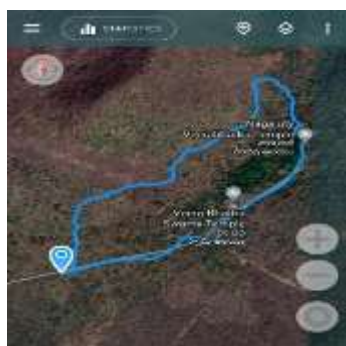
Perambulation of the plantations revealed discrepancies between the recorded and actual areas due to dense jungle growth and trenches around the plantation boundaries. These natural obstructions made it difficult to trace the exact boundaries, leading to measurements being taken along the outer perimeters or likely due to rocky or waste patches within the plantation and possibility taken during survey.

- P A Puram 5 Ha plantation (Bairluty range): The measured area exceeded the actual plantation by 2.0 Ha.
- Siddapuram 10 Ha Bamboo plantation (Bairluty range): The measured area exceeded the actual plantation by 2.0 Ha.
- At Venkata Puram 7 Ha plantation (Nagaluty range), the actual area exceeded the recorded area by 1.50 Ha.
- Pangidi 10 Ha Plantation (Velgode range): The perambulated area exceeded the recorded area by 1.26 Ha.
- Pecheruvu Plantation (Srisailam range): The perambulated area was same as per the recorded area 5.0 Ha.

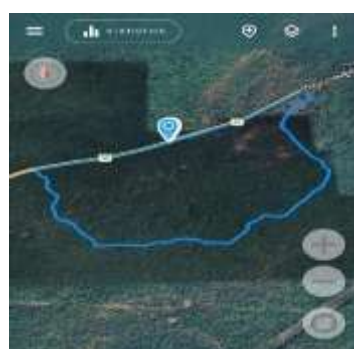
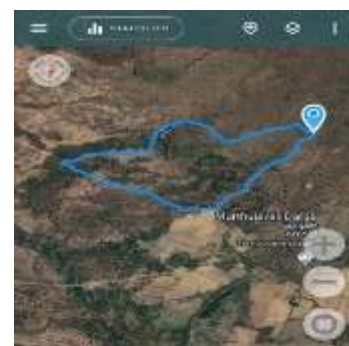
Verification was carried out with the assistance of the local Forest Beat Officer, using QGIS software and further confirmed through Geo Tracker application. Geotagged images were documented as evidence.



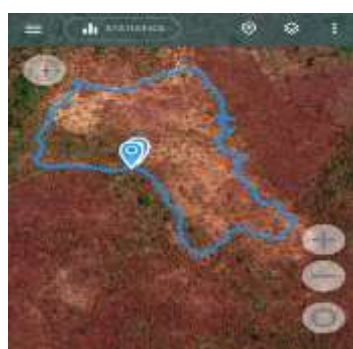
P A Puram plantation 7.0 Ha



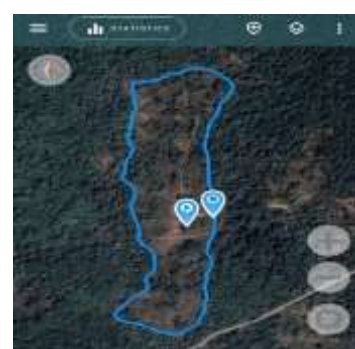
Venkatapuram plantation Bit-I and II 8.50 Ha



**Siddapuram plantation
12.0 Ha**



**Pangidi plantation
11.26 Ha**



**Pecheruvu
plantation 5.0 Ha**

Health Status of Plantations: Field inspections revealed no evidence of insect infestation or pest-related damage, indicating that the plantations are in a satisfactory condition with good resistance to pests and diseases. Overall plant health was found to be stable across the sites.

Protection Measures: Adequate preventive and protective measures have been undertaken to safeguard the plantations from environmental threats. These include the creation and maintenance of fire lines, establishment of inspection paths, and deployment of fire watchers. Such measures are effective in mitigating the risks of forest fires and related hazards.

Biotic Pressure on Plantations: Evidence of grazing and browsing pressure from cattle and wild herbivores was observed at certain sites, particularly the Siddapuram 10 Ha plantation,

where this has posed a serious challenge to plant survival and growth. However, in other locations, no significant human or cattle interference was reported, suggesting variable biotic pressure across sites. Strengthened protective strategies are necessary in vulnerable areas to reduce these threats.

Maintenance of Plantation Journals and Records: The plantation journals were well maintained, with details of activities and observations recorded in a satisfactory manner. However, it was noted that the periodic updating of plantation parameters (such as survival percentage, height, girth measurements, and maintenance activities) needs further strengthening to ensure accuracy and support effective monitoring and evaluation. Additionally, plantation boards an important tool for transparency, public awareness, and easy identification of plantation details were not observed. The absence of such boards reduces the visibility of plantation activities and should be addressed promptly. Plantation is inspected by concerned forest official and entered the observations.

Vana Samrakshan Samithi (VSS): Among the three plantations evaluated in the Atmakur Division, the involvement of Vana Samrakshana Samithi (VSS) or Joint Forest Management Committees (JFMCs) was recorded in the Bailuty, Nagaluty and Srisailam ranges for plantation establishment and maintenance. However, in the Velgode range, there was no involvement of VSS. Consequently, no Focus Group Discussions (FGDs) were conducted for community feedback or qualitative evaluation.



P A Puram plantation



Sidda Puram plantation



Venkatapuram plantation



Pangidi plantation

2. Monitoring and Evaluation of Maintenance Activities

During 2016-17 a total of six maintenance activities were carried out in the Nagaluty range of Atmakur division during 2016-17, of which one activity was sampled for monitoring. There was no maintenance activities reported from the other ranges.

Table 91 Maintenance activity selected for evaluation in Atmakur division

Sl. no.	Maintenance Activity	GPS Co-ordinates	SO no. and year
Nagaluty range			
1	Estimate for second year maintenance 50 Ha ANR plantation CA land area of Indireswaram west beat	N 18.145717 E 83.775214	RSO 26 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken in the second year of implementation following plantation establishment. These activities include weeding operations, soil tilling (inter-ploughing), formation of saucers and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. However, in the site, plantation boards were not found or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Intensify weeding operations, particularly along plantation boundaries, to control Lantana and bushy grasses, reduce competition, and promote healthy plant growth.
- Continue maintaining clear fire lines, ensuring they are regularly cleared before the dry season to improve effectiveness in preventing forest fires.
- Undertake timely replanting with healthy bagged seedlings to maintain proper stocking density, enhance survival rates, and strengthen plantation health.
- Install and maintain plantation boundary stones and boards for accurate demarcation, better monitoring, prevention of encroachments, and reliable record-keeping.
- Maintain accurate and regularly updated plantation journals, markers, and records to support effective monitoring and accountability.



Indireswaram West beat, Nagaluty range

3. Monitoring and Evaluation of Soil and Moisture Conservation (SMC) Activities

A total of one activity was carried out during 2016-17 in Nagaluty range, 20 % was sampled which is equivalent to single activity. No SMC works were recorded in other ranges of Atmakur division.

3.1 Digging of water absorption trenches in CA land area in Indireswaram West beat of Nagaluty range

GPS location: N 15.924186 E 78.65098

SO no. and year: DSO 213 (2016-17)

Digging of water absorption trenches in CA land area in Indireswaram West beat of range was monitored and evaluated in Nagaluty range. The trenches were found well maintained with the dimensions of width -1.375 m, length - 4000 rmt and depth of 1.5 m, and its measurements align with the recorded specifications. It demonstrates good water facility. However, periodic maintenance is recommended to enhance effectiveness.



Water absorption trenches in CA land area in Indireswaram west beat

4. Monitoring and Evaluation of Other activities

During the period 2016-17, 99 activities were carried out under the “Others” category in Atmakur Forest Division, with 22 activities sampled. Atmakur range reported the highest number with 31 activities (6 sampled), followed by Velgode with 18 (4 sampled), Bairluty and Nagaluty with 17 each (4 sampled each), and Srisailam with 16 (4 sampled). Document verification and cross-checking were conducted in the presence of Division and Range Office staff. The documents reviewed included sanction orders, estimation sheets, and work registers. It was found that sanctioned amounts aligned with actual expenditures, financial records were properly maintained and authenticated by the concerned officials (DFO, SDO, and FRO), and fund utilization was consistent with approved estimates and CAMPA guidelines. Internal audits by the Conservator of Forests and external audits by the Accountant General’s office ensured transparency and compliance with financial and administrative protocols. However, discrepancies were noted during record verification. In Nagaluty range, estimates for DSO 24, 28, and 47 were not presented. In Atmakur range, both the estimate and work register were missing for DSO 85, 7, and 113. In Bairluty range, estimates for DSO 43, 45, and 242 were not presented, while both estimate and work register were missing for DSO 51. In Velgode range, estimates and work registers were not presented for RSO 10 and DSO 57, and work registers were missing for DSO 38, 76, and 19. These missing records were formally acknowledged by the Velgode Ranger. In Srisailam range, both the estimate and work register were not presented for DSO 25, 12, 109, and 61. These findings indicate gaps in documentation and highlight the need to strengthen record-keeping and accountability across the division.

Key Findings

- Bamboo plantations achieved moderate success in P.A. Puram and Pangidi, but failed in Siddapuram and Pecheruvu, with Venkatapuram showing poor results due to grazing and poor soils.
- KML verification revealed frequent mismatches in recorded and actual plantation extents.
- Maintenance activities were minimal and insufficient relative to the plantation area created.
- SMC works were effective but limited to a single site.

- Records for “Other” activities were generally maintained but not comprehensive across all ranges.
- Community participation through VSS was present in some plantations but absent in others, limiting local ownership

Recommendations

- Strengthen protection (especially fencing) in vulnerable plantations to reduce grazing losses.
- Expand soil and moisture conservation measures to improve survival in drought-prone areas.
- Scale up maintenance works and enforce systematic record updating, including plantation boards.
- Improve precision of plantation boundary demarcation through GPS and GIS tools.
- Ensure complete documentation for all sanctioned works to enhance transparency and accountability.

13. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN MARKAPUR DIVISION

Markapur Division in Andhra Pradesh covers a total forest area of 1,603.09 km² as per the *India State of Forest Report (ISFR) 2023*. Of this, 137.84 km² is classified as Very Dense Forest (VDF), 832.15 km² as Moderately Dense Forest (MDF), and 633.10 km² as Open Forest (OF). In addition, the division contains 538.82 km² of scrubland, reflecting areas under degradation or regeneration. A net decline of 10.16 km² in forest cover has been recorded since the previous assessment, pointing to mounting ecological pressures. The forests of Markapur, dominated by dry teak formations, are highly fire-prone and vulnerable to grazing and other anthropogenic disturbances. Ecologically, this division plays a critical dual role by maintaining a sustainable timber base and functioning as a vital wildlife corridor that supports the movement of large mammals, while management interventions such as fire line establishment and assisted natural regeneration are being implemented to safeguard and restore its ecological integrity.

In Markapur Division during 2016-17, a total of 122 CAMPA activities were carried out, of which 27 activities (around 22 %) were selected for detailed monitoring and evaluation. In GV Palli range, 34 activities were implemented, and 8 were sampled. In Dornala range, 31 activities were implemented, and 8 were sampled. In Markapur range, 24 activities were implemented, with 5 sampled. In V P south range, 18 activities were implemented, and 2 were sampled. In Y Palem range, 15 activities were implemented, and 4 were sampled. Among activity types, other works dominated with 90 activities (18 sampled), followed by plantations (19 implemented; 5 sampled), maintenance (6 implemented; 2 sampled), construction (4 implemented; 2 sampled), there were no protection, soil moisture and conservation activities were implemented.

1. Monitoring and Evaluation of Plantation Activities

In Markapur division, a total of 19 plantation activities were carried out under CAMPA, of which 5 activities (about 26 %) were selected for monitoring and evaluation. Among the ranges maximum counted in Markapur range reported with 7 activities implemented (1 sampled), GV Palli range with same (6 implemented; 2 sampled), Dornala range with 4 activities (1 sampled), and Y Palem with 2 activities (1 sampled). No plantation activities were reported from V P South range.

1.1 Markapur range

A total of seven plantation activities were carried out under the CAMPA scheme in Markapur range. In this monitoring and evaluation process, approximately 20 % of these activities equivalent to one plantation site was randomly selected.

Table 92 Details of plantation selected in Markapur range

Sl. no.	Plantation	SO no. and year
1	Estimate for raising of 20 Ha plantation bit-II (SMM method) in 2016-17 of Gotlagattu beat of Podili section of Markapur range through Chinnarikatla VSS	DSO108 (2016-17)

The selected site for the 20 Ha plantation at Gotlagattu in the Markapur Range is characterized by red soil.

Survival Percentage: In Markapur range, the Gotlagattu 20 Ha plantation shows good suitability for *Azadirachta indica* and *Syzygium cumini* with survival rates of 85.53 % and 85.12 % respectively. *Sterculia urens* shows moderate growth with a survival rate of 69.42 %.

Growth: In Markapur range, the 20 Ha plantation at Gotlagattu has an average tree height ranging from 1.46 to 3.54 m and a girth ranging from 17.17 to 32.88 cm.

Table 93 Details of plantation enumerated in Markapur range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth		
						Height (m)	GBH (cm)	Collar girth (cm)
1	Gotlagattu 20 Ha Plantation	1	<i>Azadirachta indica</i>	N 15.523331 E 79.474117	86.77	2.88 ±0.53	30.10 ±4.04	-
		2	<i>Syzygium cumini</i>	N 15.523552 E 79.47418	84.29	1.86 ±0.38	-	17.56 ±3.32
		3	<i>Sterculia urens</i>	N 15.525265 E 79.474485	69.42	1.46 ±0.42	-	17.17 ±3.57
		4	<i>Syzygium cumin</i>	N 15.525116 E 79.475807	85.95	3.54 ±0.50	32.88 ±7.63	-
		5	<i>Azadirachta indica</i>	N 15.52301 E 79.473833	84.29	2.76 ±0.75	23.73 ±5.88	-
Plantation average					82.14	2.50	28.90	17.36

1.2 GV Palli range

A total of six plantation projects were implemented under the CAMPA scheme in GV Palli range during 2016–17. For evaluation purposes, 20 % of these activities equivalent to one plantation site were randomly selected for assessment.

Table 94 Details of plantations selected in G.V. Palli range

Sl. no.	Plantations	SO no. and year
1	Estimate for raising of 3 Ha. Bamboo plantation along the streams in Regumanupenta beat of Palutla section of GVPalli range	DSO 36 (2016-17)
2	Estimate for raising of 4 Ha. Bamboo plantation along the streams in Nekkanti beat of Nekkanti section of G.V. Palli range	DSO38 (2016-17)

The Regumanupenta 03 Ha plantation site has red, hard, gravelly soil, which typically offers good drainage but may be low in nutrients. This type of soil might require soil conditioning with organic matter or fertilizers to improve its fertility and support healthy plant growth. It may also need measures to break up its hardness to allow for better root penetration. The Nekkanti 04 Ha plantation site has red soil, which is often rich in iron and can be well-draining. Red soil typically supports a variety of crops but may require periodic management to maintain its fertility.

Survival percentage: In the G.V. Palli range, the Nekkanti plantation has a survival percentage of 43.32%. The limited growth and low survival rate of the Bamboo can be attributed to factors such as overgrazing by herbivorous animals and inadequate rainfall. These environmental challenges likely hinder the establishment and growth of the Bamboo, impacting their overall

survival rate. Addressing these issues, such as improving grazing control and managing water resources, could potentially improve the survival and growth of the plantation.

Growth: In the Nekkanti plantation, *Dendrocalamus strictus* reaches an average height of 2.41 to 3.03 m, with an average clump girth ranging from 3.27 to 4.07 m and an average culm girth ranging from 11.50 to 12.67 cm.

Note: In the GV Palli Range, a 3 Ha Bamboo plantation was taken up along the streams in Regumanupenta Beat of Palutla Section under the CAMPA-NPV Scheme, vide DSO 36 (2016–17), in Compartment No. 370 at GPS location N 16.134841, E 79.073153. However, during the field inspection, no plantation was observed in the designated and recorded area, indicating complete plantation downfall. The reason is attributed to rocky soil conditions, low rainfall, lack of watering, and transportation difficulties, all of which severely affected the survival and growth of the bamboo plants.

Table 95 Details of plantation enumerated in GV Palli range

Sl. no.	Plantation / Village name	Plot no.	Species name	GPS Coordinates	Average Growth			Survival (%)
					Avg. Clump Height (m)	Avg. Clump GBH (m)	Avg. Culm Collar girth (cm)	
1	Nekkanti 4 Ha Bamboo plantation	1	<i>Dendrocalamus strictus</i>	N 16.089612 E 78.973856	2.78 ±0.58	3.69 ±0.79	12.44 ±1.86	44.44
		2	<i>Dendrocalamus strictus</i>	N 16.089604 E 78.973846	3.03 ±0.48	4.07 ±1.28	11.93 ±1.79	41.66
		3	<i>Dendrocalamus strictus</i>	N 16.089614 E 78.973857	2.66 ±0.44	3.94 ±0.85	11.50 ±1.37	44.44
		4	<i>Dendrocalamus strictus</i>	N 16.082994 E 78.978401	2.87 ±0.52	3.27 ±0.88	12.67 ±1.50	41.66
		5	<i>Dendrocalamus strictus</i>	N 16.081675 E 78.979759	2.41 ±0.42	4.00 ±0.89	11.81 ±1.60	44.44
Plantation average					2.75	3.79	12.07	43.32

1.3 Dornala range

A total of four plantation projects were implemented under the CAMPA scheme in Dornala range during 2016–17. For evaluation purposes, 20 % of these activities equivalent to one plantation site was randomly selected for assessment.

Table 96 Details of plantation selected in Dornala range

Sl. no.	Plantation	SO no. and year
1	Estimate for raising of 5 Ha. Bamboo plantation along the streams in Peddapenta area of Chinnamanthanala beat of Dornala range	DSO 43 (2016-17)

The selected site for the 5 Ha plantation at Chinnamanthanala is characterized by red soil.

Survival percentage: Chinnamanthanala plantation recorded a survival rate of 25.95%. The selected site was not appropriate for plantation activities and the limited growth and low survival

rate of the Bamboo can be attributed to overgrazing by herbivorous animals and inadequate rainfall.

Growth: In Chinnamanthanala plantation, *Dendrocalamus strictus* exhibited average heights ranging from 2.06 to 2.28 meters, average clump girths from 3.05 to 4.17 m and average culm girths from 16.10 to 17.67 cm.

Table 97 Details of plantation enumerated in Dornala range

Sl. no.	Plantation / Village name	Plot no.	Species Name	GPS Coordinates	Average Growth			Survival (%)
					Avg. Clump Height (m)	Avg. Clump GBH (m)	Avg. Collar girth of culm (cm)	
1	Chinna manthanala 5 Ha Bamboo plantation	1	<i>Dendrocalamus strictus</i>	N 15.804703 E 78.849168	2.06 ±0.17	3.11 ±0.82	16.22 ±2.05	25.00
		2	<i>Dendrocalamus strictus</i>	N 15.804992 E 78.848944	2.20 ±0.26	3.05 ±0.60	16.10 ±1.85	27.77
		3	<i>Dendrocalamus strictus</i>	N 15.808229 E 78.848307	2.11 ±0.22	4.17 ±0.56	17.67 ±1.50	25.00
		4	<i>Dendrocalamus strictus</i>	N 15.807197 E 78.850106	2.15 ±0.24	3.95 ±0.55	16.30 ±1.95	27.77
		5	<i>Dendrocalamus strictus</i>	N 15.805417 E 78.848983	2.28 ±0.26	3.56 ±0.88	16.56 ±1.67	25.00
Plantation average					2.16	3.56	16.57	26.10

1.4 Y Palem range

A total of two plantation projects were implemented under the CAMPA scheme in Y Palem range during 2016–17. For evaluation purposes, one plantation site constituting 50 % of the activities was randomly selected for assessment.

Table 98 Details of plantation selected in Y Palem range

Sl. no.	Plantation	SO no. and year
1	Estimate for raising of 20 Ha. at Mogullapalli VSS of Komarolu beat of Y. Palem section of Y. Palem range	DSO100 (2016-17)

The plantation site at Komarolu is characterized by red soil.

Survival percentage: In Komarolu plantation Overall survival was low, with species-wise survival recorded as: *Terminalia arjuna* – 45.45 %, *Azadirachta indica* – 54.54 %, *Holoptelea integrifolia* – 43.8 %, *Pongamia pinnata* – 44.62 %, *Syzygium cumini* – 46.28 %, *Albizia lebbek* – 46.28 %.

Growth: In Komarolu plantation average tree height ranged from 1.66 to 3.88 m, while girth ranged from 19.55 to 30.32 cm.

Table 99 Details of plantation enumerated in Y Palem range

Sl. no.	Plantation / Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average		
						Height (m)	GBH (cm)	Collar girth (cm)
1	Komarolu 20 Ha plantation	1	<i>Terminalia arjuna</i>	N 16.074424 E 79.290187	45.45	3.88 ±0.62	29.91 ±5.22	-
		2	<i>Azadirachta indica</i>	N 16.07475 E 79.289335	54.54	3.45 ±0.41	21.88 ±4.89	-
		3	<i>Holoptelea integrifolia</i>	N 16.07524 E 79.287218	43.80	1.81 ±0.52	-	19.55 ±4.08
		4	<i>Pongamia pinnata</i>	N 16.075225 E 79.287257	44.62	1.66 ±0.56	-	22.81 ±5.41
		5	<i>Syzygium cumini</i>	N 16.074748 E 79.289014	46.28	3.02 ±0.43	30.32 ±6.94	-
Plantation Average					46.93	2.76	27.37	21.18

Comparative assessment of plantations in Markapur division during 2016-17

Among the plantations evaluated, Gotlagattu (20 Ha) showed the best results with high survival of *Azadirachta indica* (85.53%) and *Syzygium cumini* (85.12%) and moderate performance of *Sterculia urens* (69.42%), along with good growth (1.46–3.54 m height, 17.17–32.88 cm girth). In contrast, Nekkanti (43.32% survival) and Komarolu (overall survival 43–55%) showed poor establishment despite moderate growth. Chinnamanthanala (25.95% survival) and Regumanupenta (complete let-down) recorded the lowest performance due to unsuitable site conditions, inadequate rainfall, grazing, and soil limitations. Overall, the assessment highlights that Gotlagattu performed well, while the other sites suffered from poor survival and establishment, stressing the need for better site-species matching, water management, and protection measures.

Verification of plantation area and boundaries

In Markapur division during 2016-17 measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

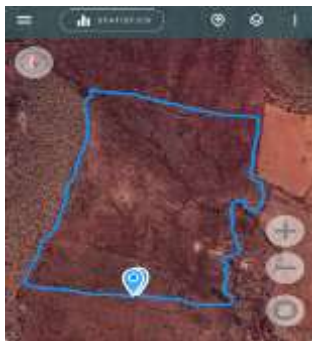
Table 100 Details of plantation area perambulation in Markapur division

Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Estimate for raising of 20 Ha plantation bit-II (SMM method) Gotlagattu beat of Markapur range	20 Ha	24.58 Ha
2	Estimate for raising of 3 Ha. Bamboo plantation along the streams in Regumanupenta beat of G.V. Palli range	03 Ha	5.37 Ha
3	Estimate for raising of 4 Ha. Bamboo plantation along the streams in Nekkanti beat of G.V. Palli range	04 Ha	5.34 Ha
4	Estimate for raising of 5 Ha. Bamboo plantation along the streams in Chinnamanthanala beat of Dornala range	05 Ha	7.12 Ha
5	Estimate for raising of 20 Ha. at Mogullapalli VSS of Komarolu beat of Y. Palem Section of Y. Palem Range	20 Ha	24.28 Ha

Perambulation of the plantations revealed discrepancies between the recorded and actual areas due to dense jungle growth and trenches around the plantation boundaries. These natural obstructions made it difficult to trace the exact boundaries, leading to measurements being taken along the outer perimeters or likely due to rocky or waste patches within the plantation and possibility taken during survey.

- Gotlagattu 20 Ha plantation (Markapur range): The measured area exceeded the actual plantation by 4.58 Ha.
- Regumanupenta 3 Ha plantation (GV Palli range): The measured area exceeded the actual plantation by 2.37 Ha.
- At Nekkanti 4 Ha plantation (GV Palli range), the actual area exceeded the recorded area by 1.34 Ha.
- Chinnamanthanala 5 Ha Plantation (Dornala range): The perambulated area exceeded the recorded area by 2.12 Ha.
- Komarolu Plantation (Y Palem range): The perambulated area was exceeded the recorded area by 4.28 Ha.

Verification was carried out with the assistance of the local Forest Beat Officer, using QGIS software and further confirmed through Geo Tracker application. Geotagged images were documented as evidence.



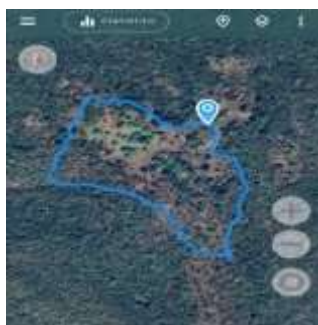
**Gotlagattu
plantation 24.58 Ha**



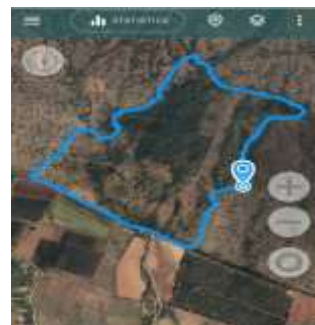
**Regumanupenta
plantation 5.37 Ha**



**Nekkanti
plantation 5.34 Ha**



Chinnamanthanala plantation 7.12 Ha



Komarolu plantation 24.28 Ha

Health Status of Plantations: Field observations across the plantations in Markapur Division revealed that the overall health status was good, with no incidences of insect or pest damage reported in Gotlagattu, Nekkanti, and Chinnamanthanala plantations.

Protection Measures: including the creation and maintenance of fire lines, inspection paths, and deployment of fire watchers, were undertaken in all sites to safeguard against fire and other environmental hazards.

Biotic Pressure on Plantations: However, varying levels of biotic pressure were observed: while Gotlagattu recorded minimal grazing and browsing disturbance, moderate incidences were noted in Nekkanti, Regumanupenta, and Chinnamanthanala plantations.

Maintenance of Plantation Journals and Records: Regarding plantation records, journals were generally well maintained in Gotlagattu and Regumanupenta plantations but require periodic updating of plantation parameters (such as survival percentage, height, girth measurements, and maintenance activities), whereas journals were not available for Chinnamanthanala and Nekkanti plantations where the plantation board was also not displayed. The absence of such boards reduces the visibility of plantation activities and should be addressed promptly. Plantation is inspected by concerned forest official and entered the observations.

Vana Samrakshan Samithi (VSS): Among the three plantations evaluated in the Markapur Division, the involvement of Vana Samrakshana Samithi (VSS) or Joint Forest Management Committees (JFMCs) was recorded in the Markapur, Regumanupenta plantation in GV Palli, Dornala and Y Palem ranges for plantation establishment and maintenance. However, in the Nekkanti plantation of GV Palli range, there was no involvement of VSS. Consequently, no Focus Group Discussions (FGDs) were conducted for community feedback or qualitative evaluation.



Gotlagattu plantation, Markapur



Chinnamanthanala plantation, Dornala



Nekkanti plantation, GV Palli



Komarolu plantation, Y Palem

2. Monitoring and Evaluation of Maintenance Activities

A total of 9 maintenance activities were carried out in the Markapur division during 2016-17, of which 2 activities were sampled for monitoring. In Markapur 5 activities 1 sampled, in Y

palem 3 activities 1 sampled and in Dornala 1 activity implemented 0 sampled. There was no maintenance activities reported from the GV Palli and V P South ranges.

Table 101 Maintenance activities selected for evaluation in Markapur division

Sl. no.	Maintenance Activities	GPS Co-ordinates	SO no. and year
Markapur range			
1	Second year maintenance 2014-15, 34 Ha. Penal CA Plantation at K.J. Padu beat of Markapur range	N 15.691383 E 79.343764	DSO 159 (2016-17)
Y Palem range			
2	Estimate for first year maintenance of 35 Ha CA plantation at Naidupalem beat of Y. Palem range	N 16.058977 E 79.435433	DSO 165 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken in the first and second year of implementation following plantation establishment. These activities include weeding operations, soil tilling (inter-ploughing) and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. However, in the site, plantation boards were not found or missing in K J Padu beat plantation, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Intensify weeding, especially along boundaries, to control invasive species and promote healthy growth.
- Carry out soil tilling and adopt mulching or bunding to improve soil aeration and moisture retention.
- Maintain and widen fire lines, deploy fire watchers, and raise community awareness to prevent fires.
- Replant casualties with healthy seedlings to maintain stocking density and ensure uniform growth. Install and maintain boundary pillars and boards to prevent encroachment and aid monitoring.
- Keep plantation records updated, with GPS or digital monitoring for accountability.
- Implement protective fencing, supplemental watering, and soil amendments to enhance resilience.



K J Padu beat, Markapur



Naidupalem beat, Y Palem

3. Monitoring and Evaluation of Construction Activities

A total of four activities were carried out during 2016-17 in Markapur division, of which 2 were selected for monitoring. In Markapur range with 2 activities 1 sampled and in Dornala 2 activities 1 sampled. None of the SMC works were recorded in other ranges of division.

3.1 Estimate for construction of boundary pillars (89 nos.) around CA land through Jammanapalli VSS of Gottipadia beat Markapur section and range

GPS Location: N 15.784545 E 79.123279 **SO no. & year:** DSO 442 (2016-17)

3.2 Estimate for construction of boundary pillars around Bommalapuram CA land in Bommalapuram beat of Dornala range

GPS Location: N 15.950832 E 79.072917 **SO no. & year:** DSO 439 (2016-17)

A total of 89 boundary pillars were constructed around the CA land of Jammanapalli VSS in Gottipadia Beat of Markapur range and 42 boundary pillars were constructed around the CA land in Bommalapuram Beat of Dornala Range. As per the measurement book and field verification, all pillars matched the recorded dimensions, with no variations observed, although the top width in some cases was slightly narrower (0.80 m) than the recorded 1.00 m. The pillars are intact and effectively demarcate the respective CA land boundaries, ensuring proper identification and protection. Some pillars in both locations require plastering for maintenance to preserve their durability and visibility.



RCC pillars, Markapur



RCC pillars, Dornala

4. Monitoring and Evaluation of Other activities

In 2016–17, ninety activities under the “Others” category were implemented, of which eighteen were sampled for verification. GV Palli recorded the highest number (28, six sampled), followed by Dornala (24, six sampled), V P South (18, two sampled), and Markapur and Y Palem (10 each, two sampled). Verification of sanction orders, estimation sheets, and work registers confirmed that sanctioned amounts matched actual expenditures, with records duly authenticated by the DFO, SDO, and FRO. Fund utilization was consistent with approved estimates and CAMPA guidelines, and both internal and external audits validated transparency and compliance with financial and administrative protocols.

Key Findings

- High variability in plantation success: Gotlagattu plantation was highly successful, while bamboo plantations in GV Palli and Dornala failed outright.

- Species-site mismatch: Bamboo was repeatedly chosen in unsuitable rocky and drought-prone sites.
- Boundary and area discrepancies: All verified sites showed higher field-measured areas than official records.
- Weak maintenance culture: Few maintenance works were taken up, with poor signage and incomplete documentation.
- Skewed activity portfolio: “Other works” dominated, while plantation and ecological resilience measures were modest.
- Partial community participation: VSS involvement was inconsistent, affecting accountability.

Recommendations

- Species-site alignment: Avoid bamboo plantations in rocky, low-moisture areas; promote hardy native species suited to local conditions.
- Water and grazing management: Establish protective fencing, controlled grazing measures, and water harvesting structures.
- Strengthen monitoring: Regularize GPS-based plantation records, update journals, and mandate plantation boards.
- Expand maintenance interventions: Scale up maintenance activities to ensure plantations survive beyond the establishment phase.
- Audit and reconcile area discrepancies: Institutionalize QGIS/KML-based surveys for accurate mapping and record-keeping.
- Rebalance activity portfolio: Increase focus on plantation, soil and moisture conservation, and protection activities rather than overloading “other works.”
- Community involvement: Ensure VSS participation in all plantations, supported by periodic focus group discussions for feedback.

14. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN GUNTUR DIVISION

Introduction

Guntur division in Andhra Pradesh, covering 2,508.14 sq.km, has one of the lowest forest covers in the state with only 36.93 sq.km (1.47%) under forests. Of this, 34.63 sq.km is Open Forest and 2.30 sq.km is Moderately Dense Forest, while no Very Dense Forests are present, underscoring the ecological vulnerability of the region. Between ISFR 2021 and 2023, the division recorded a net forest loss of 0.67 sq.km. In addition, the division has 14.34 sq.km of scrubland, which, though degraded, offers potential for restoration. Vegetation is adapted to the semi-arid climate and includes Neem, *Acacia catechu*, *Hardwickia binata*, *Pongamia pinnata*, *Butea monosperma*, and over 60 medicinal plants traditionally used by local communities. Despite limited forests, surveys around Guntur city have recorded over 400 plant species, indicating notable floristic diversity. Major threats include agricultural expansion, overgrazing, fuelwood dependency, illegal harvesting, and forest fires, compounded by the semi-arid climate that hampers natural regeneration. To address these challenges, management must focus on afforestation, scrubland rehabilitation, soil and moisture conservation, and community-based eco-restoration through CAMPA, social forestry, and urban greening programs, thereby improving forest resilience, biodiversity, and local livelihoods.

Out of 127 activities implemented, a total of 26 were sampled, accounting for 20.47 % overall coverage during 2016-17. The Guntur range implemented 55 activities, with 9 sampled. The Macherla range carried out 20 activities, of which 5 were sampled. In the Vinukonda range, 48 activities were implemented, with 11 sampled. The Repalli range recorded 4 implemented activities, of which 1 was sampled. For plantation, 5 activities were implemented and 1 sampled (20 %). In maintenance, 41 were implemented and 8 sampled (19.51 %). Under protection, 2 activities were implemented and 1 sampled (50 %). For construction, 4 were implemented and 1 sampled (25 %). No activities were taken up under SMC. In the others category, 75 were implemented, with 15 sampled (20 %). In Guntur Range, a total of 55 activities were implemented, out of which 9 were sampled. The activities include Maintenance (13 implemented and 2 sampled), Protection (1 implemented and none sampled), SMC, Plantation and Construction none implemented and Others (41 implemented and 7 sampled). In Macherla Range, a total of 20 activities were implemented, out of which 5 were sampled. The activities include Plantation (2 implemented and none sampled), Maintenance (7 implemented and 2 sampled), Protection, SMC and Construction none implemented and Others (11 implemented and 3 sampled). In Vinukonda Range, a total of 48 activities were implemented, out of which 11 were sampled. The activities include Plantation (3 implemented and one sampled), Maintenance (21 implemented and 4 sampled), Protection (1 implemented and 1 sampled), SMC (none implemented), Construction (4 implemented and one sampled), and Others (19 implemented and 1 sampled). In Repalli Range, a total of 4 activities were implemented, out of which 1 was sampled. The activities include Plantation, Maintenance, Protection, SMC, and Construction none implemented and Others (4 implemented and one sampled).

11. Monitoring and Evaluation of Plantation Activities

Five plantation activities were implemented in Guntur division and one sampled during 2016-17. In Vinukonda range 3 plantation activities implemented and one sampled. In Macherla range

2 plantation activities implemented and none sampled. In Guntur and Repalli range no plantation activities were implemented during 2016-17.

1.1 Vinukonda range

A total of three plantation activities were undertaken in Vinukonda range during 2016–17. From these, 20 % (equivalent to one plantation activity) was selected for detailed monitoring and evaluation.

Table 102 Details of plantation selected in Vinukonda range

Sl. no.	Plantation	SO no. and year
1	Raising of 20 Ha NTSH plantation of Badrupalem VSS in Ipur East beat of Vinukonda range during 2016-17	DSO 26 (2016-17)

The selected site for the 20-hectare Badrupalem plantation is characterized by gently sloping terrain with hard, gravelly red soil.

Survival Percentage: In Badrupalem 20 Ha plantation, *Terminalia arjuna* showed survival rates ranging from 84.29 % to 85.95 %, while *Holoptelea integrifolia* had a survival rate of 85.12 %. These figures indicate that the site is well-suited for both species, with average survival rates of 84.91% for *Terminalia arjuna* and 85.12% for *Holoptelea integrifolia*.

Growth: Growth measurements revealed that, the average tree height ranged from 2.25 to 4.41 meters, and the average girth ranged from 21.72 to 34.80 cm.

Table 103 Details of plantation enumerated in Vinukonda range

Sl. no.	Planation name/ Village name	Plot no.	Species Name	GPS Coordinates	Survi val (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Badrupalem 20 Ha	1	<i>Terminalia arjuna</i>	N 16.257584 E 79.794604	85.95	4.41±0.38	-	34.80 ±6.48
		2	<i>Holoptelia integrefolia</i>	N 16.257487 E 79.79539	85.12	2.25±0.25	21.72 ±3.22	-
		3	<i>Terminalia arjuna</i>	N 16.258077 E 79.794948	84.29	3.59±0.39	-	29.92 ±4.13
		4	<i>Terminalia arjuna</i>	N 16.257973 E 79.794308	84.29	3.91±0.44	-	30.76 ±3.64
		5	<i>Terminalia arjuna</i>	N 16.257747 E 79.794062	85.12	4.27±0.26	-	32.14 ±3.98
Plantation average					84.95	3.69	21.72	31.91

Verification of plantation area and boundaries

The plantation boundaries and areas were verified using KML files obtained for each site. These files were processed using GIS tools to generate accurate maps and to calculate the actual area covered under each plantation. This geospatial verification ensured consistency between recorded and actual field data.

Table 104 Details of plantation area perambulation in Guntur division

Sl. no.	Plantation	Area as per records	Area as per field perambulation
1	Raising of 20 Ha NTSH plantation of Badrupalem VSS in Ipur East beat of Vinukonda range during 2016-17	20 Ha	20.51 Ha

During the verification of plantation areas at Badrupalem plantation, it was consistently observed that the perambulated extents exceeded the officially recorded areas. The field verification was conducted with the assistance of local forest beat officers, and in all cases, the plantations were surrounded by dense jungle growth, trenches, and natural obstructions. Consequently, the field teams traced the outer boundaries of these physical features, rather than adhering strictly to the originally recorded plantation limits. As a result, the perambulated area was found to be 0.51 hectares larger at Badrupalem plantation. This discrepancy is attributed to the inclusion of waste, degraded, or rocky patches within the demarcated plantation areas that may not have been reflected in earlier records. Spatial analysis was conducted using QGIS software, and the verification was further supported through physical perambulation using the Geo Tracker mobile application. To substantiate the findings, geo-tagged photographs and GIS-based mapping outputs were generated, providing clear evidence of the verification process. Relevant images documenting this process are provided below.



Badrupalem 20.51 Ha



Badrupalem plantation of Vinukonda range

Health Status of Plantations: During the field visit, both plantations were thoroughly inspected for signs of biotic stress, with particular attention to insect and pest-related damage. No visible symptoms such as defoliation, boreholes, discoloration, or stem lesions were observed on the vegetation in either plantation.

Protection of Plantations: To safeguard the plantation against fire and other environmental risks, fire lines and inspection paths were established and maintained regularly. Additionally, fire watchers were deployed as a precautionary measure to ensure effective protection.

Biotic (Human/Cattle) Pressure on Plantations: Grazing and browsing activity within the plantation area was found to be minimal. Only a few isolated instances of such activity were recorded during the field visit, indicating low levels of biotic pressure.

Maintenance of Plantation Journals and Records: The plantation journals are being maintained appropriately. However, the plantation board was not visible during the inspection. It is recommended that regular updates of plantation parameters be recorded in the journals to

ensure accurate and up-to-date documentation. Plantations are inspected by the concerned forest officials, and their observations are duly recorded.

Vana Samrakshana Samithi (VSS): In terms of community involvement, Badrupalem plantation of Vinukonda range involved the Vana Samrakshana Samithi (VSS) in plantation activities, and consequently, Focus Group Discussions (FGDs) was conducted.

12. Monitoring and Evaluation of Maintenance Activities

Forty-one maintenance activities were implemented in Guntur division and eight sampled during 2016-17. In Guntur range (13, 2 sampled), Macherla range (7, 2 sampled), Vinukonda range (21, 4 sampled) and Repalli range none of the maintenance activity was implemented during 2016-17.

Table 105 Maintenance activities selected for evaluation in Guntur division

Sl. No.	Maintenance Activities	GPS Co-ordinates	SO no. and year
Guntur range			
1	First year maintenance of 0.92 Ha plot (S. Ranga Swamy) at Neeleswarapalem Guntur range	N 16.641638 E 80.073545	RSO 3 (2016-17)
2	First Year Maint., of 5Ha GAP plantation at Zulakallu VSS	N 16.393574 E 79.789123	RSO 54 (2016-17)
Macherla range			
3	First year maintenance of 10 Ha (NTHWs) plantation at Kothapalli VSS	N 16.460538 E 79.401703	DSO 55 (2016-17)
4	Third year maintenance of 10 Ha (NTHWS) plantation at Jangameswarapadu VSS	N 16.336024 E 79.465125	ACSO 40 (2016-17)
Vinukonda range			
5	1st year maintenance of 20 Ha NTSHS plantation 3mx3m Espacement of Neelagangavaram VSS in Tangirala Beat of Vinukonda Range	N 16.044721 E 79.586697	DSO 62 (2016-17)
6	1st year maintenance of 20 Ha NTSHS plantation 3mx3m Espacement of Bridge Thanda VSS in Kanumalacheruvu Beat of Vinukonda Range	N 16.148035 E 79.553994	DSO 59 (2016-17)
7	1st year maintenance of 20 Ha NTSHS plantation 3mx3m Espacement of Seetharampuram Thanda in Naidupalem Beat of Vinukonda Range during	N 16.163712 E 79.649105	DSO 58 (2016-17)
8	3rd year Maint. Of 20 Ha NTHS plantaiton in Gutlapalli VSS in Kanumalacheruvu Beat of Vinukonda Range	N 16.140803 E 79.565014	DSO 383 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. The works undertaken included casualty replacement, circular weeding and soil working, coppice management, pruning of lower branches, fertilizer application, creation and upkeep of fire lines, and other contingency measures. Verification showed that most of these activities had been properly executed in accordance with sanctioned orders. Circular weeding and soil working reduced weed competition and improved aeration, coppice cutting minimized competition from secondary shoots, and pruning promoted healthier plant structure. Fertilizer application was carried out in several plantations, though in some cases the dosage and distribution were not uniform. Fire lines were created or maintained, but at certain locations they required better

clearance to remain effective in peak summer. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Continue regular circular weeding, especially along plantation boundaries, to minimize competition for nutrients and water.
- Implement and maintain appropriate soil and moisture conservation measures to enhance soil health and water retention capacity.
- Maintain clear and effective fire lines by regularly removing weeds and grass to reduce fire risk.
- Improve visibility and upkeep of fire lines as part of a comprehensive fire risk management strategy.
- Install or restore plantation stones and boards to clearly demarcate plantation boundaries.
- Maintain accurate records of plantation activities and progress.



0.92 Ha plot at Neeleswarapalem



5 Ha GAP plantation at Zulakallu



20 Ha Neelagangavaram plantation



20 Ha Kanumalacheruvu plantation

13. Monitoring and Evaluation of Protection Activities

Seven Protection activities were implemented in Guntur division and two sampled during 2016-17. Vinukonda range 2 implemented, one activity was sampled. In Guntur range one implemented, none sampled. In Repalli and Marcherla range no protection activity was implemented during 2016-17.

3.1 Erection of Chain link fencing about 700 rmt length and 1.20 m height along the pathway inside EEC at Kotappakonda through Guravayapalem VSS of Vinukonda range

GPS location: N 16.145766 E 80.027879

SO no. and year: DSO 225 (2016-17)

A Chain link fencing was erected and maintained in natural forest of Kotappakonda through Guravayapalem VSS of Vinukonda Range was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of Chain link fencing are width – 1.2 m, and length – 700 rmt. The field measurements matched those in the measurement book, indicating no deviations. The Chain link fencing is well maintained. The fence is intact and covers only a portion of the planted area, primarily along the boundary with revenue land. Its main purpose is to reduce grazing of the planted seedlings.



Chain link fencing along the pathway inside EEC at Kotappakonda of Vinukonda range

14. Monitoring and Evaluation of Construction activities

Four Construction activities were implemented in Vinukonda range, and one activity was sampled during 2016-17.

4.1 Construction of bird's enclosure-4 (circuit-I) at Kotappakonda through Guravayapalem VSS of Vinukonda range

GPS location: N 16.146246 E 80.027424

SO no. and year: ACSO 37 (2016-17)

Constructed of bird's enclosure-4 (circuit-I) at Kotappakonda through Guravayapalem VSS of Vinukonda range was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of bird's enclosure are Length - 5 m, Width - 3.5 m and Height – 2.85 m (Compact chain link mesh). The field measurements matched those in the measurement book, indicating no deviations. Basal door, shade net and roof sheets has been provided to the enclosure-4. The construction of Bird Enclosure-4 was completed at Kotappakonda in the Thangedumalli Beat. The enclosure was specifically designed to house Iguanas and is fully enclosed with a compact chain-link mesh, featuring a small iron mesh door for access. The rooftop is covered with iron sheets and a shade net to ensure protection and provide a suitable environment for the Iguanas. Regular maintenance of the enclosure is recommended to ensure the continued health and safety of the birds.



Birds' enclosure-4 (circuit-I) at Kotappakonda of Vinukonda range

15. Monitoring and Evaluation of Other activities

During 2016–17, a total of 75 activities were implemented under the CAMPA scheme in Guntur Division, of which 15 activities were selected for document verification. These activities were distributed across four ranges: Guntur (41 implemented, 7 sampled), Macherla (11 implemented, 3 sampled), Vinukonda (19 implemented, 4 sampled), and Repalli (4 implemented, 1 sampled). The verification process involved the review of key documents such as sanction orders, estimation sheets, and work registers. It was conducted in the presence of the Division and Range office staff. The findings revealed that the sanctioned amounts matched the actual expenditures, and all financial records were properly maintained and authenticated by the designated officials (DFO, SDO, and FRO). The utilization of funds was consistent with the approved estimates and CAMPA guidelines. Additionally, both internal audits (by the Conservator of Forests) and external audits (by the Accountant General's office) were conducted, ensuring compliance with financial and administrative procedures.

However, a few irregularities and documentation gaps were observed. In the Macherla Range, the estimates and work registers for RSO 60 (2016–17) were not made available for verification. In Vinukonda Range, the work registers for DSO 233 (2016–17) was found to be incomplete, as it lacked the official seal and signature. At the Head Office, under the IT component, a payment was made to M/s. Sri Karthikeya Security Services for outsourcing 15 project scientists, but the DSO number related to this activity was not provided. In the Guntur Range, neither the estimates nor the work registers were presented; only the cash book was shown for verification.

Key Findings

- Plantation at Badrupalem demonstrated strong survival of *Terminalia arjuna* and *Holoptelea integrifolia*, with moderate growth and minimal biotic pressures.
- Verification consistently showed perambulated plantation areas exceeding recorded extents.
- Maintenance works were implemented, but signage and record-keeping required improvement.
- Protection through fencing at Kotappakonda was effective in reducing grazing.
- Construction of the bird enclosure at Kotappakonda was successful and functional.
- No SMC activities were taken up, limiting ecological outcomes.
- “Other works” dominated the portfolio, with financial compliance ensured but some documentation gaps remaining.

Recommendations

- Consolidate plantation successes like Badrupalem by replicating species-site models.
- Improve maintenance quality through better signage, updated journals, and intensified operations.
- Institutionalize systematic weeding, coppice regulation, and casualty replanting.
- Expand ecological interventions by including SMC works in future years.
- Maintain fencing and animal enclosures with regular upkeep.
- Strengthen documentation practices by ensuring all registers and estimates are submitted during audits.

15. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN KRISHNA DIVISION

Introduction

Krishna division encompasses a relatively smaller area of 98.28 km² of forest land, yet it holds significant ecological importance due to its composition and strategic location. The majority of the forest cover falls under the category of Moderately Dense Forest (MDF), accounting for 92.82 km², while a smaller yet critical portion of Very Dense Forest (VDF) covers 5.46 km². In a positive development, Krishna Division has recorded a net gain of 4.29 km² in forest cover, which stands as an encouraging sign of successful forest management. This gain could be attributed to a combination of recent protection initiatives, effective afforestation and restoration projects, and the natural regeneration of mangrove ecosystems along the coastal stretches. The presence of limited scrubland, measured at only 3.56 km², is also a favourable indicator of ecological stability and resilience, suggesting that the division has relatively low levels of degradation. Krishna division forests are characterized predominantly by dry deciduous scrub and mangrove stands, both of which contribute to maintaining the ecological balance of the region. Further strengthening this ecological security, Casuarina shelterbelts have been strategically established along the coast. These shelterbelts serve as natural windbreaks, protecting agricultural hinterlands from the adverse effects of sea winds, salt spray, and potential storm damage. Overall, the Krishna Division reflects a well-preserved forest ecosystem with positive trends in cover and an emphasis on both biodiversity conservation and community-oriented benefits.

In Krishna division, a total of 94 CAMPA activities were carried out, of which 20 activities (around 21 %) were selected for detailed monitoring and evaluation. In Mylavaram range, 39 activities were implemented, and 8 were sampled. In Nuzvid range, 23 activities were implemented, and 7 were sampled. In Vijayawada range, 32 activities were implemented, with 8 sampled. Among activity types, maintenance dominated with 53 activities (10 sampled), followed by others (27; 7 sampled), protection (8; 2 sampled), plantation (6; 1 sampled), maintenance (2; 1 sampled), None were implemented or sampled from soil and moisture conservation and construction.

1. Monitoring and Evaluation of Plantation Activities

In Krishna division, a total of 6 plantation activities were carried out under CAMPA, of which 1 activity were selected for monitoring and evaluation. Among the ranges, Mylavaram with 4 (1 sampled), Nuzvid with 1 (0 sampled) and Vijayawada 1(0 sampled).

1.1 Mylavaram range

A total of four plantation activities were carried out under the CAMPA scheme in the Mylavaram range. In this monitoring and evaluation process, 20 % of these activities equivalent to one plantation site was randomly selected.

Table 106 Details of plantation selected in Mylavaram range

Sl. no.	Plantation	SO no. and year
1	Raising of 1.2 Ha NTSH plantation in A. Konduru RF, A. Konduru beat of Mylavaram range during 2016-17	RSO 05 (2016-17)

Note: GPS location: N 16.943939 E 80.647720

SO no. and year: RSO 05 (2016-17)

In 2016–17, 1.2-hectare NTSH plantation was undertaken at A. Konduru locality, Compartment No. 150, within the A. Konduru beat of Mylavaram range under the CAMPA-NPV scheme. However, the plantation was declared a poor performance in 2019 by the Range Officer, with a reported survival rate of only 10 %. As of 2025, no plantation growth is visible at the site, and invasive species such as *Prosopis juliflora* have proliferated. The lapse has been attributed to poor soil fertility, specifically the presence of red loamy gravel soil, as reported by the local Forest Beat Officer.

Verification of plantation area and boundaries

In Krishna division during 2016-17 measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

Table 107 Details of plantation area perambulation in Krishna division

Sl. no.	Plantation	Area as per records	Area as per field perambulation
1	Raising of 1.2 Ha NTSH plantation in A. Konduru RF, A. Konduru beat of Mylavaram range	1.20 Ha	3.24 Ha

Thus, it is evident that the actual perambulated area of the A. Konduru plantation is more than the area recorded in the official documents. The Perambulation was done in presence of forest officer and as per the demarcation shown by the watcher/guard working as in-charge of the plantation. After measuring the total area using QGIS software, it was found that the actual area is 2.04 hectares more the recorded area from the records.



A Konduru 3.24 Ha



A. Konduru plantation

Health Status of Plantation: During field verification, no visible plantation growth was observed, indicating poor establishment of the planted species. The absence of growth suggests that the saplings either failed to survive or did not develop beyond the initial stages. As a result, the overall health status of the plantation could not be assessed in detail.

Protection Measures: Adequate preventive and protective measures have been undertaken to safeguard the plantations from environmental threats. These include the creation and maintenance of fire lines, establishment of inspection paths. Such measures are effective in mitigating the risks of forest fires and related hazards.

Biotic Pressure on Plantations: Incidents of grazing and browsing pressure were noted in plantation. However, these pressures have been significantly reduced through the creation of

peripheral trenches and the deployment of plantation watchers, which have helped restrict the entry of cattle from nearby villages.

Maintenance of plantation journals and records: Plantation journals are being maintained adequately; however, there is a need for regular updates of plantation parameters to ensure accurate record-keeping.

Vana Samrakshan Samithi (VSS): In Mylavaram Range A. Konduru plantation were implemented and maintained without the involvement of any Vana Samrakshana Samithi (VSS). Consequently, Focus Group Discussion (FGD) activities were not conducted.

2. Monitoring and Evaluation of Maintenance Activities

A total of 53 maintenance activities were carried out in Krishna division during 2016-17, of which eleven activities were selected for monitoring. Mylavaram accounted for the maximum with 20 activities (4 sampled), followed by Vijayavada with 19 (4 sampled), Nuzvid with 14 (3 sampled).

Table 108 Maintenance activities selected for evaluation in Krishna division

Sl. no.	Maintenance Activities	GPS Co ordinates	SO no. and year
Mylavaram range			
1	First year maintenance of 10 Ha NTSHWS plantation in Jangalapalli RF, Velvadam beat of Mylavaram range	N 16.810892 E 80.649003	DSO 34 (2016-17)
2	First year maintenance of 30 Ha BHA plantation in Krishnaraopalem RF, Cheemalapadu beat	N 16.914954 E 80.652318	DSO 38 (2016-17)
3	Second year maintenance of 25 Ha NTSHWS plantation in T. Gannavaram RF and beat of Mylavaram range	N 16.734072 E 80.728753	DSO 14 (2016-17)
4	Third year maintenance of 20 Ha Eucalyptus plantation in Chandragudem RF and beat of Mylavaram range	N 16.812056 E 80.594539	DSO 20 (2016-17)
Nuzvid range			
5	First year maintenance of 10 ha NTSHWS plantation at Katrenipadu	N 16.771367 E 80.93655	DSO 29 (2016-17)
6	First year maintenance of 15 ha BHA plantation at Katrenipadu	N 16.767114 E 80.938180	DSO 54 (2016-17)
7	Second year maint of 25 Ha NTSHWS plantation at somavaram F.B	N 16.914173 E 80.915671	DSO 59 (2016-17)
Vijayawada range			
8	First year maintenance of 10 Ha NTSH plantation in Kondapalli RF, Jujjuru beat, Kanchikacherla section	N 16.744358 E 80.466093	DSO 42 (2016-17)
9	Second year maintenance of 5 Ha Teak plantation at Kothuru RF in Tadepalli beat of Vijayawada range	N 16.598085 E 80.639602	DSO 45 (2016-17)
10	Second year maintenance of 3 Ha Bamboo plantation mixed with <i>Eucalyptus</i> at Mulapadu beat in Kondapalli	N 16.645969 E 80.488657	RSO 7 (2016-17)
11	Third year maintenance of 5 Ha NTSHW plantation at Kothuru RF, Koduru beat, Sobhanapuram section	N 16.662262 E 80.652782	RSO 14 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. These activities include casualty replacement, weeding operations, soil tilling (inter-ploughing), coppice management, pruning of lower branches, fire line management, and other contingency measures. During the

monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantation. However, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Intensify weeding operations, especially along plantation boundaries, to control Lantana and bushy grasses, minimizing competition and ensuring healthy plant growth.
- Continue maintaining clear and effective fire lines, with regular clearing before dry seasons to enhance visibility and effectiveness in preventing forest fires.
- Install and maintain plantation boundary stones and boards to ensure accurate demarcation, facilitate monitoring, prevent encroachments, and complement contingency records.
- Maintain accurate and updated plantation journals, markers, and records to support ongoing identification, monitoring, and accountability.
- Continue timely and appropriate fertilizer application, with special focus on weaker plants to promote uniform growth and ensure optimal nutrient support.
- Carry out timely replanting with healthy bagged seedlings to maintain uniform density, improve survival rate, and strengthen overall plantation health.



Katrenipadu beat, Nuzvid



Budavada RF Vijayawada



Velvadam beat Mylavaram range



Koduru beat, Vijayawada range



T GAnnaram beat, Mylavaram



Chandragudem beat, Mylavaram

3. Monitoring and Evaluation of Protection Activities

During 2016–17 Andhra Pradesh Forest Department undertook eight protection activities under the CAMPA scheme in the Mylavaram and Vijayawada range. For monitoring and evaluation, a representative sample of 20 %, comprising two protection activities, was selected for detailed assessment.

3.1 Creation of fire lines in T. Gannavaram RF and beat of Mylavaram range

GPS location: N 16.770481 E 80.742079

SO no. and year: RSO 19 (2016-17)

A fire line was created and maintained in T. Gannavaram beat under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of new fire line are width – 3 m, and length – 3000 rmt. The field measurements matched those in the measurement book, indicating no deviations. The fire line is clearly visible, as it has been created within the Reserve Forest (RF) area. There is no significant growth of dense grass or weeds, indicating that the fire line is being maintained as recommended. However, certain sections require periodic trimming to sustain the ideal width and ensure the effectiveness of the fire line in preventing the spread of forest fires.

3.2 Creation of firelines in Gudimetla RF, Gandrai beat, Jaggaiahpetta section

GPS location: N 16.723245 E 80.152835

SO no. and year: DSO 127 (2016-17)

A fire line was created and maintained in Gandrai beat of Vijayawada range under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of new fire line are width – 3 m, and length – 10000 rmt. The field measurements matched those in the measurement book, indicating no deviations. The visibility of the fire line is clear, and it effectively marks the boundary to control fire outbreaks. The absence of dense grass or weeds along the fire line indicates that it has been maintained properly, as regular maintenance is recommended to prevent the growth of flammable vegetation and ensure its effectiveness in fire control.



T Ganavaram beat Mylavaram range



Gandrai beat, Vijayawada range

4. Monitoring and Evaluation of Other activities

During 2016-17, a total of 27 activities were carried out under the “Others” category, with 7 selected for sampling. Mylavaram reported the highest number of activities with 11 (2 sampled), followed by Vijayawada with 8 activities (3 sampled), and Nuzvid also with 8 activities (2 sampled). Document verification and cross-checking were conducted in the presence of Division

and Range office staff. The documents reviewed included sanction orders, estimation sheets, and work registers. It was found that sanctioned amounts aligned with actual expenditures, and all financial records were properly maintained and duly authenticated by the concerned officials, including the DFO, SDO, and FRO. Fund utilization was appropriate and consistent with approved estimates and guidelines. Both internal audits by the Conservator of Forests and external audits by the Accountant General's office were conducted, ensuring transparency and compliance with financial and administrative protocols under the CAMPA scheme.

Key Findings

- Plantation success was negligible, with total lacunae attributed to site unsuitability and severe infestation of invasive weeds.
- Recorded plantation areas appeared overstated, indicating inadequate GIS-based verification and spatial validation.
- Maintenance activities contributed to improved growth in isolated surviving patches, but absence of signage limited monitoring and accountability.
- Fire lines were technically sound and constructed as per specifications; however, their effectiveness may decline without regular seasonal upkeep.

Recommendations

- Adopt soil–species matching protocols and prioritize resilient native species over teak and eucalyptus in marginal or low-retentive soils to enhance survival and ecological suitability.
- Institute mandatory GIS verification both before and after plantation establishment to ensure spatial accuracy and eliminate discrepancies in recorded areas.
- Strengthen community participation by involving Vana Samrakshana Samithis (VSS) in planning, implementation, and maintenance to reduce plantation failures and enhance local ownership.
- Maintain fire lines proactively, ensuring seasonal clearance before the dry period, and integrate early-warning fire detection systems for effective protection.
- Replace missing signage and plantation boards, and upgrade digital plantation registers to enable real-time monitoring, transparency, and accountability.

16. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN ELURU DIVISION

Introduction

Eluru division encompasses an extensive forest landscape spanning 1,678.11 km², playing a vital role in maintaining the ecological stability of the region. The forest composition within the division is notably skewed toward Open Forest (OF), which occupies the largest share at 826.19 km². This is followed by Moderately Dense Forest (MDF) at 485.22 km² and Very Dense Forest (VDF) at 366.70 km². The dominance of Open Forest is a point of concern, as it makes the division more susceptible to fragmentation, degradation, and biotic pressures such as grazing, illicit felling, and encroachment. Over recent years, the division has suffered a net forest loss of 6.88 km², coupled with the expansion of scrublands over 23.68 km², underscoring the pressing challenges to the sustainability of its forest cover. The landscape predominantly supports Southern Dry Mixed Deciduous Forests, interspersed with extensive plantation areas. In summary, Eluru Division's Forest landscape holds immense ecological significance but faces challenges related to forest loss, scrubland expansion, and fire vulnerability. The proactive management strategies in place, particularly community involvement and preventive fire control measures, are crucial to sustaining and enhancing the health of these forests for long-term ecological balance and watershed security.

In Eluru division, a total of 182 CAMPA activities were carried out, of which 42 activities (around 23 %) were selected for detailed monitoring and evaluation. In Eluru range, 81 activities were implemented, and 19 were sampled. In J R Gudemrange, 38 activities were implemented, and 9 were sampled. In Kannapuram 15 activities were implemented, with 3 sampled. In Kukunoor range, 10 activities were implemented, and 2 were sampled. In Polavaram range 38 activities implemented, with 9 sampled. Among activity types, others dominated with 100 activities (25 sampled), followed by maintenance (41; 9 sampled), soil and moisture conservation (23; 4 sampled), plantation (16; 3 sampled), protection (2; 1) and none were selected from construction activity.

1. Monitoring and Evaluation of Plantation Activities

In eluru division, a total of 16 plantation activities were carried out under CAMPA, of which 3 activities (about 21 %) were selected for monitoring and evaluation. Among the ranges, Eluru with 6 (1 sampled), J R Gudem with 6 (1 sampled), Kukunoor with 4 (1 sampled).

1.1 Eluru range

During 2016–17, a total of six plantation activities were carried out under the CAMPA scheme in Eluru range. In this monitoring and evaluation process, one plantation site constituting approximately 20 % of the activities was randomly selected for assessment.

Table 109 Details of plantation selected in Eluru range

Sl. no.	Plantation	SO no. and year
1	Raising operations in 20.00 Ha non-teak hard wood plantation in Adamilli (V)	DSO 35 (2016-17)

In Tadikalapudi 20 Ha plantations were established on red sandy loam soil, indicating suitable site conditions for afforestation.

Survival Percentage: Tadikalapudi plantation (20 Ha) *Pterocarpus marsupium* and *Dalbergia latifolia* showed good adaptability with survival rates of 71.62 % and 74.37 %, respectively.

Growth: In Tadikalapudi range, average height ranged from 2.95 m to 6.24 m, with girth ranging from 21.33 cm to 33.36 cm.

Table 110 Details of plantation enumerated in Eluru range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Tadikalapudi 20 Ha NTSH plantation	1	<i>Pterocarpus marsupium</i>	N 16.930765 E 81.187496	73.55	6.24 ±1.43	33.36 ±11.34
		2	<i>Dalbergia latifolia</i>	N 16.932387 E 81.186762	76.03	4.69 ±4.23	24.75 ±6.30
		3	<i>Pterocarpus marsupium</i>	N 16.931702 E 81.186394	70.24	2.95 ±0.78	21.33 ±4.69
		4	<i>Dalbergia latifolia</i>	N 16.930461 E 81.788275	72.72	4.28 ±0.64	30.16 ±8.98
		5	<i>Pterocarpus marsupium</i>	N 16.930476 E 81.188399	71.07	3.81 ±0.44	21.47 ±3.45
Plantation average					72.72	4.39	26.21

1.2 J R Gudem range

A total of six plantation projects were implemented under the CAMPA scheme in JR Gudem range during 2016–17. For evaluation purposes, 20 % of these activities amounting to one plantation site were selected using a random sampling method.

Table 111 Details of plantation selected in J R Gudem range

Sl. no.	Plantation	SO no. and year
1	Raising of 2016 non-teak secondary Hardwood (NTSHW) (30 Ha) plantation at P. Rajavaram, Jeelugumilli beat, Jangareddigudem section, Jangareddigudem range.	DSO 37 (2016-17)

Jeelugumilli 30 Ha Plantation: The site is characterized by flat terrain with red loamy soil, which supports moderate plantation growth.

Survival Percentage: Jeelugumilli 30 Ha Plantation, In the Jeelugumilli 30 Ha plantation, species-wise survival rates were as follows: *Albizia chinensis* recorded a survival rate of 66.05%, *Dalbergia latifolia* stood at 68.98%, *Terminalia arjuna* at 65.14%, and *Terminalia elliptica* showed the highest survival among the four at 74.54%. Overall, the plantation demonstrated moderate survival performance across all species.

Growth: Jeelugumilli 30 Ha Plantation: The average height of the plantation ranges from 5.13 meters to 12.10 meters, while the average girth varies between 25.39 cm and 56.06 cm. These growth parameters indicate consistent and healthy development of the plantation under existing site conditions.

Table 112 Details of plantation enumerated in J R Gudem range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Jeelugumilli 30 Ha NTSH plantation	1	<i>Albizia chinensis</i>	N 17.179993	65.45	5.13 ±0.83	25.39 ± 7.43
			<i>Dalbergia latifolia</i>	E 81.109146	56.06	4.81 ±0.63	28.51 ± 3.83
		2	<i>Terminalia arjuna</i>	N 17.180050	57.57	10.58 ±2.48	41.74 ±14.34
			<i>Dalbergia latifolia</i>	E 81.109232	70.90	9.36 ±1.42	32.00 ±6.04
		3	<i>Terminalia arjuna</i>	N 17.180055	62.12	11.38 ±1.00	38.47 ±9.81
			<i>Terminalia elliptica</i>	E 81.109428	74.54	11.60 ±1.53	40.10 ±10.96
		4	<i>Terminalia arjuna</i>	N 17.180509	72.72	10.65 ±1.52	30.96 ±12.82
			<i>Dalbergia latifolia</i>	E 81.109216	80.00	11.66 ±1.32	39.34 ±8.36
		5	<i>Terminalia arjuna</i>	N 17.180834	68.18	12.10 ±1.95	28.80 ±11.26
			<i>Albizia chinensis</i>	E 81.109784	66.66	11.49 ±1.39	31.61 ±12.02
Plantation average					67.42	9.87	33.69

1.3 Kukunoor range

A total of four plantation projects were implemented under the CAMPA scheme in Kukunoor range during 2016–17. For evaluation purposes, 20 % of these projects amounting to one plantation site were selected using a random sampling method.

Table 113 Details of plantation selected in Kukunoor range

Sl. no.	Plantation	SO no. and year
1	Raising operations in 20 Ha Bamboo plantation in Lankalapalli beat	DSO 44 (2016-17)

The plantation site at Lankalapalli, covering 20 hectares, features a predominantly plain terrain with a gentle slope from south to north. The soil type is red with a sandy loam texture, offering suitable conditions for plantation development.

Survival Percentage: In the Kukunoor range, the Lankalapalli plantation has shown excellent suitability for Bamboo species, achieving a survival rate of 87.21%.

Growth: The Bamboo plantation at Lankalapalli exhibits healthy growth, with the following average parameters observed: Tree Height: 4.78 to 6.00 m, Clump Girth: 1.06 to 1.24 m, Culm Girth: 15.34 to 21.66 cm.

Table 114 Details of plantation enumerated in Kukunoor range

Sl. no.	Plantation/ Village name	Plot no	Species name	GPS Coordinates	Average growth			Survival (%)
					Avg. Clump Height (m)	Avg. Clump GBH (m)	Avg. Culm GBH (cm)	
1	Lankalapalli 20 Ha Bamboo plantation	1	Dendrocalamus strictus	N 17.519126 E 81.144131	5.30 ±0.68	1.24 ±0.12	21.66 ±3.54	88.88
		2	Dendrocalamus strictus	N 17.519557 E 81.143630	5.15 ±0.64	1.12 ±0.26	17.06 ±3.36	86.11
		3	Dendrocalamus strictus	N 17.519543 E 81.143467	6.00 ±0.60	1.16 ±0.44	15.80 ±3.33	83.33
		4	Dendrocalamus strictus	N 17.518698 E 81.142540	4.59 ±0.98	1.06 ±0.19	15.34 ±2.39	88.88
		5	Dendrocalamus strictus	N 17.519130 E 81.140660	4.78 ±0.69	1.21 ±0.37	20.22 ±5.31	88.88
Plantation average					5.16	1.15	18.01	87.21

Comparative assessment of plantations in Eluru division during 2016-17

In Lankalapalli Bamboo plantation recorded the highest survival (87.21 %) with healthy growth, Jeelugumilli showed moderate survival (65–74 %) but superior height and girth (5.13–12.10 m; 25.39–56.06 cm), while Tadikalapudi achieved good survival (71–74 %) with comparatively lower growth (2.95–6.24 m; 21.33–33.36 cm).

Verification of plantation area and boundaries

In Eluru division during 2016-17 measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

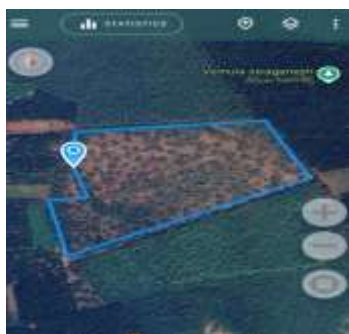
Table 115 Details of plantation area perambulation in Eluru division

Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising operations in 20.00 ha non-teak hard wood plantation in Adamilli (V) during 2016 planting season	20 Ha	19.10 Ha
2	Raising of 2016 non-teak secondary Hardwood (NTSHW) (30 Ha.) plantation at P. Rajavaram, Jeelugumilli beat, JangareddyGudem range	30 Ha	34.46 Ha
3	Raising operations in 20 Ha Bamboo plantation in Lankalapalli beat	20 Ha	18.5 Ha

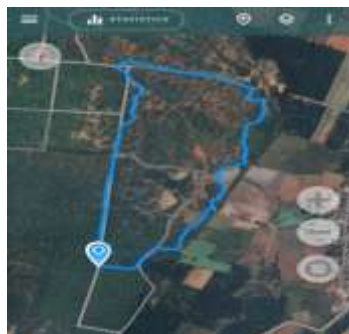
Perambulation of selected plantations was carried out with the assistance of the local Forest Beat Officer. In these cases, the perambulated area was found to exceed in some plantations and in some shortfall has been noted due to the presence of rocky terrain, trenches, and barren patches within plantation boundaries. Measurements were therefore taken along the outer boundary of these natural obstructions rather than the precise plantation limits. Plantation-wise Findings

- Tadikalapudi Plantation (Eluru range) (20 Ha): 19.1 Ha (lesser by 0.9 Ha)
- Jeelugumilli Plantation (JR Gudem range) (30 Ha): 34.46 Ha (exceeded by 4.46 Ha)
- Lankalapalli Plantation (Kukunoor range) (20 Ha): 18.5 Ha (lesser by 1.5 Ha)

Verification was carried out with the assistance of the local Forest Beat Officer, using QGIS software and further confirmed through Geo Tracker application. Geotagged images were documented as evidence.



19.1 Ha Tadikalapudi



34.46 Ha Jeelugumilli



18.5 Ha Lankalapall

Health status of plantation: Based on the observations recorded during the field visit, no visible signs of insect-related damage were detected within the plantation area. This suggests that, at present, the plantations are free from any significant pest-related threats, reflecting effective site protection and favourable ecological conditions for plant growth.

Protection Measures: To safeguard plantations from fire and other environmental threats, several protection measures were implemented, including the creation and maintenance of fire lines, development of inspection paths, and deployment of fire watchers. These measures have proven generally adequate in reducing plantation vulnerability, particularly during the dry season. However, ongoing maintenance and clear visibility of these features are essential to ensure their continued effectiveness.

Biotic pressure on plantations: Evidence of grazing and browsing by both wild and domestic herbivores was observed across several plantation sites. This biotic interference led to stunted apical growth in certain species, particularly in areas lacking adequate fencing or community oversight. These signs of pressure emphasize the need for stronger physical protection measures such as installation of protective barriers and increased community sensitization to ensure sustainable plantation development and seedling survival.

Maintenance of plantation journals and records: Plantation journals are being maintained in all plantations. However, there is a need for regular updating of plantation parameters to ensure accuracy and facilitate effective monitoring. Plantation board was seen in all three plantations. Plantation is inspected by concerned forest official and entered the observations.



Tadikalapudi, Eluru range



Jeelugumilli, JR Gudem range

Vana Samrakshan Samithi (VSS): The Tadikalapudi, Jeelugumilli and Lankalapalli plantations were implemented and maintained with the involvement of any Vana Samrakshana Samithi (VSS). Consequently, Focus Group Discussion (FGD) activities were conducted.

2. Monitoring and Evaluation of Maintenance Activities

During 2016-17 a total of forty-one maintenance activities were carried out in Eluru division during 2016-17, of which nine activities were selected for monitoring. Eluru accounted for the maximum with 24 activities implemented (6 sampled), JR Gudem 12 implemented (2 sampled) and Kannapuram 4 implemented (1 sampled).

Table 116 Maintenance activities selected for evaluation in Eluru division

Sl. no.	Maintenance activities	GPS Co ordinates	SO no. and year
Eluru range			
1	First year maintenance operations in 10.00 ha. 2015 teak wood Plantation in Bhogole	N 16.904136 E 81.048053	DSO 58 (2016-17)
2	First year maintenance operations in 10.00 ha. 2015 non-teak hard wood plantation in Bhogole (V)	N 16.904663 E 81.044864	DSO 80 (2016-17)
3	Second year maintenance operations in 10.00 ha. 2014 teak wood plantation in Namavaram (V)	N 17.141122 E 80.964045	DSO 84 (2016-17)
4	Third year maintenance operations in 10.00 ha 2013 non-teak hard wood plantation in Ramasingavaram (V)	N 16.88182 E 81.075159	RSO 18 (2016-17)
5	Third year maintenance operations in 10.00 ha 2013 non-teak hard wood plantation in Adamilli (V)	N 16.977401 E 80.985291	RSO 21 (2016-17)
6	Third year maintenance operations in 10.00 ha 2013 teak wood plantation in Veerisettygudem (V)	N 17.141126 E 80.963983	DSO 128 (2016-17)
JR Gudem range			
7	First year maintenance of 2015 teak plantation 20 Ha at Jillellagudem, Kamaiahpalem beat, Kamaiahpalem section, JangareddyGudem range	N 17.265794 E 81.197725	DSO 52 (2016-17)
8	First year maintenance of 2015 non-Teak secondary hardwood (NTSHW) (10 Ha) plantation at Marlagudem beat, JangareddyGudem section and range	N 17.17319 E 81.29943	DSO 56 (2016-17)
Kannapuram range			
9	First year maintenance of 2015 ANR planting at CA area Lammipuram, Muddappagudem of Kovvada beat	N 17.186942 E 81.480592	DSO 79 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. These activities include casualty replacement, formation of saucers, weeding operations, soil tilling (inter-ploughing), coppice management, pruning of lower branches, fire line management, and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and

monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Intensify weeding operations, especially along plantation boundaries, to control Lantana and bushy grasses, minimizing competition and ensuring healthy plant growth.
- Continue maintaining clear and effective fire lines, with regular clearing before dry seasons to enhance visibility and effectiveness in preventing forest fires.
- Install and maintain plantation boundary stones and boards to ensure accurate demarcation, facilitate monitoring, prevent encroachments, and complement contingency records.
- Maintain accurate and updated plantation journals, markers, and records to support ongoing identification, monitoring, and accountability.
- Continue timely and appropriate fertilizer application, with special focus on weaker plants to promote uniform growth and ensure optimal nutrient support.
- Carry out timely replanting with healthy bagged seedlings to maintain uniform density, improve survival rate, and strengthen overall plantation health.
- Implement routine coppice management to reduce competition from secondary shoots.



Ramasingavaram beat, Eluru range



Jillellagudem beat, JR Gudem range

3. Monitoring and Evaluation of Protection Activities

During 2016–17 Andhra Pradesh Forest Department undertook five protection activities under the CAMPA scheme in the J R Gudem and polavaram range. For monitoring and evaluation, a representative sample of 20 %, comprising two protection activities, was selected for detailed assessment.

3.1 Creation of new fire lines in Gullapudi beat of Buttaigudem section

GPS Location: N 17.3438522 E 81.391325

SO no. and year: RSO 36 (2016-17)

3.2 Creation of new fire lines in Kondrukota beat of Vadapalli section

GPS Location: N 17.346758 E 81.37994

SO no. and year: RSO 61 (2016-17)

A fire line created and maintained in Gullapudi Beat under the CAMPA–NPV (Forest Fire Management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of the newly established fire line in Gullapudi Beat were recorded as 3 m in width and 1,700 rmt in length, while in Kudrukota beat, the dimensions were 3 m in width and 3,352 rmt in length. The field measurements were not found to be consistent with the entries in the measurement book, indicating deviations. The fire lines were clearly visible and well-defined, reflecting proper

implementation. Moreover, the fire lines were observed to be clear of any grass or weed growth throughout their length.



Gullapudi beat, JR Gudum



Kondrukota beat, Polavaram range

4. Monitoring and Evaluation of Soil and Moisture Conservation (SMC) Activities

A total of twenty-three SMC activities were carried out during 2016-17, of which four were sampled. The polavaram range reported 23 activity (5 sampled).

4.1 Digging of Percolation tank at Devarakonda-1 (3 Hillocks) CA areas in Sivagiri beat

GPS Location: N 17.404767 E 81.572076

SO no. and year: RSO 22 (2016-17)

4.2 Digging of Percolation tank at Mullukonda CA areas in Tekuru beat and section

GPS Location: N 17.387608 E 81.580513

SO no. and year: RSO 35 (2016-17)

4.3 Digging of percolation tank in CA area Tenikonda, Kouturu section Polavaram range

GPS location: 17.387566 E 81.580492

SO no. and year: RSO 47(2016-17)

Percolation tanks constructed in sivagiri, Tenikonda and tekuru beats were monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of the percolation tanks were: length- 10 m, width- 10 m and depth-1 m with net volume 100 cum. The percolation tank, located in a low-lying area, has accumulated silt due to water overflow during the monsoon. While the structure remains intact, it is largely covered with silt. De-silting is necessary to restore its full storage capacity.

4.4 Digging of Staggered trenches SaruguduKonda CA areas in Thutigunta beat

GPS Location: N 17.366831 E 81.58619

SO no. and year: RSO 40 (2016-17)

Staggered trenches in sarugudukondabeat were monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of the ST were: length- 5 m, width- 0.50 m and depth-0.50 m with net volume 100 cum. The staggered trenches, located in a low-lying area, were found covered with silt and dried plant residues due to water overflow. Although the trenches are visible, de-silting is required to restore their full water retention capacity.

4.5 Digging of percolation tank at ChaparathiKonda CA area in Polavaram beat and section

GPS Location: N 17.257976 E 81.645257

SO no. and year: RSO 24 (2016-17)

Percolation tanks constructed in Polavaram beat were monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of the percolation tanks were: length- 17 m, width- 15 m and depth-1 m with net volume 255 cum as in measurement book. The field measurement: length-15 m, width-10.60 m,

depth- 0.60 m. The percolation tank, located on the slope of Chaparathi Konda, was found completely covered with silt due to monsoon water overflow. The bunds were distorted by runoff, and dense growth of *Prosopis juliflora* was also observed. De-silting and removal of vegetation are necessary to restore its structure and full storage capacity.



Tekuru beat, Polavaram range

5. Monitoring and Evaluation of Other activities

During 2016-17, a total of 100 activities were carried out under the “Others” category, with 25 selected for sampling. Eluru reported the highest number with 51 activities (12 sampled), followed by JR Gudem with 18 activities (5 sampled), Polavaram with 15 activities (5 sampled), Kannapuram with 11 activities (2 sampled), Kukunoor with 5 activities (1 sampled), and Amaravaram, where none were sampled. Document verification and cross-checking were conducted in the presence of Division and Range office staff. The documents reviewed included sanction orders, estimation sheets, and work registers. It was found that sanctioned amounts aligned with actual expenditures, and all financial records were properly maintained and duly authenticated by the concerned officials, including the DFO, SDO, and FRO. Fund utilization was appropriate and consistent with approved estimates and guidelines. Internal audits by the Conservator of Forests and external audits by the Accountant General’s office ensured transparency and compliance with financial and administrative protocols under the CAMPA scheme. However, in JR Gudem range, the estimates for RSO 32 (2016–17) were not made available or presented for verification. Additionally, estimates and work registers for miscellaneous entries 4, 17, and 21 (2016–17) were also not presented for verification.

Key Findings

- Plantation outcomes were mixed, with bamboo performing best at Lankalapalli, moderate results at Jeelugumilli, and good but slower growth at Tadikalapudi.
- Area verification revealed both excess and deficit in plantation extents compared to records.
- Maintenance works were generally effective, though signage and record updating were inconsistent.
- Fire lines were visible and clear but discrepancies with records were observed.
- SMC structures were heavily silted and required urgent maintenance.
- Financial records were largely well maintained, but documentation gaps existed in some ranges.

Recommendations

- Strengthen site-species matching and expand bamboo plantations in suitable zones like Kukunoor.
- Improve plantation visibility by ensuring boards and boundary stones are installed and maintained.
- Institutionalize regular desilting of SMC structures and upkeep of bunds and trenches.
- Improve accuracy of fire line documentation and enforce systematic maintenance.
- Address record-keeping lapses by mandating submission of all estimates and registers during audits.
- Intensify grazing control measures through fencing and community sensitization.
- Ensure continuous VSS involvement across all plantation and maintenance works.

17. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN ELURU WLM DIVISION

Introduction

Eluru Wild Life Management (WLM) Division is relatively small but ecologically significant, encompassing 82.92 km² of forest area. Its composition includes Very Dense Forest (VDF) covering 44.13 km² and Moderately Dense Forest (MDF) spanning 38.79 km², with no Open Forest (OF) recorded. The division has shown a forest gain of 5.87 km², reflecting effective management and natural regeneration. Notably, scrubland is almost negligible (0.07 km²), indicating excellent forest integrity and possibly intensive protection efforts. Due to its compact size and strategic location, WLM Eluru Division is less fire-prone and plays a vital role in coastal protection, biodiversity conservation, and fishery support.

In Eluru WLM Division during 2016-17, a total of 72 CAMPA activities were carried out, of which 10 activities (around 22 %) were selected for detailed monitoring and evaluation. Among activity types, other works dominated with 66 activities (13 sampled), followed by construction (5; 1 sampled), Maintenance (1; 1 sampled). None of the plantation projects, protection, soil and moisture conservation works were implemented.

5. Monitoring and Evaluation of Maintenance Activities

In Eluru WLM Division during 2016-17, a total of one maintenance activity was carried out under CAMPA, of which one activity (approximately 20 %) was selected for monitoring and evaluation

1.1 First year maintenance of 10.00 Ha Mangrove Plantation in Nachugunta beat

GPS location: N 16.102416 E 80.910836 **SO no. and year:** RSO27 (2016-17)

As per the approved maintenance plan, the following activities, Replacement of dead plants, cultural operations, fertilizer applications and other contingencies were committed and executed at Nachugunta beat. However, during the field visit mangrove plantation was found to be satisfactory growth with the species of *Avicennia officinalis*, *Excoecaria agallocha* and *Avicennia marina*. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- **Regular Monitoring:** Conduct routine field visits to assess plant health, survival rates, and identify any dead or unhealthy plants promptly.
- **Replacement of Dead Plants:** Replace dead or poorly growing saplings with healthy ones of the same species during the suitable planting season to maintain optimal plant density.
- **Weeding & Clearing:** Regularly remove weeds and competing vegetation around young mangrove saplings to minimize competition for nutrients, water, and sunlight.
- **Soil and Water Management:** Ensure proper tidal flushing and prevent stagnation of water. If necessary, clear blockages in channels for unobstructed tidal flow. Maintain slight mounding or ditching to prevent waterlogging and salt accumulation near root zones.
- **Documentation & Reporting:** Maintain updated records of maintenance activities, plant survival, and growth progress for periodic review and future reference.

- **Community Involvement:** Involve local communities in monitoring and protection activities to enhance success and build ownership.



Mangrove plantation in Avanigadda range

6. Monitoring and Evaluation of Construction Activities

A total of 5 Construction activities were carried out in Eluru WLM division during 2016-17, of which 20 % (one activity) was selected for monitoring.

2.1 Construction of Boundary Pillars in Lakavanidiba beat in Krishna WL

GPS Location: N 15.795261 E 80.841232 **SO no. and year:** RSO 30 (2016-17)

A total of one boundary pillars were constructed in Lakavanidibba Beat of Avanigadda range. As per the measurement book and field verification, measurements were matched the recorded dimensions, 1.20 m above ground with a top width of 0.45 m, bottom width of 1.20 m, and 1.20 m below ground with no variations observed, the pillar is in intact and effectively demarcate the respective boundary, ensuring proper identification and protection.



RCC boundary pillar in Lakavanidibba beat

7. Monitoring and Evaluation of Other activities

During 2016–17, a total of 66 activities were carried out under the “Others” category, of which 13 were selected for sampling. Document verification and cross-checking were conducted in the presence of Division/Range office staff. The documents reviewed included sanction orders, estimation sheets, and work registers. It was found that the sanctioned amounts were consistent with the actual expenditures, and all financial records were properly maintained and duly authenticated by the concerned officials, including the DFO, SDO, and FRO. The utilization of funds was appropriate and aligned with the approved estimates and guidelines. Both internal (by the Conservator of Forests) and external (by the Accountant General’s Office) audits were conducted, ensuring transparency and compliance with financial and administrative protocols

under the CAMPA scheme. However, the work registers for DSO 15, DSO 17, DSO 18, DSO 19, RSO 90, RSO 35, RSO 73, and RSO 8 were not presented for the year 2016–17 during the verification process.

Key Findings

- Maintenance of mangrove plantation in Nachugunta beat was successful, with *Avicennia officinalis*, *Excoecaria agallocha*, and *Avicennia marina* showing satisfactory growth.
- Boundary pillar construction was intact and met specifications, contributing to effective demarcation.
- No plantations, protection works, or SMC activities were undertaken, limiting ecological restoration efforts.
- “Other works” dominated, with financial compliance ensured but incomplete documentation in several cases.

Recommendations

- Expand plantation and SMC interventions in future years to enhance ecological resilience, particularly in mangrove and wetland ecosystems.
- Continue mangrove maintenance with emphasis on tidal flushing and weed management.
- Strengthen documentation practices by ensuring submission of all registers and estimates during verification.
- Replicate effective boundary demarcation models to reduce encroachment risks.
- Enhance community participation in mangrove and wetland management to build local stewardship.

18. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN CHINTUR DIVISION

Introduction

Chintur forest division, located in eastern Andhra Pradesh within the Alluri Sitarama Raju District, is an ecologically important area at the junction of the Eastern Ghats and Deccan Plateau. Covering about 145,000 hectares, including 25,000 hectares of Papikonda National Park, it is a biodiversity hotspot with predominantly tropical dry deciduous forests. The dominant tree species include Teak, *Terminalia*, *Anogeissus*, *Pterocarpus marsupium* and others with an understory of shrubs and bamboo in moist areas. The Godavari River enriches the ecosystem, supporting both wildlife and tribal communities, including migrant groups like the Guthikoya. The division faces significant threats from encroachment about 6,000 hectares have been cleared for cultivation and settlement and shifting agriculture (Podu cultivation), which degrade the forest. Additional challenges include staff shortages, illegal logging, poaching, and smuggling. Despite these pressures, the forest remains vital for local tribal livelihoods, especially through the collection of non-timber forest products like tendu leaves, providing employment to thousands. Overall, Chintur Forest Division is an ecologically rich but vulnerable region requiring strengthened protection and sustainable management to conserve biodiversity and support the socio-economic well-being of its tribal communities.

During the period 2016-17, a total of 60 CAMPA activities were implemented in the Chintur Forest Division. Out of these, 14 activities representing approximately 21% were selected for detailed monitoring and evaluation. Among the five forest ranges in the division, V.R. Puram carried out the highest number of activities implementing 21, of which 5 were included in the evaluation sample. Kunavaram followed with 12 activities with 3 selected for evaluation. Nellipaka implemented 11 activities and 2 of them were evaluated. Both Lakkavaram and Chintur ranges undertook 8 activities each, with 2 activities chosen in each for detailed evaluation. In terms of activity type, other works constituted the largest share with 24 activities implemented and 5 sampled. This was followed by protection activities (15 implemented; 5 sampled), maintenance (11; 2) and plantation (10; 2). Notably, no SMC and construction works were reported during this period. This distribution highlights the focus on general and protection-related works under CAMPA funding, while infrastructural and conservation-specific interventions were absent that year.

1. Monitoring and Evaluation of Plantation Activities

During the period 2016-17, Chintur Forest Division implemented a total of 10 plantation activities under the CAMPA programme, of which 2 activities (approximately 20 %) were selected for monitoring and evaluation. A range-wise distribution shows that V. R. Puram carried out the highest number of plantation activities with 4, of which one was sampled for evaluation. Chintur, Kunavaram and Nellipaka each implemented 2 plantation activities. However, only Kunavaram had 1 activity selected for evaluation, while no activities were sampled from Chintur and Nellipaka. Lakkavaram range reported no plantation activities during this period. This distribution indicates a relatively modest focus on plantation efforts, with activity concentrated primarily in V.R. Puram.

1.1 Kunavaram range

During 2016–17, a total of two plantation activities were implemented under the CAMPA

scheme in Kunavaram range. For monitoring and evaluation, one plantation site constituting 50 % of the activities was randomly selected.

Table 117 Details of plantation selected in Kunavaram range

Sl no.	Plantation	SO no. and year
1	Raising of Teak stump plantation 20 Ha in Bodunuru beat of Kunavaram range	DSO 51 (2016-17)

The 20-hectare Teak stump plantation at Bodunuru established under the CAMPA-NPV scheme (2016-17) has been assessed as a complete let-down with no evidence of successful establishment or survival. The plantation site is characterized by sandy, hard and gravelly soil which is inherently unsuitable for sustainable plantation growth particularly for moisture and nutrient-demanding species like Teak (*Tectona grandis*). A field assessment conducted on 05.03.2025 in the presence of Forest Department staff confirmed that the plantation had completely failed with no live stumps or regeneration observed. The primary reason cited was inadequate rainfall although site unsuitability, lack of community involvement and biotic pressures also significantly contributed to the outcome.

1.2 V R Puram range

During 2016–17, a total of four plantation activities were implemented under the CAMPA scheme in V R Puram range. For monitoring and evaluation, one plantation site constituting 25 % of the activities was randomly selected.

Table 118 Details of plantation selected in V.R. Puram range

Sl no.	Plantation	SO no. and year
1	Raising of Teak plantation 10 Ha in Darapally beat of V.R. Puram range.	DSO 57 (2016-17)

The 10-hectare Teak plantation located in compartment no. 62, Darapally beat, Jeediguppa section, V.R. Puram range was established under the CAMPA-NPV scheme (2016-17) and was evaluated on 05.03.2025 in the presence of the concerned Forest Department staff. Based on comprehensive field assessment and complete perambulation, the plantation was found to have completely failed with no evidence of successful establishment of the planted teak species. The plantation site is characterized by red sandy loam soil which along with poor soil fertility and inadequate rainfall are identified as the primary reasons for no performance.

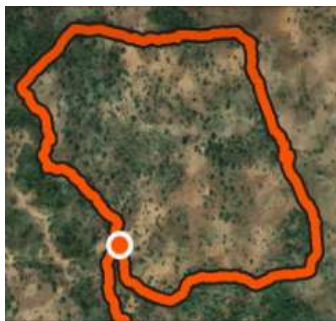
Verification of plantation area and boundaries

In Chintur division during 2016-17, measurement of plantation area was conducted using KML files for each location.

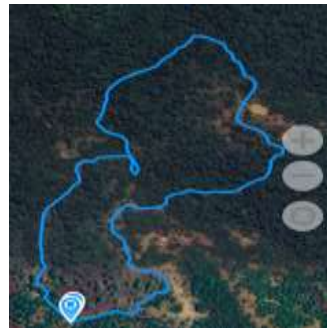
Table 119 Details of plantation area perambulation in Chintur division

Sl. no.	Plantation	Area as per records	Area as per field perambulation
1	Raising of Teak stump plantation 20 Ha in Bodunuru beat of Kunavaram range	20 Ha	20.56 Ha
2	Raising of Teak plantation 10 Ha in Darapally beat of V.R. Puram range	10 Ha	7.55 Ha

As part of the monitoring and evaluation of CAMPA plantation activities in Chintur Forest Division during 2016-17, perambulation and area verification were conducted at two plantation sites: Bodunuru and Darapally. These exercises were carried out with the active support of local Forest Beat Officers, utilizing GPS-based tracking through the Geo Tracker app and QGIS software for accurate area calculation. To ensure transparency and credibility, photographic documentation was also captured during the visits. At Bodunuru plantation, the area calculated from the perambulated boundary when analysed using QGIS, showed a minor excess of 0.56 hectares compared to the officially recorded area. In contrast, the 10-hectare Darapally plantation showed a significant shortfall in area. The GPS-based measurement revealed only 7.55 hectares, indicating a discrepancy of 2.45 hectares from the area recorded in the plantation journal. The cause of this shortfall could not be conclusively established during the field verification. The perambulation was guided by the boundary demarcation provided by the plantation watcher or guard and conducted under the supervision of the Forest Beat Officer.



Bodunuru 20.56 Ha, Kunavaram



Darapally 7.55 Ha, VR Puram



Bodunuru plantation, Kunavaram



Darapally plantation, VR Puram

Health Status of Plantation: In both plantations, no live plants were observed indicating that the plantations were unsuccessful. Due to the poor establishment and complete absence of surviving individuals, the health condition of the plantations could not be assessed in detail.

Protection Measures: In both plantations, essential protection measures such as fire lines, inspection paths and the deployment of fire watchers were implemented.

Biotic Pressure on Plantations: Despite the implementation of protection measures, both plantation sites experienced heavy grazing and browsing by cattle and wild herbivores, which significantly hindered regeneration and compromised overall plantation success.

Maintenance of Plantation Journals and Records: Although plantation journals were maintained, discrepancies were observed between recorded entries and the actual field

conditions. Furthermore, the absence of a plantation display board on-site reduced visibility, transparency, and ease of identification of the plantation's location and purpose.

Vana Samrakshana Samithi (VSS): In the Darapally beat of V.R. Puram range, the plantation was implemented with the involvement of the Vana Samrakshana Samithi (VSS), and a Focus Group Discussion (FGD) was conducted. However, despite community participation, the plantation failed to establish successfully, underscoring the need for improved site selection, adaptive planning, and stronger technical oversight, even within participatory frameworks. In contrast, in the Bodunuru beat of Kunavaram range, the plantation was implemented and maintained without VSS participation. As a result, no FGD was conducted, and local community engagement was absent, representing a critical gap that undermines the long-term protection, ownership, and sustainability of the plantation.

2. Monitoring and Evaluation of Maintenance Activities

During 2016-17, a total of 11 maintenance activities were implemented under CAMPA across the Chintur Forest Division, of which 2 activities were selected for monitoring and evaluation. A range-wise analysis indicates that V.R. Puram undertook the highest number of maintenance activities with 6 and 1 was sampled for evaluation. Kunavaram followed with 4 activities, of which one was sampled. The Chintur range implemented 1 activity, but none was selected for evaluation. Notably, no maintenance works were reported from the Lakkavaram and Nellipaka ranges during this period.

Table 120 Maintenance activities selected for evaluation in Chintur division

SI no.	Maintenance activities	GPS Co-ordinates	SO no. and year
Kunavaram range			
1	First Year maintenance of 20 Ha Teak Plantation in Bodunuru Beat of Kunavaram range	N 17.62165 E 81.216311	DSO 65 (2016-17)
VR Puram range			
2	First year maintenance of teak plantation (20 Ha) at Darapally beat of V.R. Puram range	N 17.555695 E 81.356993	DSO 60 (2016-17)

As per the approved maintenance plan, the nature of maintenance activities undertaken depends on the year of implementation following plantation establishment. According to the work register, the maintenance operations undertaken included casualty replacement, weeding operations, soil tilling (inter-ploughing), coppice management, pruning of lower branches, fire line management and other contingency measures aimed at ensuring plantation survival and growth. However, during the monitoring visit, it was found that no live plants were visible at either of the inspected sites, indicating a complete letdown of the plantations. The teak (*Tectona grandis*) plantations in particular showed poor survival with no surviving individuals observed. At Bodunuru plantation, although the teak plantation failed, there was noticeable natural regeneration of *Hardwickia binata*, which appeared healthy and well-established. In contrast, at the Darapally plantation, no live plants neither planted nor naturally regenerated-were found indicating a total ecological and operational lacunae at that site. Despite the documentation of maintenance activities in the records, the absence of surviving plants suggests that either the plantation was not properly maintained or that the site conditions were unsuitable for plant survival. Additionally, plantation board was missing at the site.

General recommendations for maintenance activities

- Selection of plantation sites and species should be based on scientific criteria including topography, soil quality, moisture availability and ecological suitability.
- Avoid planting in areas with known poor survival history or unsuitable condition.
- Prioritize native species like *Hardwickia binata* over less adaptive ones like teak.
- Encourage and manage natural regeneration where feasible, especially in areas showing successful native growth.
- It is recommended to install plantation board at sites for proper identification and monitoring.



Bodanuru, Kunavaram



Darapally, VR Puram

3. Monitoring and Evaluation of Protection Activities

During the period 2016-17, Chintur Forest Division undertook a total of 15 protection activities, out of which 5 were selected for monitoring and evaluation. The distribution of activities across different ranges was as follows: Chintur carried out 3 activities with 1 sampled; Kunavaram had 4 activities with 1 sampled; Lakkavaram conducted 5 activities with 1 sampled; VR Puram completed 2 activities with 1 sampled; and Nellipaka had only 1 activity, which was sampled.

3.1 Creation of fire lines at Kansuluru beat of Chintur section and range

GPS location: N 17.757863 E 81.441322

SO no and year: RSO 21 (2016-17)

3.2 Creation of fire lines at E. D. Pally beat and section of Kunavaram range

GPS location: N 17.748114 E 81.206568

SO no and year: RSO 22 (2016-17)

3.3 Creation of fire lines at Lakkavaram beat, section and range

GPS location: N 17.726527 E 81.530612

SO no and year: RSO 20 (2016-17)

3.4 Creation of fire lines at Maredupudi beat of Jeediguppa section of V.R Puram

GPS location: N 17.519542 E 81.399233

SO no and year: RSO 25 (2016-17)

3.5 Creation of fire lines at Bandirevu (S) beat of Bandirevu section of Nellipaka range

GPS location: N 17.748850 E 81.140528

SO no and year: RSO 16 (2016-17)

Under the CAMPA–NPV (Forest Fire Management) scheme, fire lines were established across multiple beats in accordance with approved specifications and no deviations were found.

In Kansuluru beat, the fire line measured 3 m in width and 5,000 rmt in length, consistent with official records. While the fire line remains physically present, it is poorly visible due to moderate to dense growth of grass and weeds. Regular maintenance and vegetation clearance are recommended to ensure its continued effectiveness in fire prevention.

In E.D. Pally beat, the fire line measured 3 m in width and 5,000 rmt in length, matching official records. It has been well maintained and remains clearly visible, with only minimal growth of grass, weeds, and plant residues. Routine maintenance is advised to sustain its functionality.

In Lakkavaram beat, the fire line measured 3 m in width and 3,000 rmt in length, consistent with records. It has been established and maintained along the inspection path within the forest area and is clearly visible, with minimal weed growth observed along its stretch.

In Maredupudi beat, the fire line measured 3 m in width and 6,950 rmt in length, as per official records. However, it was not clearly distinguishable during field verification due to dense vegetation cover and poor maintenance, indicating the need for immediate upkeep and clearance to restore its functionality.

In Bandirevu beat, the fire line measured 3 m in width and 5,800 rmt in length, aligning with official documentation. The fire line is clearly visible, with moderate grass and weed growth observed. Regular maintenance is recommended to retain its fire-preventive efficiency.



Fire lines at Lakkavaram beat



Fire lines at E. D. Pally beat

4. Monitoring and Evaluation of Other Activities

During the period 2016-17, a total of 24 activities were implemented under the "Others" category in Chintur Forest Division, with 5 activities selected for monitoring and evaluation. Range-wise, V.R. Puram had the highest number of activities at 9, of which 2 were sampled. Nellipaka followed with 8 activities, with 1 sampled. Lakkavaram had 3 activities, with 1 sampled. Both Chintur and Kunavaram had the lowest number of activities, 2 each, with 1 activity sampled in Chintur and none in Kunavaram. Document verification and cross-checking were conducted in the presence of Division and Range Office staff. The types of documents reviewed included sanction orders, estimation sheets, and work registers. It was found that sanctioned amounts aligned with actual expenditures, and all financial records were properly maintained and duly authenticated by the concerned officials, including the DFO, SDO, and FRO. Fund utilization was appropriate and consistent with approved estimates and guidelines. Internal audits by the Conservator of Forests and external audits by the Accountant General's office ensured transparency and compliance with financial and administrative protocols under the CAMPA scheme.

Key Findings

- The plantation efforts undertaken during 2016–17 largely failed to establish successfully, primarily due to poor site selection, unsuitable soil conditions, and uncontrolled grazing pressure

- Subsequent maintenance activities were ineffective in reviving plantation growth, with only sporadic patches of natural regeneration observed in certain areas.
- Fire line creation and maintenance showed inconsistency across ranges, affecting the overall preparedness for forest fire management.
- Community participation in plantation establishment and protection was limited or entirely absent in several locations, reducing the long-term sustainability of interventions.

Recommendations

- Strengthen site selection processes by incorporating soil characteristics and ecological suitability criteria to ensure higher plantation survival and growth.
- Prioritize native and site-appropriate species, such as *Hardwickia binata*, over teak and other non-suitable species in areas with fragile or shallow soils.
- Enforce regular maintenance and clearance of fire lines to maintain their functional effectiveness in preventing forest fires.
- Promote active participation of Vana Samrakshana Samithis (VSS) and conduct Focused Group Discussions (FGDs) to build local ownership and accountability in plantation protection and upkeep.
- Reconcile discrepancies in recorded plantation areas through GIS-based mapping and periodic spatial audits, ensuring accuracy and transparency in reporting.

19. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN KAKINADA DIVISION

Introduction

Kakinada Forest Division, located in East Godavari district of Andhra Pradesh, is ecologically diverse, encompassing coastal plains, deltaic lowlands, uplands, and parts of the Eastern Ghats. It has a tropical climate with moderate to high rainfall, supporting varied vegetation including tropical dry and moist deciduous forests. As per the ISFR 2023, the district has 544.13 sq.km of forest cover, with a net increase of 4.12 sq.km since 2021. The forest types include Moderately Dense Forest (184.33 sq.km), Open Forest (359.78 sq.km), and Very Dense Forest (0.02 sq.km). Mangrove ecosystems near the Godavari estuary, especially in the Coringa Wildlife Sanctuary, play a vital role in coastal protection and biodiversity conservation. Key tree species include Teak, Asan, Tendu, and Satinwood in inland areas, and *Avicennia*, *Rhizophora*, and *Sonneratia* in mangroves. Soil types range from fertile alluvial loams to red sandy and lateritic soils. Threats include grazing, invasive species, and illegal extraction. Community participation through VSSs/JFMCs has improved forest management, though challenges remain. Continued efforts in restoration, scientific management, and community engagement are crucial for sustaining these forests.

During the period 2016-17, a total of 136 CAMPA (Compensatory Afforestation Fund Management and Planning Authority) activities were carried out in Kakinada Forest Division. Out of these, 32 activities approximately 23% were selected for detailed monitoring and evaluation. Among the seven forest ranges in the division, the Kakinada range implemented the highest number of activities with 30, of which 6 were sampled for evaluation. Rajavommangi followed with 27 activities, with 5 selected for monitoring. Sudikonda carried out 23 activities and 8 of these were evaluated, making it the range with the highest number of sampled activities. Yeleswaram implemented 17 activities with 4 sampled. Rampachodavaram undertook 15 activities with 3 evaluated. Addatheegala carried out 14 activities also with 3 taken up for evaluation. Gokavaram with the fewest activities at 10 had 3 of them sampled. Notably, Sudikonda and Gokavaram had the highest sampling rates, with over 30% of their activities evaluated, indicating a relatively greater focus on monitoring in those ranges. In terms of activity type, other works constituted the largest share with 57 activities implemented and 13 sampled. This was followed by plantation activities (36 implemented; 7 sampled), maintenance (27 implemented; 5), protection (9 implemented; 3), soil and moisture conservation or SMC (4 implemented; 2) and protection (3; 2).

1. Monitoring and Evaluation of Plantation Activities

During 2016-17, Kakinada division implemented a total of 36 plantation activities under the Compensatory Afforestation Fund Management and Planning Authority (CAMPA) program. Of these, 7 plantations approximately 20% were selected for monitoring and evaluation to assess the quality of implementation and ecological outcomes. A range-wise analysis shows that Rajavommangi range undertook the highest number of plantations with 12 activities, of which 2 were included in the evaluation. RC Varam and Sudikonda ranges each carried out 2 plantations and 1 from each was selected for monitoring indicating a 50% evaluation rate in those ranges. Yeleswaram and Addatheegala ranges implemented 5 and 4 plantations respectively, with one plantation from each included in the evaluation process. Notably, the

Kakinada range conducted only one plantation activity, but it was not included in the evaluation. Gokavaram range reported no plantation activities during this period.

1.1 Yeleswaram range

A total of five plantation activities were implemented under the CAMPA scheme in Yeleswaram range. For monitoring and evaluation, one plantation site constituting 20 % of the activities was randomly selected.

Table 121 Details of plantation selected in Yeleswaram range

Sl. no.	Plantation	SO no. and year
1	Raising of Teak plantation (5 Ha) at Kithamuripeta Peddipalem beat, Yeleswaram section	DSO 56 (16-17)

Peddipalem (5 Ha) is characterized by red sandy loam soil which is well-drained and moderately fertile. This soil, being a balanced mixture of sand, silt and clay provides good aeration and root penetration making it moderately suitable for the establishment and growth of *Tectona grandis*.

Survival Percentage: At Peddipalem, the plantation recorded an average survival rate of 48.70 % reflecting moderate suitability for *Tectona grandis*.

Growth Performance: At Peddipalem, the average tree height ranges from 4.88 to 6.49 m with girth measurements between 29.21 and 42.07 cm.

Table 122 Details of plantation enumerated in Yeleswaram range

Sl. no.	Plantation / Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Peddipalem 5 Ha Teak plantation	1	<i>Tectona grandis</i>	N 17.359798 E 82.243047	50.03	5.72± 1.25	-	33.96 ±11.7
		2	<i>Tectona grandis</i>	N 17.360685 E 82.243072	49.21	6.49± 1.16	-	42.07 ±5.04
		3	<i>Tectona grandis</i>	N 17.359847 E 82.243065	46.87	4.88± 0.84	-	29.21 ±7.23
Plantation average					48.70	5.69	-	35.08

1.2 Rampachodavaram range

A total of six plantation activities were implemented under the CAMPA scheme in Rampachodavaram range. For monitoring and evaluation, one plantation site constituting approximately 20 % of the activities was randomly selected.

Table 123 Details of plantation selected in Rampachodavaram range

Sl. no.	Plantation	SO no. and year
1	Raising of Teak plantation 11 Ha at Maredumilli RF, comp.no.265, Maredumilli south beat of Rampachodavaram range	DSO 38 (16-17)

The selected 11-hectare plantation site at Maredumilli South beat is characterized by red sandy soil. The plantation is strategically located along the roadside connecting Rampachodavaram to Maredumilli, ensuring easy access and visibility.

Survival Percentage: Maredumilli South plantation site has demonstrated good suitability for *Tectona grandis* with an average survival rate of 89.52 %.

Growth Performance: In Maredumilli South plantation, the average tree height ranges from 6.91 to 7.18 m while the average girth ranges from 13.79 to 41.82 cm.

Table 124 Details of plantation enumerated in Rampachodavaram range

Sl. no.	Plantation / Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Maredumilli 11 Ha Teak plantation	1	<i>Tectona grandis</i>	N 17.575917 E 81.715604	93.75	7.00 ±0.62	34.70 ±6.34
		2	<i>Tectona grandis</i>	N 17.575315 E 81.715660	90.62	7.13 ±0.73	34.64 ±5.87
		3	<i>Tectona grandis</i>	N 17.574702 E 81.715965	86.71	7.18 ±0.84	41.24 ±12.38
		4	<i>Tectona grandis</i>	N 17.573987 E 81.716271	89.06	6.92 ±1.32	41.82 ±11.47
		5	<i>Tectona grandis</i>	N 17.573040 E 81.716669	87.50	6.91 ±0.89	40.76 ±10.78
Plantation average					89.52	7.02	38.63

1.3 Addatheegala range

A total of four plantation activities were implemented under the CAMPA scheme in Addatheegala range. For monitoring and evaluation, one plantation site constituting 25 % of the activities was randomly selected.

Table 125 Details of plantation selected in Addatheegala range

Sl. no.	Plantation	SO no. and year
1	Raising of Bamboo linear planting 5.00 Ha at Chavididibbalu beat	DSO 75 (2016-17)

The 5-hectare site selected for bamboo plantation at Chavididibbalu beat is characterized by hilly terrain with well-drained red soil. The undulating landscape and soil conditions are considered suitable for bamboo cultivation offering adequate drainage and moderate nutrient content to support healthy growth.

Survival Percentage: 5-hectare linear bamboo plantation at Chavididibbalu beat demonstrates good suitability for bamboo species with an average survival rate of 60 %.

Growth Performance: In 5-hectare linear bamboo plantation at Chavididibbalu beat, the average tree height ranges from 2.12 to 5.13 m, while the average clump girth ranges from 0.18 to 0.79 m and the average culm girth ranges from 10.31 to 19.27 cm.

Table 126 Details of plantation enumerated in Addatheegala range

Sl. no.	Plantation / Village name	Plot no.	Species name	GPS Coordinates	Survival (%)	Avg. Clump Height (m)	Avg. Clump GBH (m)	Avg. Culm GBH (cm)
1	Chaviti -dibbalu 5 Ha Linear plantation	1	<i>Dendrocalamus strictus</i>	N 17.631510 E 81.915847	64.00	5.13 ±1.61	0.45 ±0.12	14.06 ±2.93
		2	<i>Dendrocalamus strictus</i>	N 17.631800 E 81.916189	60.00	4.67 ±0.52	0.79 ±0.60	19.27 ±7.73
		3	<i>Dendrocalamus strictus</i>	N 17.632381 E 81.916802	68.00	4.41 ±0.64	0.47 ±0.49	17.06 ±4.66
		4	<i>Dendrocalamus strictus</i>	N 17.632820 E 81.917520	52.00	2.12 ±0.29	0.20 ±0.90	10.31 ±5.60
		5	<i>Dendrocalamus strictus</i>	N 17.632117 E 81.917503	56.00	2.61 ±0.29	0.18 ±0.29	11.93 ±0.29
Plantation average					60.00	3.78	0.41	14.52

1.4 Sudikonda range

A total of six plantation activities were implemented under the CAMPA scheme in the Sudikonda range. For monitoring and evaluation, two plantation sites constituting approximately 33 % of the activities were randomly selected.

Table 127 Details of plantations selected in Sudikonda range

Sl. no.	Plantations	SO no. and year
1	Raising of 2.5 Ha Bamboo plantation at Bheemavaram area of Bheemavaram beat	RSO 7 (16-17)
2	Raising of 2.5 Ha Bamboo plantation at Thakurupalem area of Tirumalayapalem beat	RSO 5 (2016-17)

The selected 2.5-hectare plantation site at Bheemavaram is characterized by hilly terrain with well-drained red soil. The undulating landscape and soil conditions are suitable for bamboo cultivation, offering adequate drainage and moderate nutrient content to support healthy growth. The 2.5-hectare site at Thirumalayapalem is characterized by red soil interspersed with stones.

Survival percentage: Bheemavaram plantation site has shown moderate suitability for bamboo with an average survival rate of 52 %. The Thirumalayapalem plantation site also shows moderate suitability with an average survival rate of 51.99 %.

Growth Performance: In Bheemavaram plantation, the average tree height ranges from 3.17 to 4.31 m with an average clump girth of 0.86 to 0.91 m and an average culm girth of 12.92 to 15.71 cm. In Thirumalayapalem plantation the average tree height ranges from 2.14 to 3.57 m with an average clump girth of 0.36 to 0.80 m and an average culm girth of 4.71 to 12.43 cm.

Table 128 Details of plantations enumerated in Sudikonda range

Sl. no.	Plantation /village name	Plot no.	Species name	GPS Co-ordinates	Average growth			Survival (%)
					Avg. Clump Height	Avg. Clump GBH (m)	Avg. Culm GBH (cm)	
1	Bheemavaram 2.5 Ha Bamboo plantation	1	<i>Dendrocalamus strictus</i>	N 17.473121 E 81.828475	4.31 ±0.60	0.91 ±0.01	14.38 ±2.14	48.00
		2	<i>Dendrocalamus strictus</i>	N 17.473717 E 81.828994	3.17 ±0.24	0.87 ±0.03	12.92 ±1.97	52.00
		3	<i>Dendrocalamus strictus</i>	N 17.474195 E 81.829301	3.29 ±0.377	0.86 ±0.03	15.71 ±1.06	56.00
Plantation average					3.59	0.88	14.33	52.00
2	Thirumalayapalem 2.5 Ha Bamboo plantation	1	<i>Dendrocalamus strictus</i>	N 17.274413 E 81.828475	2.14 ±1.15	0.36 ±0.11	4.71 ±1.38	46.66
		2	<i>Dendrocalamus strictus</i>	N 17.273996 E 81.916606	2.75 ±0.26	0.56 ±0.16	8.00 ±0.75	53.33
		3	<i>Dendrocalamus strictus</i>	N 17.273260 E 81.917240	3.57 ±0.34	0.80 ±0.04	12.43 ±2.07	56.00
Plantation average					2.82	0.57	8.38	51.99

1.5 Rajavommangi range

A total of 12 plantation activities were implemented under the CAMPA scheme in the Rajavommangi range. For monitoring and evaluation, two plantation sites constituting 20 % of the activities were randomly selected.

Table 129 Details of plantations selected in Rajavommangi range

Sl. no.	Plantations	SO no. and year
1	Raising of 12 Ha Teak plantation at Labbarthi beat of Rajavommangi range	DSO 16 (2016-17)
2	Raising of 05 Ha Bamboo plantation along the RF boundary side in Thimmapuram beat (Bit - II) of Rajavommangi range	DSO 80 (2016-17)

The proposed 12-hectare Teak plantation site at Labbarthi beat is characterized by plain terrain with black loamy soil, good drainage and no water-logging issues. The 5-hectare bamboo plantation site at Thimmapuram beat is characterized by well-drained red soil.

Survival Percentage: Labbarthi beat teak plantation demonstrated good suitability for *Tectona grandis* with an average survival rate of 88.66 %. The Thimmapuram bamboo plantation demonstrated good suitability for *Dendrocalamus strictus* with an average survival of 71.20 %.

Growth Performance: In Labbarthi beat teak plantation, average tree height ranged from 5.88 to 7.02 m with girth ranging from 33.30 to 37.54 cm. In 5-hectare Thimmapuram bamboo plantation, average height ranged from 5.22 to 7.25 m with clump girth between 0.68 and 1.05 m and culm girth between 14.31 and 23.94 cm.

Table 130 Details of plantations enumerated in Rajavommangi range

Sl. no.	Plantation / Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Labbarthi 12 Ha Teak plantation	1	<i>Tectona grandis</i>	N 17.516173 E 82.163966	85.93	6.74 ±0.57	37.36 ±6.96
		2	<i>Tectona grandis</i>	N 17.516524 E 82.164638	89.84	7.02 ±0.69	33.30 ±5.05
		3	<i>Tectona grandis</i>	N 17.516377 E 82.163719	88.67	6.56 ±0.55	35.46 ±6.64
		4	<i>Tectona grandis</i>	N 17.515896 E 82.163530	88.28	6.43 ±0.69	34.77 ±6.66
		5	<i>Tectona grandis</i>	N 17.516134 E 81.163349	90.62	5.88 ±0.52	37.54 ±4.94
Plantation average					88.66	6.52	35.68

Sl. no.	Plantation name	Plot no.	Species name	GPS Coordinates	Average growth			Survival (%)
					Avg. Clump Height (m)	Avg. Clump GBH (m)	Avg. Culm GBH (cm)	
2	Thimma Puram 5 Ha Bamboo plantation	1	<i>Dendrocalamus strictus</i>	N 17.441884 E 82.139895	6.88 ±0.69	0.74 ±0.10	14.41 ±2.42	68.00
		2	<i>Dendrocalamus strictus</i>	N 17.440677 E 82.139415	6.84 ±0.23	0.81 ±0.11	16.95 ±3.27	76.00
		3	<i>Dendrocalamus strictus</i>	N 17.441658 E 82.139713	7.25 ±0.25	0.69 ±0.15	14.31 ±3.04	64.00
		4	<i>Dendrocalamus strictus</i>	N 17.439978 E 82.138074	5.26 ±0.25	0.68 ±0.17	19.16 ±4.69	76.00
		5	<i>Dendrocalamus strictus</i>	N 17.438532 E 81.135097	5.22 ±0.25	1.05 ±0.57	23.94 ±5.58	72.00
Plantation average					6.29	0.79	17.75	71.20

Comparative assessment of plantation in Kakinada division during 2016-17

The comparative assessment of plantations across five forest ranges reveals notable variations in the survival percentage and growth performance of *Tectona grandis* (Teak) and bamboo species. Among the teak plantations, Rampachodavaram range (Maredumilli South) demonstrated the highest suitability with an impressive survival rate of 89.52% and superior average tree height ranging from 6.91 to 7.18 m, indicating optimal growth conditions. Similarly, Rajavommangi range (Labbarthi beat) also showed good performance with a survival rate of 88.66% and consistent girth growth making it highly suitable for Teak. In contrast, Yeleswaram range (Peddipalem) displayed only moderate suitability with a lower survival rate of 48.70%, although growth measurements were acceptable. For bamboo plantations, the Rajavommangi range (Thimmapuram) emerged as the most successful site with a survival rate

of 71.2% and strong growth metrics including average height up to 7.25 m, clump girths up to 1.05 m and culm girths reaching 23.94 cm. Addatheegala range (Chavitidibbalu beat) also showed fair results with a survival rate of 60% and moderate growth. However, Sudikonda range, particularly the Thirumalayapalem site, exhibited the weakest performance with survival rates just above 51% and the lowest overall growth figures indicating limited suitability for bamboo cultivation. Overall, Rajavommangi demonstrated the best combined performance for both Teak and Bamboo while Sudikonda showed the least favourable conditions for plantation success.

Verification of plantation area and boundaries

In Kakinada division during 2016-17, measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

Table 131 Details of plantation area perambulation in Kakinada division

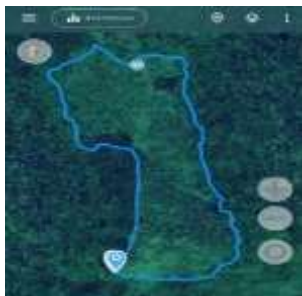
Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising of Teak plantation (5 Ha) at Kithamuripeta Peddipalem beat, Yeleswaram section	5.0 Ha	4.61 Ha
2	Raising of Teak plantation 11 Ha at Maredumilli south beat, of Rampachodavaram range.	11.0 Ha	21.12 Ha
3	Raising of Bamboo linear planting 5.00 Ha at Chavitidibbalu beat	5.0 Ha	5.77 Ha
4	Raising of 2.5 Ha Bamboo plantation at Bheemavaram area of Bheemavaram beat	2.5 Ha	5.76 Ha
5	Raising of 2.5 Ha Bamboo plantation at Thakurupalem area of Tirumalayapalem beat	2.5 Ha	7.92 Ha
6	Raising of 12 Ha Teak plantation at Labbarthi beat of Rajavommangi range.	12.0 Ha	13.19 Ha
7	Raising of 05 Ha Bamboo plantation in Thimmapuram beat (bit - II) of Rajavommangi range.	5.0 Ha	4.70 Ha

Perambulation of the plantation area was carried out in the presence of the designated Forest Officer, based on the demarcation indicated by the respective watcher or guard responsible for each site. During the verification process, it was observed that the perambulated area for five plantations exceeded the officially recorded extent, while two plantations showed a lesser extent than documented. The variance in area is primarily attributed to the inclusion of rocky terrain, trenches and barren patches within the plantation boundaries features that were not accounted for in the original records. The reasons for the reduced area in two plantations could not be conclusively determined. Actual extents were measured using QGIS software, which confirmed the following deviations from the recorded figures.

- 5 Ha Teak Peddipalem plantation (Yeleswaram): Lesser by 0.39 Ha
- 11 Ha Teak Maredumilli south plantation (RC Varam): Exceeded by 10.12 Ha
- 5 Ha Bamboo Chavitidibbalu plantation (Addatheegala): Exceeded by 0.77 Ha
- 2.5 Ha Bamboo Bheemavram plantation (Sudikonda): Exceeded by 3.26 Ha

- 2.5 Ha Bamboo Tirumalayapalem plantation (Sudikonda): Exceeded by 5.42 Ha
- 12 Ha Teak Labbarthi plantation (Rajavommangi): Exceeded by 1.19 Ha
- 5 Ha Bamboo Thimmapuram plantation (Rajavommangi): Lesser by 0.3 Ha

The verification was conducted through physical perambulation using the Geo Tracker mobile application, which facilitated the collection of geotagged photographs and GPS coordinates for accurate documentation. These visual and spatial records are provided below for reference.



Peddipalem 4.61 Ha



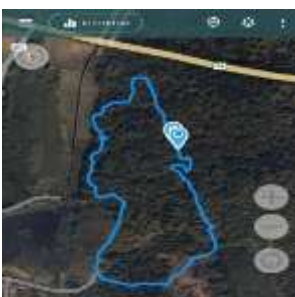
Maredumilli south 21.12 Ha



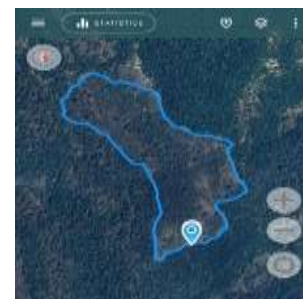
Chavitidibbalu 5.77 Ha



Bheemavaram 5.76



Tirumalayapalem 7.92 Ha



Labbarthi 13.19 Ha



Thimmapuram 7.92 Ha

Health Status of Plantation: Based on field observations across the seven evaluated plantations Maredumilli South, Chavitidibbalu, Bheemavaram, Tirumalayapalem, Labbarthi and Thimmapuram no signs of insect or pest damage were observed. These plantations were generally found to be in healthy condition exhibiting good survival rates and vigorous growth. However, the Peddipalem plantation showed evidence of damage caused by pests and insects, indicating compromised plant health in that area.

Protection of plantation: To safeguard the plantations from fire and other environmental threats, various protection measures were implemented including the creation and maintenance of fire lines, development of inspection paths and the engagement of fire watchers during vulnerable periods. These efforts contribute significantly to the overall protection of the plantations.

Biotic (human/cattle) pressure on plantation: Minimal incidents of grazing and browsing pressure were observed across all seven plantations. However, these pressures have been effectively mitigated through the construction of peripheral trenches and the deployment of plantation watchers. These measures have significantly restricted the entry of cattle from nearby villages, thereby reducing potential damage to the plantation areas.

Maintenance of plantation journals and records: Plantation journals and records are generally well-maintained with baseline information properly documented. However, periodic updating of key plantation parameters such as survival rates, growth metrics and maintenance activities needs improvement to ensure the records accurately reflect current field conditions and remain relevant for monitoring and evaluation. It was noted that inspections are being carried out by the concerned forest officials with their observations entered into the journals. However, during the field visit the journal for Tirumalayapalem plantation was not made available. Additionally, it was observed that plantation boards were missing at all seven plantation sites.

Vana Samrakshana Samithi (VSS): The involvement of the Vana Samrakshana Samithi (VSS) or Joint Forest Management Committee (JFMC) was observed at six plantation sites among seven indicating active community engagement in the protection, maintenance and monitoring of plantation activities. This reflects the core principles of Joint Forest Management (JFM) which emphasize participatory forest governance. In recognition of this involvement, Focus Group Discussions (FGDs) were conducted at Peddipalem, Maredumilli South, Chavitidibbalu, Bheemavaram, Labbarthi and Thimmapuram bit-II plantations to gather insights from community members regarding their roles, contributions and challenges in plantation management. However, in case of Tirumalayapalem plantation under the Sudikonda range, VSS participation was not observed; hence, Focus Group Discussion was not conducted at this site.



Peddipalem plantation



Maredumilli south beat



Chavitidibbalu plantation



Bheemavaram plantation



Tirumalayapalem plantation



Labbarthi plantation



Thimmapuram bit-II plantation

2. Monitoring and Evaluation of Maintenance Activities

During 2016-17, a total of 27 maintenance activities were implemented across the Kakinada Forest Division, out of which 5 activities were selected for monitoring and evaluation. A range-wise analysis indicates that Rajavommangi range carried out the highest number of maintenance activities with 7 implemented and 1 included in the evaluation. Yeleswaram range followed with 6 activities with 1 sampled. Both Kakinada and RC Varam ranges implemented 5 activities each and 1 from each was selected for evaluation. Sudikonda range undertook 3 activities with 1 included in the evaluation. Addatheegala range had the lowest number of maintenance activities with only 1 implemented and none sampled for evaluation.

Table 132 Maintenance activities selected for evaluation in Kakinada division

Sl. no.	Maintenance Activities	GPS Co-ordinates	SO no. and year
Kakinada range			
1	First year maintenance of non-teak hard wood species plantation under ANR method.	N 17.399542 E 82.539765	DSO 07 (2016-17)
Yeleswaram range			
2	Third year maintenance of teak plantation at Vathangi (15.00 Ha) through Vathangi VSS in Vathangi section.	N 17.485700 E 82.240164	DSO 60 (2016-17)
Rampachodavaram range			
3	Second year maintenance of teak plantation in 2014 (4 Ha) at Devarapalli of Rampachodavaram range.	N 17.528157 E 81.717745	SDSO 02 (2016-17)
Sudikonda range			
4	First year maintenance of 6 Ha teak plantation of Chupparipalem area of Korumilli beat.	N 17.465429 E 81.857157	SDSO 06 (2016-17)
Rajavommangi range			
5	Second year maintenance of NTHWS plantation in Badadanapalli RF (10 Ha) of Rajavommangi range	N 17.584877 E 82.306305	DSO 21 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. These activities include casualty replacement, fertilizer application, weeding operations, soil tilling (inter-ploughing), coppice management, pruning of lower branches, fire line management and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth are as follows;

General recommendations for maintenance activities

- Intensify weeding operations, especially along plantation boundaries, to control *Lantana* and bushy grasses, minimizing competition and ensuring healthy plant growth.
- Continue maintaining clear and effective fire lines with regular clearing before dry seasons to enhance visibility and effectiveness in preventing forest fires.
- Install and maintain plantation boundary stones and boards to ensure accurate demarcation, facilitate monitoring, prevent encroachments, and complement contingency records.
- Maintain accurate and updated plantation journals, markers, and records to support ongoing identification, monitoring, and accountability.
- Continue timely and appropriate fertilizer application, with special focus on weaker plants to promote uniform growth and ensure optimal nutrient support.
- Carry out timely replanting with healthy bagged seedlings to maintain uniform density, improve survival rate, and strengthen overall plantation health.
- Implement routine coppice management to reduce competition from secondary shoots.
- Improve the frequency and timing of pruning operations to promote healthy plant structure and better bole formation.



NTSH ANR



Vathangi beat



Korumilli beat



Maredumilli south beat

3. Monitoring and Evaluation of Protection Activities

A total of nine protection activities were undertaken in Kakinada Forest Division, out of which 3 were selected for monitoring and evaluation. Sudikonda range accounted for the majority of these, implementing 7 activities with 2 included in the evaluation sample. Gokavaram range carried out 2 protection activities, of which 1 was sampled. No protection activities were reported from Kakinada, Yeleswaram, RC Varam, Addatheegala and Rajavommangi ranges during this period.

3.1 Creation of fire lines in Bheemavaram beat

GPS location: N 17.481576 E 81.832636

SO no and year: RSO 16 (2016-17)

3.2 Creation of fire lines in Burugubanda beat

GPS location: N 17.338756 E 81.736542

SO no and year: RSO 18 (2016-17)

The fire lines in Bheemavaram and Burugubanda beats, established under the CAMPA-NPV scheme measure 3 meters in width and 3500 rmt and 4000 rmt in length respectively, consistent with official records. In both locations, fire lines are present but poorly visible due to moderate to dense growth of grasses and weeds. Regular maintenance is recommended to ensure their effectiveness in fire prevention and control.



Fire lines at Bheemavaram beat



Fire lines at Burugubanda beat

4. Monitoring and Evaluation of Soil and Moisture Conservation Activities

A total of 4 Soil and Moisture Conservation (SMC) activities were implemented in Kakinada Forest Division. Of these, 2 activities were selected for monitoring and verification. RC Varam range conducted three SMC activities, with one activity sampled for review. Sudikonda reported one activity, with 1 sampled. No SMC activities were reported from Kakinada, Yeleswaram, Addatheegala, Gokavaram and Rajavommangi ranges during this period.

4.1 Construction of rock fill dams (RFDs) at Geddada beat, R C Varam section and range

GPS Location: N 17.428698 E 81.73847

SO no. and year: SDSO 21 (2016-17)

4.2 Construction of RFDs in Lakkonda CA area

GPS Location: N 17.424286 E 81.952786

SO no. and year: DSO 101 (2016-17)

A rock fill dam constructed at Geddada beat and Lakkonda CA area were monitored and evaluated against the specifications recorded in the measurement book (MB) and verified through field measurements. The Geddada dam is recorded as 4 meters in length, 0.7 meters in width and 0.5 meters in depth, while the Lakkonda dam is recorded as 5 meters in length, 2 meters in width and 0.3 meters in depth. However, field verification revealed that for both cases

measured dimensions do not match the MB records, showing a reduced depth compared to the approved specifications. The water holding capacities of both dams have decreased due to silt and sediment accumulation. In addition, the Lakkonda dam's apron has suffered major damage, requiring significant repairs and seepage has been observed from both the main dam and the apron, indicating an urgent need for maintenance. De-silting and repair work are necessary to restore storage capacity and ensure the structural integrity of both dams.



Rock fill dam at Geddada beat



Rock fill dam at Lakkonda CA area

5 Monitoring and Evaluation of Construction Activities

A total of three construction activities were implemented in Kakinada Forest Division, out of which two were selected for monitoring and verification. Yeleswaram reported one activity, which was sampled. While Gokavaram reported two activities with one selected for verification. No construction works were reported from the other ranges including Kakinada, RC Varam, Addatheegala, Sudikonda and Rajavommangi during this period.

5.1 Construction of RCC boundary pillars at S Pydipala CA area in Anantharam beat

GPS Location: N 17.403376 E 82.337358

SO no. and year: DSO 100 (2016-17)

5.2 Construction of RCC boundary pillars in Nelakota CA of Gokavaram range

GPS Location: N 17.243095 E 81.731378

SO no. and year: RSO 21 (2016-17)

The construction of 86 RCC boundary pillars in S. Pydipala CA area (Anantharam beat) and 5 RCC boundary pillars in Nelakota CA area was monitored and evaluated against the specifications recorded in the measurement book. The above-ground dimensions of RCC pillars at both locations: 1.20 m in height, 0.30 m top width and 0.45 m bottom width matched the recorded specifications with no deviations noted. Field verification confirmed that all boundary pillars were intact and effectively demarcating the forest boundaries at their respective sites.



RCC boundary pillars at Anantharam beat



RCC boundary pillars at Nelakota

6. Monitoring and Evaluation of Other Activities

During 2016–17, Kakinada Forest Division implemented fifty-seven activities under the “Others” category, of which thirteen were sampled for verification. Kakinada range recorded

the highest number (22, five sampled), followed by Addatheegala (9, two sampled), Rajavommangi (8, two sampled), Gokavaram and Sudikonda (6 each, one and two sampled), Yeleswaram (5, one sampled), and RC Varam (1, not sampled). Verification of sanction orders, estimation sheets, and work registers confirmed that sanctioned amounts matched actual expenditures, with records duly authenticated by the DFO, SDO, and FRO. Fund utilization was appropriate and consistent with approved estimates and CAMPA guidelines, and internal and external audits validated transparency and compliance. However, Sudikonda range records for RSO 2 and RSO 3 were not made available for verification, highlighting a need for improved documentation.

Key Findings

- Plantation outcomes were mixed, with excellent results for *Tectona grandis* at Maredumilli and Labbarthi, moderate performance for *Dendrocalamus strictus* at Chavitidibbalu and Sudikonda, and poor survival for teak at Peddipalem.
- Verification showed frequent discrepancies between recorded and actual plantation areas.
- Maintenance operations were executed but weakened by missing signage and incomplete record updates.
- Fire lines were created but overgrown, reducing effectiveness.
- SMC structures were functional but degraded by siltation and apron damage.
- Construction works such as RCC boundary pillars were intact and effective.
- Financial records for “other works” were compliant, though documentation was incomplete in some cases.

Recommendations

- Intensify weeding operations, especially along plantation boundaries, to control *Lantana* and bushy grasses, minimizing competition and ensuring healthy plant growth.
- Continue maintaining clear and effective fire lines with regular clearing before dry seasons to enhance visibility and effectiveness in preventing forest fires.
- Install and maintain plantation boundary stones and boards to ensure accurate demarcation, facilitate monitoring, prevent encroachments and complement contingency records.
- Maintain accurate and updated plantation journals, markers and records to support ongoing identification, monitoring, and accountability.
- Continue timely and appropriate fertilizer application, with special focus on weaker plants to promote uniform growth and ensure optimal nutrient support.
- Carry out timely replanting with healthy bagged seedlings to maintain uniform density, improve survival rate, and strengthen overall plantation health.
- Implement routine coppice management to reduce competition from secondary shoots.
- Improve the frequency and timing of pruning operations to promote healthy plant structure and better bole formation.

20. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN NARSIPATNAM DIVISION

Introduction

Narsipatnam Division is renowned for its rich mosaic of dry deciduous forests, which form one of the most ecologically significant landscapes in the region. The forests are dominated by teak (*Tectona grandis*) and a variety of mixed hardwood species, creating a unique and diverse canopy structure. This heterogeneous landscape supports not only moderately dense forest stands that provide crucial ecosystem services, but also extensive stretches of open forests that offer grazing grounds, enhance habitat connectivity, and support a wide range of wildlife. Additionally, the division hosts valuable plantations of teak and red sanders (*Pterocarpus santalinus*), contributing significantly to both ecological restoration and the local economy. A defining strength of Narsipatnam Division lies in the active participation of local communities in forest management. Through participatory frameworks such as Joint Forest Management Committees (JFMCs) and Vana Samrakshana Samithis (VSS), communities are engaged in protection, regeneration, and sustainable use of forest resources. From an ecological perspective, these forests serve as an important buffer against seasonal water scarcity, playing a key role in soil conservation, watershed protection, and groundwater recharge. Socio-economically, the forests of Narsipatnam are a lifeline for local livelihoods. The combination of ecological richness, economic value, and community participation underscores the importance of continued protection, sustainable harvesting practices, and capacity-building initiatives to ensure the long-term health and productivity of these forests.

In Narsipatnam division, a total of 126 CAMPA activities were carried out, of which 28 activities (around 21 %) were selected for detailed monitoring and evaluation. In Narsipatnam range, 24 activities were implemented, and 6 were sampled. In K D Peta range, 18 activities were implemented, and 4 were sampled. In Chintapalli range, 18 activities were implemented, with 8 sampled. In Lothugedda range 10 activities were implemented with 2 were sampled. Marripakala 1 activity implemented none were sampled. In sileru 54 activities were implemented, with 12 were sampled and in R V nagar none were implemented or sampled. Among activity types, maintenance dominated with 73 activities (16 sampled), followed by others (35; 8 sampled), plantation (17; 3 sampled), protection (1; 1 sampled), none were implemented or sampled from soil and moisture conservation and construction activity.

1. Monitoring and Evaluation of Plantation Activities

In Narsipatnam division, a total of 17 plantation activities were carried out under CAMPA, of which 3 activities (about 21 %) were selected for monitoring and evaluation during 2016-17. Among the ranges, Narsipatnam with 2 implemented (1 sampled), KD Peta with 3 (0 sampled), Chintapalli with 4 (1 sampled), Lothugedda with 3 (0 sampled), Sileru with 5 (1 sampled) and none of the plantation activity were implemented in Maaripakala and R V nagar.

1.1 Narsipatnam range

A total of two plantation activities were carried out under the CAMPA scheme in Narsipatnam range. In this monitoring and evaluation process, one plantation site constituting 50 % of the activities was randomly selected.

Table 133 Details of plantation selected in Narsipatnam range

Sl. no.	Plantation	SO no. and year
1	Raising of 10 Ha (NTSH) Plantation at Krishnapuram	DSO 66 (2016-17)

The proposed 10-hectare plantation site at Krishnapuram is characterized by red soil with a loamy texture, offering moderate fertility. The area experiences medium levels of soil erosion, highlighting the need for proper soil and water conservation measures. Sandstone formations are present within the site, contributing to the moderately rocky nature of the terrain.

Survival percentage: In Narsipatnam Range, the 10-hectare plantation site at Krishnapuram Beat demonstrated low suitability for *Dalbergia latifolia*, *Terminalia arjuna*, *Adina cordifolia*, and *Terminalia tomentosa*, with observed average survival rates of 33.33%, 35.48%, 43.33%, and 32.78% respectively.

Growth: In the Krishnapuram plantation, the average tree height ranged from 0.87 to 6.83 meters, while the average girth ranged from 13.54 to 41.55 cm.

Table 134 Details of plantation enumerated in Narsipatnam range

Sl. no.	Plantation name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Krishna Puram 10 Ha NTSH plantation	1	<i>Dalbergia latifolia</i>	N 17.637119	33.33	2.15 ±0.23	-	17.20 ±7.30
			<i>Terminalia arjuna</i>	E 82.583309	37.70	2.37 ±0.37	-	16.83 ±6.67
		2	<i>Adina cardifolia</i>	N 17.637205	43.33	0.87 ±0.22	13.54 ±4.54	-
			<i>Terminalia arjuna</i>	E 82.582884	29.50	0.94 ±0.29	15.28 ±5.58	-
		3	<i>Terminalia arjuna</i>	N 17.637377 E 82.582137	41.32	6.39 ±0.46	-	28.08 ±7.57
		4	<i>Terminalia arjuna</i>	N 17.637513	36.66	6.70 ±0.68	-	36.27 ±10.62
			<i>Terminalia tomentosa</i>	E 82.581916	32.78	6.83 ±0.71	-	41.55 ±6.30
		5	<i>Terminalia arjuna</i>	N 17.696946 E 82.581570	32.23	5.21 ±0.59	-	29.56 ±4.91
		Plantation average			35.85	3.93	14.41	28.24

1.2 Chintapalli range

A total of four plantation activities were carried out under the CAMPA scheme in Chintapalli range. In this monitoring and evaluation process, one plantation site constituting 25 % of the activities was randomly selected.

Table 135 Details of plantation selected in Chintapalli range

Sl. no.	Plantation	SO no. and year
1	Raising of 10 ha. NTHS Plantation 3m x 3m esp at Chilakalamamidi Village of Chintapalli range	DSO 70 (2016-17)

The proposed 10-hectare NTSH plantation site at Chilakalamamidi is characterized by lateritic and red loamy soils with pebble beds, underlain by rocks of the Khondalite group with granite formations also present.

Survival percentage: In Chintapalli Range, the 10-hectare NTSH plantation site at Chilakalamamidi Beat has demonstrated good suitability for *Toona ciliata*, *Pterocarpus marsupium* and *Dalbergia latifolia*, with observed average survival rates of 74.16%, 71.43% and 75.18% respectively.

Growth: Growth assessment indicated that in the Chilakalamamidi plantation the average tree height ranged from 3.70 to 5.01 meters, while girth measurements varied from 30.51 to 43.70 cm.

Table 136 Details of plantation enumerated in Chintapalli range

Sl. no.	Plantation / Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Chilakala Mamidi 10 Ha NTSH plantation	1	<i>Toona ciliata</i>	N 17.865464	75.00	3.70 ±1.45	30.51 ±12.23
			<i>Pterocarpus marsupium</i>	E 82.362758	72.13	3.98 ±1.32	33.02 ±10.94
		2	<i>Toona ciliata</i>	N 17.865163	73.33	3.94 ±1.47	33.68 ±9.66
			<i>Pterocarpus marsupium</i>	E 82.362857	68.85	4.30 ±1.41	35.40 ±9.57
		3	<i>Dalbergia latifolia</i>	N 17.864921	73.33	5.01 ±1.48	42.64 ±16.24
			<i>Toona ciliata</i>	E 82.363038	72.13	4.73 ±1.24	42.55 ±12.51
		4	<i>Toona ciliata</i>	N 17.864829	71.66	4.67 ±1.76	43.70 ±15.75
			<i>Dalbergia latifolia</i>	E 82.363119	77.04	4.74 ±1.99	41.77 ±18.51
		5	<i>Pterocarpus marsupium</i>	N 17.864793	73.33	4.85 ±1.17	39.93 ±11.25
			<i>Toona ciliate</i>	E 82.363179	78.68	4.99 ±0.93	37.56 ±11.18
Plantation average					73.54	4.49	38.07

1.3 Sileru range

A total of five plantation activities were carried out under the CAMPA scheme in Sileru range. In this monitoring and evaluation process, one plantation site constituting 20 % of the activities was randomly selected.

Table 137 Details of plantation selected in sileru range

Sl. no.	Plantation	SO no. and year
1	Estimate for raising of 10 ha teak plantation near Gummirevula (V)	DSO 56 (2016-17)

The proposed 10-hectare teak plantation site at Gummirevula is characterized by red soil mixed with sandy loam, which provides moderately good drainage and supports the growth of teak.

The site exhibits a medium level of soil erosion, indicating that while the soil is moderately stable, proper soil and water conservation measures are required to prevent further degradation. Survival percentage: In Sileru Range, the 10-hectare teak plantation site at Gummirevula Beat demonstrated good suitability for *Tectona grandis*, with an observed average survival rate of 79.99%.

Growth: In the Gummirevula teak plantation, the average tree height ranged from 4.90 to 5.07 meters, while the average girth ranged from 35.87 to 40.48 cm.

Table 138 Details of plantation enumerated in Sileru range

Sl. no.	Plantation / Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Gummi revula 10 Ha Teak plantation	1	<i>Tectona grandis</i>	N 17.889979 E 82.013026	74.21	5.07 ±0.78	35.87 ±9.71
		2	<i>Tectona grandis</i>	N 17.889915 E 82.013537	80.07	5.03 ±0.79	38.80 ±12.40
		3	<i>Tectona grandis</i>	N 17.889492 E 82.013203	79.29	5.01 ±0.78	38.04 ±8.51
		4	<i>Tectona grandis</i>	N 17.889459 E 81.013422	82.03	4.92 ±0.78	39.51 ±7.84
		5	<i>Tectona grandis</i>	N 17.889508 E 82.013538	84.37	4.90 ±0.80	40.48 ±9.10
Plantation average					79.99	4.98	38.54

Comparative assessment of plantations in Narsipatnam division during 2016-17

Survival performance: The Gummirevula teak plantation in Sileru Range showed the highest survival (79.99 %) and uniform growth, followed by the Chilakalamamidi NTSH plantation in Chintapalli Range with good survival (71.43–75.18 %) and consistent growth, while the Krishnapuram plantation in Narsipatnam Range recorded the lowest survival (32.78–43.33 %) and uneven growth, indicating poor site suitability.

Verification of plantation area and boundaries

In Narsipatnam division during 2016-17 measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

Table 139 Details of plantation area perambulation in Narsipatnam division

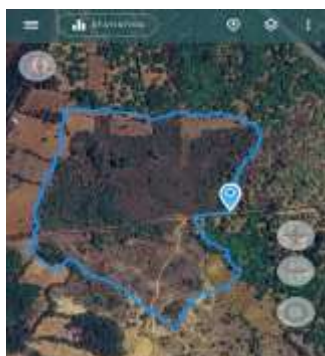
Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising of 10 ha. (NTSH) Plantation at Krishnapuram	10 Ha	9.69 Ha
2	Raising of 10 ha. NTHS Plantation 3m x 3m esp at Chilakalamamidi Village of Chintapalli Range	10 Ha	8.45 Ha
3	Estimate for raising of 10 ha teak plantation near Gummirevula (V)	10 Ha	10.67 Ha

Perambulation of selected plantations was carried out with the assistance of the local Forest Beat Officer. In these cases, the perambulated area was found to exceed in some plantations and in some shortfall has been noted due to the presence of rocky terrain, trenches, and barren patches

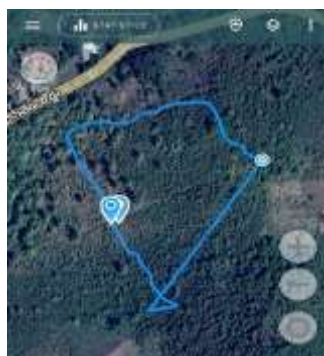
within plantation boundaries. Measurements were therefore taken along the outer boundary of these natural obstructions rather than the precise plantation limits. Plantation-wise Findings

- Krishnapuram Plantation (Narsipatnam range) (10 Ha): 9.67 Ha (lesser by 0.31 Ha)
- Chilakalamamidi Plantation (Chintapalli range) (10 Ha): 8.45 Ha (lesser by 1.55 Ha)
- Gummirevula Plantation (Sileru range) (10 Ha): 23.33 Ha (Exceeded by 0.67 Ha)

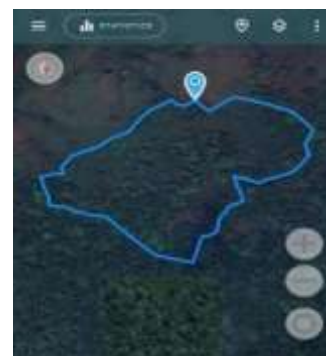
Verification was carried out with the assistance of the local Forest Beat Officer, using QGIS software and further confirmed through Geo Tracker application. Geotagged images were documented as evidence.



9.69 Ha Krishnapuram



8.45 Ha Chilakalamamidi



10.67 Ha Gummirevula

Health Status of Plantation: During the field observations, it was noted that the plantation area showed no visible signs of insect-related damage. The foliage appeared healthy, with no evidence of defoliation, boring marks, or other symptoms typically associated with insect infestation. This indicates that the plantation is currently free from any major pest outbreaks, suggesting effective natural control or the absence of conducive conditions for insect proliferation.

Protection of Plantation: To safeguard the plantations against fires and other environmental risks, protection measures such as the creation and maintenance of fire lines, development of inspection paths, and engagement of fire watchers were implemented. These interventions contribute to reducing the vulnerability of plantations, especially during dry seasons.

Biotic Pressure on Plantations: Field observations revealed that grazing and browsing pressure from both humans and cattle was minimal within the plantation area. Only a few instances of hoof marks and lightly nibbled foliage were noticed, indicating occasional but not significant biotic interference.

Maintenance of Plantation Journals and Records: The plantation journals were found to be well-maintained, with all baseline information recorded appropriately. However, it was noted that periodic updates to the journals particularly regarding survival rates, growth parameters, and maintenance activities necessary to ensure they reflect current field realities. Plantation is inspected by concerned forest official and entered the observations.

Vana Samrakshan Samithi (VSS): Among the plantation sites selected in the Sileru range for monitoring and evaluation, no involvement of Vana Samrakshana Samithi (VSS) was observed in the establishment or maintenance of the plantations. Consequently, the Focus Group Discussion (FGD) activity could not be conducted in these areas. In contrast, VSS involvement

was observed in the Narsipatnam and Chintapalli ranges, where the FGD activity was accordingly conducted.



Chilakalamamidi, Chintapalli



Gummirevula, Sileru range

2. Monitoring and Evaluation of Maintenance Activities

A total of 73 maintenance activities were carried out in Narsipatnam division during 2016-17, of which 16 activities were selected for monitoring. Sileru accounted for the maximum with 42 activities implemented (9 sampled), followed by Narsipatnam with 11 (2 sampled), Chintapalli with 9 (2 sampled), K D Peta with 7 (2 sampled) and Lothugedda with 4 (1 sampled).

Table 140 Maintenance activities selected for evaluation in Narsipatnam division

Sl. no.	Maintenance Activities	GPS Co ordinates	SO no. and year
Narsipatnam range			
1	First year maintenance of 10 Ha Teak plantation at Pedagolugondapeta	N 17.531715 E 82.43742	DSO 77 (2016-17)
2	Second year maintenance of 10 Ha Teak plantation at G Koduru	N 17.570390 E 82.753076	DSO 98 (2016-17)
K D Peta range			
3	First year maintenance of 10 Ha Teak plantation at Chinabalararam village	N 17.601514 E 82.403168	DSO 78 A (2016-17)
4	Second year maintenance of 10 Ha Teak plantation at Kincheli	N 17.590445 E 82.407546	DSO 100 (2016-17)
Chintapalli range			
5	Second year maintenance of 10 Ha NTSH plantation at Chintaluru of Lammasingi section	N 17.857517 E 82.417726	DSO 115 (2016-17)
6	Third year maintenance of 10 Ha NTSH plantation near Rowthubailu (V)	N 17.83475 E 82.416053	DSO 352 (2016-17)
Lothugedda range			
7	First year maintenance of 10 Ha Teak plantation in Regallu Village of Lothugedda range	N 17.967434 E 82.41946	DSO 80 (2016-17)
Sileru range			
8	First year maintenance of 10 Ha NTSH plantation near Chinna Gangavaram village	N 18.013705 E 82.151614	DSO 85 (2016-17)
9	Second year maintenance of 10 Ha NTSH plantation near Naramamidigondhi village	N 18.034445 E 82.138297	DSO 111 (2016-17)
10	Second year maintenance of 10 Ha Teak plantation near Komarapalli village	N 18.034065 E 82.117155	DSO 108 (2016-17)

11	Estimate for Second year maintenance 10 Ha Teak plantation at Kondapalli village	N 17.957355 E 82.051007	DSO235(I) (2016-17)
12	Estimate for third year maintenance of 10 Ha Teak plantation Petrai (V)	N 18.045225 E 82.145225	DSO239(I) (2016-17)
13	Estimate for third year maintenance of 20 Ha Teak plantation near Kappakonda (V)	N 17.935284 E 82.034954	DSO 234(II) (2016-17)
14	Estimate for 30 th year silvicultural thinning for 1985 26.00 Ha Teak plantation	N 18.042357 E 82.052687	SDSO 2 (2016-17)
15	Decongestion of long bamboo from Kommulawada BC-II coupe to gtd	N 17.88937 E 82.01348	DSO 227 (2016-17)
16	Decongestion of long bamboo (4454 no.) from kommulawada BC-II	N 17.892037 E 82.015013	DSO 272 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year of implementation following plantation establishment. These activities include casualty replacement, weeding operations, soil tilling (inter-ploughing), saucer formation, coppice management, pruning of lower branches, fire line management, and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantation. However, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Intensify weeding operations, especially along plantation boundaries, to control Lantana and bushy grasses, minimizing competition and ensuring healthy plant growth
- Continue maintaining clear and effective fire lines, with regular clearing before dry seasons to enhance visibility and effectiveness in preventing forest fires.
- Install and maintain plantation boundary stones and boards to ensure accurate demarcation, facilitate monitoring, prevent encroachments, and complement contingency records.
- Maintain accurate and updated plantation journals, markers, and records to support ongoing identification, monitoring, and accountability.
- Continue timely and appropriate fertilizer application, with special focus on weaker plants to promote uniform growth and ensure optimal nutrient support.
- Carry out timely replanting with healthy bagged seedlings to maintain uniform density, improve survival rate, and strengthen overall plantation health.
- Implement routine coppice management to reduce competition from secondary shoots.



G Koduru, Narsipatnam range



Kincheli, K D Peta range



Chintaluru, Chintapalli range



Regallu, Lothugedda range

3. Monitoring and Evaluation of Protection Activities

During 2016–17 the Andhra Pradesh Forest Department undertook one protection activities under the CAMPA scheme in the Sileru range. For monitoring and evaluation, a representative sample of 20 %, comprising one protection activities, was selected for assessment.

3.1 Estimate for fire line in teak plantation Bamboo coupe areas of sileru range

GPS location: N 18.04816 E 82.04091

SO no. and year: DSO 343 (2016-17)

A fire line was created and maintained in T. Gannavarm beat under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of new fire line are width – 3 m, and length – 2000 rmt. The field measurements matched those in the measurement book, indicating no deviations. The visibility of the fire line was clear, as it was established along the inspection path. No dense grass or weed growth was observed, indicating that the fire line has been well-maintained throughout the natural forest area.



Creation of fire line in Sileru range

4. Monitoring and Evaluation of Other activities

Under the “Others” category, 35 activities were undertaken during 2016–17, of which 8 were selected for sampling and verification. Narsipatnam recorded the highest number of activities (11, with 3 sampled), followed by K D Peta (9, 2 sampled), Sileru (6, 1 sampled), Chintapalli (5, 1 sampled), Lothugedda (3, 1 sampled), Marripakala (1, none sampled), and R V Nagar, where no activities were implemented or sampled. Document verification was conducted in the presence of Division/Range office staff, reviewing sanction orders, estimation sheets, and work registers. Sanctioned amounts aligned with actual expenditures, and financial records were properly maintained and duly authenticated by the DFO, SDO, and FRO. Fund utilization was appropriate and consistent with approved estimates and CAMPA guidelines. Both internal

(Conservator of Forests) and external (Accountant General's Office) audits were conducted, ensuring transparency and compliance. However, in Chintapalli (SDSO 11), estimates were not available for verification; in K D Peta (RSO 14 and DSO 349), estimates and work registers were not presented; and in Narsipatnam (DSO 130), the estimate was also not made available.

Key Findings

- Plantation survival exhibited wide variation weak in Krishnapuram, but strong and well-established in Chilakalamamidi and Gummirevula.
- Area discrepancies were observed between recorded data and actual field measurements, indicating the need for improved verification mechanisms.
- Plantations were largely free from pest and disease outbreaks, and grazing pressure remained minimal across sites.
- Maintenance works were executed as per specifications; however, monitoring was weakened due to missing or incomplete signage.
- Fire line protection measures in Sileru were effective and well-maintained.
- Financial transparency was generally satisfactory, though documentation gaps were noted in certain ranges.
- Vana Samrakshana Samithi (VSS) involvement was inconsistent, with strong participation in some ranges but absent in Sileru.

Recommendations

- Strengthen plantation survival in weak-performing sites through improved species–site matching and adaptive silvicultural practices.
- Reconcile plantation records with GIS/KML-based mapping to eliminate area discrepancies and enhance spatial accuracy.
- Update plantation journals regularly with current survival, growth, and maintenance data to support effective monitoring and reporting.
- Replace and maintain plantation boards and boundary stones to ensure visibility, accountability, and easier field verification.
- Enhance community participation, especially in ranges such as Sileru, where VSS involvement has been limited.
- Sustain vigilant pest and disease monitoring, maintaining the current healthy plantation condition.
Undertake periodic fire line maintenance, ensuring seasonal clearance and proper upkeep to prevent fire risks.
- Maintain complete documentation, ensuring that sanction orders, estimates, and work registers are readily available for audit and verification.

21. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN PADERU DIVISION

Introduction

Paderu Forest Division, located in the hilly tracts of the Eastern Ghats, covers a total forest area of 1,219.39 km², comprising 507.03 km² of Very Dense Forest (VDF) and 712.36 km² of Moderately Dense Forest (MDF), with no Open Forest reported. In addition, the Division has 572.09 km² of scrubland, reflecting areas under disturbance or natural secondary succession. As per the latest assessment (ISFR-2023), the Division has recorded a net forest cover loss of 8.20 km², which is a matter of concern given its ecological significance. The forests of Paderu Division are predominantly Southern Moist Mixed Deciduous, harboring rich biodiversity and providing critical ecological services. The Division is categorized under very high fire-prone zones, necessitating robust fire management interventions. The forests also play a vital socio-economic role, supporting the livelihoods of tribal communities through bamboo harvesting, honey collection, and traditional use of plant resources. Conservation and management efforts in Paderu are therefore focused on sustaining biodiversity, ensuring habitat continuity, and strengthening fire protection measures.

In Paderu Division during 2016-17, a total of 232 CAMPA activities were carried out, of which 47 activities (around 20 %) were selected for detailed monitoring and evaluation. In Paderu (T) range, 22 activities were implemented, and 4 were sampled. In Araku (T) range, 41 activities were implemented, and 9 were sampled. In Pedabayalu (T) range, 36 activities were implemented, with 9 sampled. In Paderu FRO-I range, 32 activities were implemented, and 4 were sampled. In Araku FRO-II range, 20 activities were implemented, and 3 were sampled. In Paderu FRO-III range, 23 activities were implemented, and 4 were sampled. In Paderu FRO-IV range, 20 activities were implemented, and 6 were sampled. In Pedabayalu FRO-V range, 22 activities were implemented, and 5 were sampled. In Paderu FRO-VI range, 14 activities were implemented, and 3 were sampled. Among activity types, other works dominated with 109 activities (22 sampled), followed by maintenance (104; 21 sampled), plantations (12; 3 sampled), Protection (7; 1 sampled), there were no soil and moisture conservation works and construction activities were implemented.

1. Monitoring and Evaluation of Plantation Activities

In Paderu division, a total of 12 plantation activities were carried out under CAMPA, of which 3 activities (about 25 %) were selected for monitoring and evaluation. Among the ranges in Paderu (T) range, 1 activity (0 sampled), in Araku (T) range, (1; 0 sampled), in Pedabayalu (T) range, (2; 1 sampled), in Paderu FRO-I range, (2; 0 sampled), in Araku FRO-II range, (2; 0 sampled), in Paderu FRO-III range, (1; 0 sampled), in Paderu FRO-IV range, (1; 1 sampled), in Pedabayalu FRO-V range, (1; 1 sampled), in Paderu FRO-VI range, (1; 0 sampled).

1.1 Pedabayalu (T) range

A total of two plantation activities were carried out under the CAMPA scheme in Pedabayalu (T) range. In this monitoring and evaluation process, one plantation site constituting 50 % of the activities was randomly selected for assessment.

Table 141 Details of plantations selected in Pedabayalu (T) range

Sl. no.	Plantation	SO no. and year
1	Raising of 2016-17 NTSH 20 Ha plantation at Jangamputtu village	DSO 56A (2016-17)

In Jangamputtu plantation site was found to be suitable for plant growth, featuring red rocky soil that supports the healthy development of the selected species.

Survival percentage: In Jangamputtu plantation demonstrated good suitability for both *Pongamia pinnata* and *Acrocarpus fraxinifolius*, with survival rates of 84.29% and 76.85%, respectively.

Growth: In Jangamputtu plantation, the average tree height ranged from 3.35 to 5.84 metres, while the average girth varied between 29.91 and 47.57 centimetres.

Table 142 Details of plantation enumerated in Pedabayalu range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Coordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Jangamputtu 20 Ha NTSH Plantation	1	<i>Pongamia pinnata</i>	N 18.263337 E 82.546338	84.29	3.35 ±0.30	30.82 ±3.63
		2	<i>Acrocarpus fraxinifolius</i>	N 18.262721 E 82.546359	76.85	5.84 ±0.55	47.57 ±5.68
		3	<i>Acrocarpus fraxinifolius</i>	N 18.262771 E 82.546085	73.55	3.69 ±0.40	29.91 ±3.85
		4	<i>Acrocarpus fraxinifolius</i>	N 18.263320 E 82.545722	75.20	5.12 ±0.86	32.38 ±7.27
		5	<i>Acrocarpus fraxinifolius</i>	N 18.263611 E 82.546159	76.03	5.08 ±0.54	33.45 ±4.89
Plantation average					77.18	4.61	34.82

1.2 Paderu FRO-IV Range

A total of one plantation project was implemented under the CAMPA scheme in Paderu FRO-IV range during 2016–17. For evaluation purposes, this single plantation site constituting 100 % of the activities was selected randomly for assessment.

Table 143 Details of plantation selected in Paderu FRO-IV range

Sl. no.	Plantation	SO no. and year
1	Raising of NTSH plantation 20 Ha near Ramachandrapuram village	DSO 104 (2016-17)

The plantation site at Ramachandrapuram in Paderu FRO-IV range is situated on sloping terrain with black-red gravelly soil.

Survival percentage: In Ramachandrapuram plantation shows good suitability for *Acrocarpus fraxinifolius*, *Toona ciliata*, and *Grevillea robusta*, with survival rates of 63.63%, 77.68%, and 80.16%, respectively.

Growth: Average tree height in the plantation ranges from 3.26 m to 7.90 m, and average girth varies between 25.36 cm and 45.73 cm.

Table 144 Details of plantation enumerated in Paderu FRO-IV range

Sl. no.	Plantation / Village name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Rama chandrapur am 20 Ha plantation	1	<i>Acrocarpus fraxinifolius</i>	N 18.124070 E 82.739945	63.63	7.90 ±1.16	-	45.73 ±8.36
		2	<i>Toona ciliata</i>	N 18.123531 E 82.739934	66.11	3.26 ±0.25	29.54 ±2.85	-
		3	<i>Gravillea robusta</i>	N 18.123258 E 82.739873	80.16	4.14 ±0.50	25.36 ±5.43	-
		4	<i>Gravillea robusta</i>	N 18.123238 E 82.740255	69.42	4.27 ±5.52	28.50 ±4.98	-
		5	<i>Toona ciliata</i>	N 18.123704 E 82.738164	77.68	5.57 ±0.59	-	36.50 ±7.30
Plantation average					71.40	5.02	27.80	41.11

1.3 Pedabayalu FRO-V range

A total of one plantation activity was implemented under the CAMPA scheme in Pedabayalu FRO-V range during 2016–17. For evaluation purposes, this single plantation site constituting 100 % of the activities was selected randomly for assessment.

Table 145 Details of plantation selected in Pedabayalu FRO-V range

Sl. no.	Plantation	SO no. and year
1	Raising of 20 Ha NTSH plantation 2016-17 at Borrabakuru village	DSO 111 (2016-17)

The selected site comprised sloping terrain with rocky soil, which was not ideal for tree survival. The presence of extensive rocky patches within the plantation area adversely affected tree establishment and overall stand density.

Survival percentage: In Borrabakuru plantation under Pedabayalu FRO-V range, the survival rate of *Acrocarpus fraxinifolius* was recorded at 70.24%. However, overall tree density was found to be low due to the challenging site conditions.

Growth: The average tree height ranged from 4.30 to 11.10 metres, while the average girth varied between 31.30 and 55.09 centimetres. These measurements indicate moderate growth among the surviving trees despite the less favourable site conditions.

Table 146 Details of plantation enumerated in Pedabayalu FRO-V range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Coordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Borrabakuru 20 Ha NTSH plantation	1	<i>Acrocarpus fraxinifolius</i>	N 18.195773 E 82.72505	66.94	7.49 ±0.74	34.40 ±9.27
		2	<i>Acrocarpus fraxinifolius</i>	N 18.196576 E 82.724968	70.24	7.46 ±6.12	43.02 ±6.58

		3	<i>Acrocarpus fraxinifolius</i>	N 18.197036 E 82.724509	34.71	7.54 ±0.47	50.74 ± 5.93
		4	<i>Acrocarpus fraxinifolius</i>	N 18.196335 E 82.724453	28.09	11.10 ±15.45	55.09 ± 4.42
		5	<i>Acrocarpus fraxinifolius</i>	N 18.197056 E 82.724494	16.52	4.30 ±0.57	31.30 ± 4.19
Plantation average					43.30	7.57	42.91

Comparative assessment of plantations in Paderu division during 2016-17

In Jangamputtu plantation, *Pongamia pinnata* (84.29%) and *Acrocarpus fraxinifolius* (76.85%) showed good survival, with tree heights of 3.35–5.84 m and girths of 29.91–47.57 cm. At Ramachandrapuram, survival was 63.63% for *Acrocarpus fraxinifolius*, 77.68% for *Toona ciliata*, and 80.16% for *Grevillea robusta*, with growth ranging 3.26–7.90 m in height and 25.36–45.73 cm in girth. In Borrabakuru, survival of *Acrocarpus fraxinifolius* was lower (70.24%) due to poor site conditions, though surviving trees attained 4.30–11.10 m height and 31.30–55.09 cm girth. Overall, Jangamputtu and Ramachandrapuram showed better survival, while Borrabakuru exhibited stronger growth among fewer surviving trees.

The verification of plantation area and boundaries

In Paderu division during 2016-17 measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

Table 147 Details of plantation area perambulation in Paderu division

Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising of NTSH 20 Ha plantation at Jangamputtu village	20 Ha	20.41 Ha
2	Raising of NTSH plantation 20 Ha near Ramachandrapuram village	20 Ha	30.68 Ha
3	Raising of 20 Ha NTSH plantation at Borrabakuru village	20 Ha	46.18 Ha

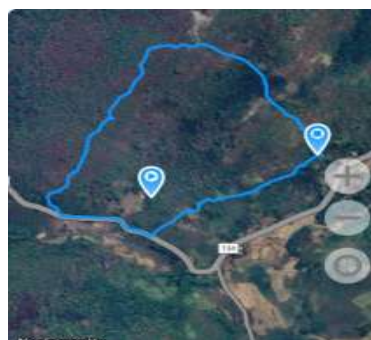
Perambulation of selected NTSH plantations was carried out with the assistance of the local Forest Beat Officer. In all cases, the perambulated area was found to exceed the recorded plantation area due to the presence of rocky terrain, trenches, and barren patches within plantation boundaries. Measurements were therefore taken along the outer boundary of these natural obstructions rather than the precise plantation limits. Plantation-wise Findings

- Jangamputtu (20 Ha): 20.41 Ha (exceeded by 0.41 Ha)
- Ramachndrapuram (20 Ha): 30.68 Ha (exceeded by 10.68 Ha)
- Borrabakuru (20 Ha): 46.18 Ha (exceeded by 26.18 Ha)

Verification was carried out with the assistance of the local Forest Beat Officer, using QGIS software and further confirmed through Geo Tracker application. Geotagged images were documented as evidence.



**Jangamputtu
plantation 20.41 Ha**



**Ramachandrapuram
plantation 30.68 Ha**



**Borrabakuru
plantation 46.18 Ha**

Health Status of Plantations: Field inspections across plantation sites revealed no incidence of insect or pest damage affecting any species. All plants appeared healthy, with no visible signs of infestation, stress, or pest-related deterioration.

Protection Measures: Adequate protection measures were in place across the plantation areas. Fire lines had been created and were being maintained to act as a barrier against the spread of accidental forest fires. Inspection paths were also provided, ensuring ease of access for monitoring and management activities.

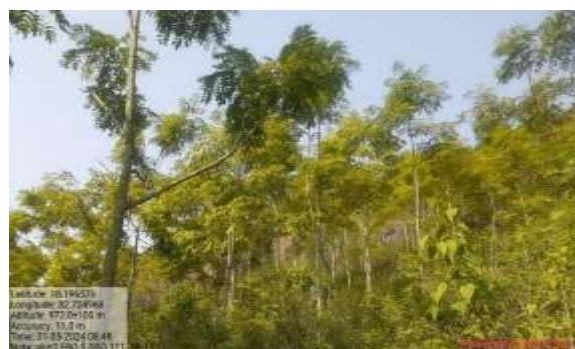
Biotic Pressure on Plantations: The plantations were found to be under negligible biotic pressure. Field observations revealed very limited evidence of grazing and browsing by cattle or other herbivores. Human interference was also minimal. This low level of disturbance is a positive indicator, as it reduces the risk of seedling mortality, soil compaction, and other negative impacts that typically arise from anthropogenic and livestock activities.

Maintenance of Plantation Journals and Records: The plantation journals were found to be well maintained, with records of activities and observations documented satisfactorily. However, the periodic updating of key plantation parameters including survival percentage, height, girth measurements, and maintenance activities requires further strengthening to ensure accuracy and to support effective monitoring and evaluation. Plantation boards, which serve as important tools for transparency, public awareness, and easy identification of plantation details, were present in all plantations, though repainting is needed for better visibility and up keep. Plantation is inspected by concerned forest official and entered the observations.

Vana Samrakshan Samithi (VSS): Among the four plantations evaluated in the Paderu Division, the involvement of Vana Samrakshana Samithi (VSS) or Joint Forest Management Committees (JFMCs) was recorded across Peddabayalu (T) and Paderu FRO-IV ranges during establishment and maintenance. Their active participation ensured smooth plantation implementation and better protection. VSS mobilized local communities, coordinated labour for planting and aftercare, and supported the Forest Department in preventing fire, grazing, and other pressures. They also created livelihood opportunities through wage employment and collective decision-making. This participatory approach improved transparency, accountability, and long-term sustainability of plantation management. However, in Pedabayalu FRO-V range did not involve the Vana Samrakshana Samithi (VSS) in its implementation or maintenance. Consequently, Focus Group Discussion (FGD) activities were not undertaken for this plantation.



Jangamputtu, Pedabayalu (T) range



Borrabakuru, FRO-V range



Ramachandrapuram, Paderu FRO-IV range

2. Monitoring and Evaluation of Maintenance Activities

A total of 104 maintenance activities were carried out in Paderu division during 2016-17, of which 21 activities were selected for monitoring. Among the ranges in Paderu (T) range, 4 activities (2 sampled), in Araku (T) range, (16; 3 sampled), in Pedabayalu (T) range, (16; 3 sampled), in Paderu FRO-I range, (11; 2 sampled), in Araku FRO-II range, (11; 2 sampled), in Paderu FRO-III range, (14; 2 sampled), in Paderu FRO-IV range, (11; 3 sampled), in Pedabayalu FRO-V range, (15; 3 sampled), in Paderu FRO-VI range, (6; 1 sampled).

Table 148 Maintenance activities selected for evaluation in Paderu division

Sl. no.	Maintenance Activities	GPS Co-ordinates	SO no. and year
Paderu (T) range			
1	First year maintenance of NTSH plantation near Lampeli over 10.00 Ha.	N 18.09854 E 82.565072	DSO 45A (2016-17)
2	Second year maintenance of 10 Ha Plantation at E. Modaputtu.	N 18.099456 E 82.715955	DSO 50 (2016-17)
Araku (T) range			
3	Third year maintenance of 15 Ha NTSH plantation at Thadda.	N 18.254640 E 82.680494	DSO 218 (2016-17)
4	Third year maintenance of 10 Ha NTSH plantation at Seelamgondi.	N 18.266401 E 82.813072	DSO 221 (2016-17)
5	Third year maintenance of 5 Ha Teak plantation at Seelamgondi bit-2.	N 18.266743 E 82.810530	DSO 223 (2016-17)
Pedabayalu (T) range			
6	First year maintenance of 10 Ha NTSH plantation at Badama.	N 18.237794 E 82.585073	DSO 58A (2016-17)

7	Third year maintenance of 10 HA NTSH plantation Pedathamangula village.	N 18.338751 E 82.447429	DSO 187 (2016-17)
8	Third year maintenance of 15 HA NTSH plantation Kilumulu bit II village.	N 18.214255 E 82.543412	DSO 192 (2016-17)
Paderu FRO-I range			
9	First year maintenance of 10 Ha NTSH plantation work at Marridatu.	N 18.120541 E 82.537077	DSO 87 A (2016-17)
10	Second year maintenance of 20 Ha NTSH plantation work at Geddarai.	N 18.026232 E 82.561033	DSO 145 A (2016-17)
Araku FRO-II range			
11	Second year maintenance of 15 Ha NTSH plantation Tikklbedda.	N 18.390786 E 82.817914	DSO 202 A (2016-17)
12	Second year maintenance of 10 Ha NTSH plantation at Koranjiguda.	N 18.419470 E 82.814155	DSO 205 A (2016-17)
Paderu FRO-III range			
13	Second year maintenance of NTSH plantation over 10.00 Ha at Paraseela village.	N 18.24342 E 82.844881	DSO 97 A (2016-17)
14	Third year maintenance of NTSH 20 Ha plantation in Baliyaguda village	N 18.231675 E 82.738771	DSO 173 (2016-17)
Paderu FRO-IV range			
15	Estimate for First year maintenance of 15.00 Ha NTSH plantation near Sampangidhatu.	N 18.129709 E 82.539325	DSO 105A (2016-17)
16	Second year maintenance of plantation over 15.00 Ha at Jamadala bit-II in Sirasapalli RF.	N 18.141382 E 82.573062	DSO 109A (2016-17)
17	Second year maintenance of plantation over 25.00 Ha at Thutangi village in Lyaiganda RF.	N 18.242712 E 82.671598	DSO 110A (2016-17)
Pedabayalu FRO-V range			
18	Second year maintenance of NTSH plantation 15 Ha at Chittigaruvu village.	N 18.186033 E 82.548820	DSO 117 A (2016-17)
19	Third year maintenance of NTSH plantation 15.00 Ha at Salepugondi.	N 18.207352 E 82.734951	DSO 180 (2016-17)
20	Third year maintenance of NTSH plantation 15.00 Ha at Barnikabanda.	N 18.206965 E 82.71821	DSO 181 (2016-17)
Paderu FRO-VI range			
21	Second year maintenance. of 15 Ha (NTSH) plantation at Ontiveedhi.	N 18.088038 E 82.532723	DSO123A (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year (first, second and third) of implementation following plantation establishment. These activities include casualty replacement, weeding operations, soil tilling (inter-ploughing), formation of saucers, coppice management, pruning of lower branches, fire line management, and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations are as follows;

General recommendations for maintenance activities

- Intensify weeding operations, especially along plantation boundaries, to control Lantana and bushy grasses, minimizing competition and ensuring healthy plant growth.

- Continue maintaining clear and effective fire lines, with regular clearing before dry seasons to enhance visibility and effectiveness in preventing forest fires.
- Install and maintain plantation boundary stones and boards to ensure accurate demarcation, facilitate monitoring, prevent encroachments, and complement contingency records.
- Maintain accurate and updated plantation journals, markers, and records to support ongoing identification, monitoring, and accountability.
- Continue timely and appropriate fertilizer application with special focus on weaker plants to promote uniform growth and ensure optimal nutrient support.



Lampeli, Paderu (T) range



Tadda, Araku (T) range



Badama, Pedabayalu (T) range



Jamadala, Paderu FRO-IV range

3. Monitoring and Evaluation of Protection Activities

A total of 7 Protection activities were carried out in Paderu division during 2016-17, of which 1 activity was selected for monitoring. In Pedabayalu (T) range 1 activity (1 sampled), Paderu 1 activity (0 sampled), Araku (T) range 2 activities (0 sampled), Paderu FRO-I 3 activities (0 sampled). No Protection activities were reported from other ranges.

3.1 Providing fire line operation at Chinna Sindhiputtu tall plantation 25 Ha

GPS location: N 18.519779 E 82.496643

SO no. and year: RSO 384 (2016-17)

A fire line was created and maintained in Chinna Sindhiputtu tall plantation of Pedabayalu (T) range under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of new fire line are width – 3 m, and length – 2600 rmt. The field measurements matched those in the measurement book, indicating no deviations. The visibility of the fire line was clear, as it was established along the inspection path. No dense grass or weed growth was observed, indicating that the fire line has been well-maintained.



Fire tracing operation at RF areas in Pedabayalu (T) range

4. Monitoring and Evaluation of Other activities

Under the “Others” category, a total of 109 activities were carried out during 2016–17, of which 21 were selected for sampling and verification. The distribution of activities across ranges included Paderu (T) with 16 activities (2 sampled), Araku (T) with 22 (6 sampled), Pedabayalu (T) with 17 (4 sampled), Paderu FRO-I with 16 (2 sampled), Araku FRO-II with 9 (1 sampled), Paderu FRO-III with 8 (2 sampled), Paderu FRO-IV with 8 (2 sampled), Pedabayalu FRO-V with 6 (1 sampled), and Paderu FRO-VI with 7 activities (1 sampled). Document verification and cross-checking were conducted in the presence of Division and Range office staff. The verification involved reviewing key documents such as sanction orders, estimation sheets, and work registers. It was found that sanctioned amounts were in line with actual expenditures, and all financial records were properly maintained and authenticated by the concerned officials (DFO, SDO, and FRO). The utilization of funds was appropriate and consistent with the approved estimates and CAMPA guidelines. Both internal (by the Conservator of Forests) and external (by the Accountant General’s Office) audits were conducted, ensuring transparency and adherence to financial and administrative protocols.

Key Findings

- Plantation survival was moderate to high, but large discrepancies existed between recorded and perambulated areas.
- Growth performance was satisfactory, with several sites showing strong establishment.
- No serious pest or disease issues were observed; plantations were largely healthy.
- Maintenance works were generally effective, though boundary demarcation and record updating need strengthening.
- Biotic pressure (grazing and browsing) was negligible in Paderu, unlike other semi-arid divisions, which is a positive factor for seedling survival.
- VSS/JFMC participation was observed in certain ranges (Paderu FRO-IV, Pedabayalu T), ensuring better plantation protection and livelihood support.

Recommendations

- Reconcile plantation records with GIS-based mapping to eliminate area discrepancies and ensure spatial accuracy.
- Sustain robust fire protection measures by maintaining clear and accessible fire lines through periodic inspection and clearance.

- Intensify maintenance operations by controlling invasive weeds and ensuring uniform fertilizer application across plantation sites.
- Strengthen record-keeping through timely updates of plantation journals and installation or replacement of plantation boards for effective monitoring.
- Enhance community participation by encouraging active involvement of VSS/JFMCs across all ranges to promote shared responsibility and protection.
- Conduct regular capacity-building programs for frontline staff to improve their monitoring, evaluation, and reporting competencies.
- Institutionalize third-party verification mechanisms alongside internal and external audits to enhance transparency and accountability.

22. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN VISAKHAPATNAM DIVISION

Introduction

Visakhapatnam Division, spanning 315.25 km², is characterized by a diverse forest landscape primarily composed of Moderately Dense Forest (202.49 km²) and Very Dense Forest (112.76 km²). This region, known for its southern moist mixed deciduous forests and productive plantations, plays a vital ecological role in supporting wildlife, replenishing groundwater sources, and stabilizing slopes. Despite a slight reduction of 6.51 km² in forest area, the division maintains relatively stable forest conditions with minimal scrubland and low fire risk. The forests are integral to the livelihoods of local tribal and rural communities, fostering a strong emphasis on biodiversity conservation and community-driven reforestation efforts.

In Visakhapatnam Division during 2016-17, a total of 156 CAMPA activities were carried out, of which 38 activities (around 24 %) were selected for detailed monitoring and evaluation. In Visakhapatnam range, 49 activities were implemented, and 13 were sampled. In Chodavaram range, 51 activities were implemented, and 12 were sampled. In Ananthagiri range, 28 activities were implemented, with 5 sampled. In Yellamanchili range, 28 activities were implemented, and 8 were sampled. Among activity types, other works dominated with 95 activities (23 sampled), followed by maintenance (27; 6 sampled), plantations (25; 5 sampled), Protection (5; 1 sampled), soil and moisture conservation works (3; 2 sampled) and construction activities (1; 1 sampled) activities were implemented.

1. Monitoring and Evaluation of Plantation Activities

In Visakhapatnam division, a total of 25 plantation activities were carried out under CAMPA, of which 5 activities (about 20 %) were selected for monitoring and evaluation. Among the ranges maximum with 9 plantation projects in Chodavaram range reported with 2 sampled, followed by Ananthagiri range with (9; 1 sampled), Yellamanchili range with 3 activities (1 sampled). Visakhapatnam range with (4; 1 sampled).

1.1.Chodavaram range

A total of nine plantation activities were carried out under the CAMPA scheme in Chodavaram Range. In this monitoring and evaluation process, two plantation sites constituting approximately 22 % of the activities were randomly selected.

Table 149 Details of plantations selected in Chodavaram range

Sl. no.	Plantations	SO no. and year
1	Raising works of 10 Ha NTSH plantation at Sirasavalasa (v) bit-II	DSO 63 (2016-17)
2	Raising works of 10 Ha Bamboo & NTSH plantation at Buddigaruvu (v) bit-II	DSO 55 (2016-17)

The proposed 10-hectare plantation site at Sirasavalasa is characterized by predominantly rocky soil with loose stones and gravel fragments, intermixed with patches of red loamy soil.

Survival percentage: At Sirasavalasa, moderate suitability was observed for *Acrocarpus fraxinifolius* (68.21%), *Syzygium cumini* (61.15%), *Pongamia pinnata* (62.59%), *Grevillea robusta* (74.57%), and *Azadirachta indica* (60.65%).

Growth: In Sirasavalasa, tree height ranged from 2.93 to 4.72 metres, with girths between 24.71 and 31.55 cm.

Table 150 Details of plantation enumerated in Chodavaram range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Sirasavalasa 10 Ha NTS plantation	1	<i>Acrocarpus fraxinifolius</i>	N 18.169284 E 82.873115	59.01	4.60 ±1.24	31.53 ±9.91
			<i>Syzygium cumini</i>		61.66	4.72 ±1.10	31.16 ±8.90
		2	<i>Syzygium cumini</i>	N 18.169365 E 82.873105	60.65	3.38 ±0.71	26.92 ±6.71
			<i>Pongamia pinnata</i>		63.33	3.68 ±0.58	31.55 ±7.29
		3	<i>Gravillea robusta</i>	N 18.169632 E 82.873102	74.57	2.96 ±0.35	24.71 ±5.60
			<i>Acrocarpus fraxinifolius</i>		77.41	2.93 ±0.54	26.89 ±8.57
		4	<i>Pongamia pinnata</i>	N 18.169749 E 82.872764	61.66	3.32 ±0.52	29.57 ±7.88
			<i>Azadirachta indica</i>		60.65	3.24 ±0.48	31.32 ±7.40
		5	<i>Pongamia pinnata</i>	N 18.169628 E 82.872678	62.80	3.43 ±0.66	27.54 ±7.29
		Plantation average					64.63

The bamboo with miscellaneous plantation at Buddigaruvu Beat is characterized by red soil interspersed with gravel particles.

Survival percentage: The Buddigaruvu bamboo with miscellaneous plantation showed mixed results, with survival rates of 46% for *Dendrocalamus strictus*, 60.56% for *Acrocarpus fraxinifolius*, and 59.26% for *Azadirachta indica*.

Growth: In Buddigaruvu, tree heights ranged from 2.50 to 4.22 metres, with girths between 10.25 and 32.22 cm.

Table 151 Details of plantation enumerated in Buddigaruvu Beat of Chodavaram range

Sl. no.	Plantation/ Village name	Plot no	Species name	GPS Coordinates	Average growth			Survival (%)
					Avg. Clump Height (m)	Avg. Clump GBH (m)	Avg. GBH (cm)	
2	Buddigaruvu Bit-II 10 Bamboo and miscellaneous plantation	1	<i>Dendrocalamus strictus</i>	N 18.112558 E 82.90669	3.55 ±0.69	0.27 ±0.37	13.91 ±3.14 (culm)	44.00
		2	<i>Acrocarpus fraxinifolius</i>	N 18.169749 E 82.872764	4.11 ±0.50	-	26.40 ±9.25	58.33
			<i>Azadirachta indica</i>		4.21 ±0.45	-	31.49 ±5.56	57.37

		3	<i>Dendrocalamus strictus</i>	N 18.112008 E 82.906657	2.50 ±0.30	0.37 ±0.10	10.25 ±2.13 (culm)	48.00
		4	<i>Azadirachta indica</i>	N 18.112058 E 82.906829	4.22 ±0.60	-	32.05 ±7.41	61.15
		5	<i>Acrocarpus fraxinifolius</i>	N 18.11226 E 83.903845	3.80 ±0.46	-	32.22 ±7.68	62.80
Plantation average					3.73	0.32	24.38	55.27

1.2 Ananthagiri range

A total of nine plantation projects were implemented under the CAMPA scheme in Ananthagiri range during 2016–17. For evaluation purposes, one plantation site constituting approximately 20 % of the projects was selected.

Table 152 Details of plantation selected in Ananthagiri range

Sl. no.	Plantation	SO no. and year
1	Raising of 10 Ha Misc & Bamboo plantations at Dabbagunta beat in Punyagiri of Ananthagiri range	DSO 84 (2016-17)

The 10-hectare site selected for bamboo with miscellaneous plantation at Dabbagunta beat is characterized by red soil with a red loam texture and the presence of chromite rock. The terrain exhibits minimal to very low erosion, indicating relatively stable soil conditions suitable for plantation activities.

Survival percentage: In Punyagiri 10-hectare bamboo with miscellaneous plantation at Dabbagunta beat demonstrates good suitability for bamboo species, with an average survival rate of 82.4 %.

Growth: In Punyagiri 10-hectare bamboo plantation at Dabbagunta beat, the average tree height ranges from 5.41 to 6.73 meters, while the average clump girth ranges from 0.53 to 1.02 meters and average culm girth ranges from 11.93 to 24.24 cm.

Table 153 Details of plantation enumerated in Ananthagiri range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Coordinates	Average growth			Survival (%)
					Avg. Clump Height (m)	Avg. Clump GBH (m)	Avg. Culm GBH (cm)	
1	Punyagiri 10 Ha Bamboo and miscellaneous plantation	1	<i>Dendrocalamus strictus</i>	N 18.110253 E 83.120177	6.73 ±0.69	0.53 ±0.37	19.30 ±3.14	80.00
		2	<i>Dendrocalamus strictus</i>	N 18.109892 E 83.120369	5.41 ±0.50	1.02 ±0.79	17.82 ±6.76	88.00
		3	<i>Dendrocalamus strictus</i>	N 18.109594 E 83.120695	6.60 ±0.64	0.90 ±0.49	24.24 ±4.66	84.00
		4	<i>Dendrocalamus strictus</i>	N 18.110497 E 83.119754	5.72 ±0.29	0.88 ±0.90	20.00 ±5.60	76.00
		5	<i>Dendrocalamus strictus</i>	N 18.110057 E 83.119599	5.48 ±0.29	0.88 ±0.29	11.93 ±0.29	84.00
Plantation average					5.61	0.75	19.61	77.87

1.3 Yellamanchili range

A total of three plantation projects were implemented under the CAMPA scheme in Yellamanchili range during 2016–17. For evaluation purposes, one plantation site constituting approximately 33 % of the projects was selected.

Table 154 Details of plantation selected in Yellamanchili range

Sl. no.	Plantation	SO no. and year
1	Raising of 10 Ha NTSH Plantation at Narendrapuram	DSO 41 (2016-17)

The 10-hectare site selected for the Narendrapuram plantation is characterized by red soil interspersed with surface stones.

Survival percentage: In Narendrapuram 10-hectare plantation site at Narendrapuram showed good suitability for *Adina cardifolia* (59.35 %), *Terminalia arjuna* (55.00 %), *Dalbergia latifolia* (59.46 %), *Terminalia elliptica* (66.11 %), and *Azadirachta indica* (62.29 %).

Growth: In Narendrapuram plantation, the average tree height ranged from 2.89 to 3.67 metres, with girths between 22.87 and 29.62 cm.

Table 155 Details of plantation enumerated in Yellamanchili range

Table 155 Details of plantation enumerated in Tenamanchi range							
Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Narendra-puram 10 Ha plantation	1	<i>Adina cardifolia</i>	N 17.579786 E 82.950791	62.05	3.04 ±0.69	27.88 ±8.60
			<i>Terminalia arjuna</i>		55.00	3.14 ±0.53	25.41 ±7.46
			<i>Dalbargia latifolia</i>		56.09	3.35 ±0.48	28.61 ±8.73
		2	<i>Terminalia elliptica</i>	N 17.579695 E 82.951025	66.11	3.67 ±0.63	33.38 ±8.24
		3	<i>Dalbergia latifolia</i>	N 17.579797 E 82.950779	61.98	2.89 ±0.51	22.87 ±5.64
		4	<i>Adina cardifolia</i>	N 17.576723 E 82.948043	56.66	3.51 ±0.65	29.62 ±8.70
			<i>Azadirachta indica</i>		62.29	3.58 ±0.56	26.74 ±8.11
		5	<i>Dalbergia latifolia</i>	N 17.577245 E 82.948456	60.33	3.49 ±0.59	24.67 ±6.74
		Plantation average					60.06

1.4 Visakhapatnam range

A total of four plantation projects were implemented under the CAMPA scheme in Visakhapatnam range during 2016–17. For evaluation purposes, one plantation site constituting 25 % of the projects was randomly selected for assessment.

Table 156 Details of plantation selected in Visakhapatnam range

Sl. no.	Plantation	SO no. and year
1	Raising of 10 Ha NTSH species Duvvapalem plantation in yerrakonda RF in Mudasarlova beat of Visakhapatnam range	DSO 41 (2016-17)

The 10-hectare site selected for the Duvvapalem plantation is characterized by red soil interspersed with hard gravel.

Survival percentage: The 10-hectare plantation site at Duvvapalem showed good suitability for *Adina cardifolia* (64.23 %), *Terminalia arjuna* (56.49 %), *Dalbergia latifolia* (56.49 %) and *Terminalia elliptica* (64.56 %).

Growth: In Duvvapalem plantation, the average tree height ranged from 3.52 to 4.89 metres, with girths between 24.68 and 37.28 cm.

Table 157 Details of plantation enumerated in Visakhapatnam range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Duvvapalem 10 Ha NTSH plantation	1	<i>Adina cardifolia</i>	N 17.810107 E 83.256225	60.00	5.12 ±0.74	30.17 ±3.33
			<i>Dalbargia latifolia</i>		58.00	3.49 ±0.50	28.26 ±9.30
		2	<i>Terminalia elliptica</i>	N 17.810162 E 83.25699	64.56	3.74 ±0.73	32.90 ±7.91
			<i>Terminalia arjuna</i>		52.00	3.78 ±0.76	32.48 ±7.66
		3	<i>Dalbergia latifolia</i>	N 17.810635 E 83.256915	57.86	3.51 ±0.67	24.56 ±6.76
		4	<i>Adina cardifolia</i>	N 17.810740 E 83.256791	68.45	3.46 ±0.96	27.06 ±9.45
		5	<i>Dalbergia latifolia</i>	N 17.810248 E 83.256659	53.60	3.32 ±0.40	23.38 ±5.84
Plantation average					59.21	3.77	28.40

Comparative assessment of plantations in Visakhapatnam division during 2016-17

The plantations showed varied performance across sites. Punyagiri bamboo (Dabbagunta beat) recorded the best results with 82.4% survival and vigorous growth (up to 6.73 m), making it highly suitable. Sirasavalasa showed moderate suitability with survival 60.65–74.57 %, best in *G. robusta*. Buddigaruva performed poorly for *D. strictus* (46 %) but moderate for others. Narendrapuram showed moderate survival (55–66%) with *T. elliptica* relatively better, while Duvvapalem performed better than Narendrapuram with survival 56.49–64.56% and higher girth values (up to 37.28 cm). Overall, bamboo plantations outperformed mixed plantations, with Duvvapalem showing better growth than Narendrapuram.

The verification of plantation area and boundaries

In Visakhapatnam division during 2016-17 measurement of plantation area was conducted using KML files for each location.

These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

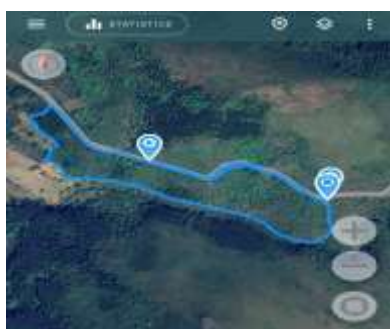
Table 158 Details of plantation area perambulation in Visakhapatnam division

Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising works of 10 Ha. NTSH plantation at Sirasavalasa (v) Bit-II	10 Ha	10.17 Ha
2	Raising works of 10 Ha Bamboo & NTSH plantation at Buddigaruvu (v) Bit-II	10 Ha	10.54 Ha
3	Raising of 10 Ha misc & Bamboo plantation at Dabbagunta beat in Punyagiri of Ananthagiri range	10 Ha	9.89 Ha
4	Raising of 10 Ha NTSH Plantation at Narendrapuram.	10 Ha	8.90 Ha
5	Raising of 10 Ha NTSH species Duvvapalem plantation in yerrakonda RF in Mudasarlova beat	10 Ha	14.57 Ha

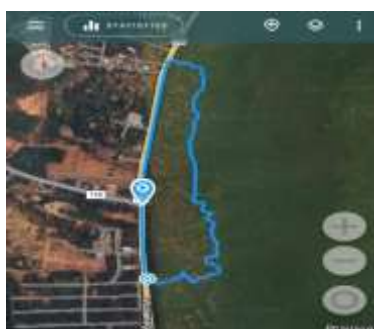
Perambulation of selected NTSH plantations was carried out with the assistance of the local Forest Beat Officer. In all cases, the perambulated area was found to be shortfall and exceed the recorded plantation area due to the presence of rocky terrain, trenches, and barren patches within plantation boundaries. Measurements were therefore taken along the outer boundary or inside the plantation boundary of these natural obstructions rather than the precise plantation limits. Plantation-wise Findings;

- Sirasavalasa (10 Ha): 10.17 Ha (exceeded by 0.17 Ha)
- Buddigaruva (10 Ha): 10.54 Ha (exceeded by 0.54 Ha)
- Dabbagunta (10 Ha): 9.89 Ha (lesser by 0.11 Ha)
- Narendrapuram (10 Ha): 8.90 Ha (lesser by 1.10 Ha)
- Duvvapalem (10 Ha): 14.57 Ha (exceeded by 4.57 Ha)

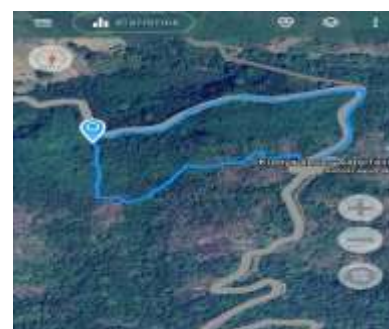
Verification was carried out with the assistance of the local Forest Beat Officer, using QGIS software and further confirmed through Geo Tracker application. Geotagged images were documented as evidence.



**Sirasavalasa
plantation 10.17 Ha**



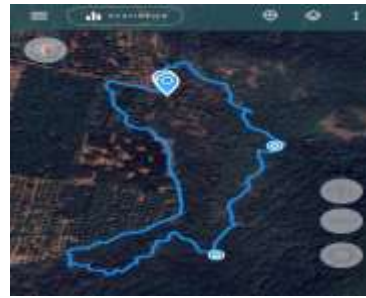
**Duvvapalem
plantation 14.57 Ha**



**Buddigaruva
plantation 10.54 Ha**



Dabbagunta plantation 9.89 Ha



Narendrapuram plantation 8.90 Ha

Health Status of Plantations: Field inspections across plantation sites revealed no incidence of insect or pest damage affecting any species. All plants appeared healthy, with no visible signs of infestation, stress, or pest-related deterioration.

Protection Measures: Adequate protection measures were in place across the plantation areas. Fire lines had been created and were being maintained to act as a barrier against the spread of accidental forest fires. Furthermore, the deployment of fire watchers played a crucial role in safeguarding the plantations, particularly during the fire-prone summer season. These collective efforts highlight a proactive approach toward minimizing environmental threats and securing the long-term survival of the plantations.

Biotic Pressure on Plantations: The plantations were found to be under negligible biotic pressure. Field observations revealed very limited evidence of grazing and browsing by cattle or other herbivores. Human interference was also minimal. This low level of disturbance is a positive indicator, as it reduces the risk of seedling mortality, soil compaction, and other negative impacts that typically arise from anthropogenic and livestock activities. Plantation is inspected by concerned forest official and entered the observations.

Maintenance of Plantation Journals and Records: The plantation journals were found to be well maintained, with records of activities and observations documented satisfactorily. However, the periodic updating of key plantation parameters. Plantation boards, which serve as important tools for transparency, public awareness, and easy identification of plantation details, were present in all plantations except in Sirasavalasa, though re install and repainting is needed for better visibility and up keep.

Vana Samrakshan Samithi (VSS): Among the four plantations evaluated in the Visakhapatnam Division, the involvement of Vana Samrakshana Samithi (VSS) or Joint Forest Management Committees (JFMCs) was recorded across Ananthagiri and Yellamanchili ranges during establishment and maintenance. Their active participation ensured smooth plantation implementation and better protection. VSS mobilized local communities, coordinated labour for planting and aftercare, and supported the Forest Department in preventing fire, grazing, and other pressures. This participatory approach improved transparency, accountability, and long-term sustainability of plantation management. In Chodavaram and Visakhapatnam Ranges, the Duvvapalem, Sirasavarasa and Buddigaruvu plantations did not involve the Vana Samrakshana Samithi (VSS) in their implementation or maintenance. Consequently, the Focus Group Discussion (FGD) activity was not conducted.



Sirasavalasa, Chodavaram range



Buddigaruva, Chodavaram range



Dabbagunta, Ananthagiri range



Narendrapuram, Yellamanchili

2. Monitoring and Evaluation of Maintenance Activities

During 2016-17 a total of 27 maintenance activities were carried out in Visakhapatnam division during 2016-17, of which 6 activities were selected for monitoring. Chodavaram accounted for the maximum with 13 activities (3 sampled), followed by Visakhapatnam with 5 (1 sampled), Ananthagiri with 5 (1 sampled), Yellamanchili with 4 (1 sampled).

Table 159 Maintenance activities selected for evaluation in Visakhapatnam division

Sl. no.	Maintenance activities	GPS Co-ordinates	SO no. and year
Chodavaram range			
1	First year maintenance of 20 Ha NTSH plantation at Mathikabandalu (v)	N 18.007292 E 82.676535	DSO 78 A (2016-17)
2	Second year maintenance of 10 Ha NTSH plantation at Kandipudi (v)	N 17.779181 E 82.896084	DSO 81 A (2016-17)
3	Second year maintenance of 13 Ha NTSH plantation at Mathikabandalu (v)	N 18.010975 E 82.668098	DSO 80 (2016-17)
Visakhapatnam range			
4	Second year maintenance of 2 Ha NTSH species Nallaregulapalem plantation in Pothukonda RF & beat, Pendurthy section of Visakhapatnam range	N 17.788256 E 83.05395	RSO 03 (2016-17)
Ananthagiri range			
5	First year maintenance of 10 Ha NTSH plantation at Sarasupodaru Ananthagiri range	N 18.239493 E 83.007312	DSO 105 (2016-17)
Yellamanchili range			
6	First year maintenance of 10 Ha miscellaneous plantation at Janguluru	N 17.52117 E 82.843618	DSO 38 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year (first and second) of implementation following plantation establishment. These activities include casualty replacement, weeding operations, soil tilling (inter-ploughing),

formation of saucers, coppice management, pruning of lower branches, fire line management, and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Weeding: Intensify weeding operations, particularly along plantation boundaries, to control Lantana and bushy grasses, reduce competition, and promote healthy plant growth.
- Fire Protection: Continue maintaining clear fire lines, ensuring they are regularly cleared before the dry season to improve effectiveness in preventing forest fires.
- Replanting: Undertake timely replanting with healthy bagged seedlings to maintain proper stocking density, enhance survival rates, and strengthen plantation health.
- Pruning: Increase the frequency and ensure proper timing of pruning operations to encourage healthy growth and better bole formation.
- Boundary Demarcation: Install and maintain plantation boundary stones and boards for accurate demarcation, better monitoring, prevention of encroachments, and reliable record-keeping.
- Records Management: Maintain accurate and regularly updated plantation journals, markers, and records to support effective monitoring and accountability.



Mathikabandalu, Chodavaram range



Pothukonda beat, Visakhapatnam range

3. Monitoring and Evaluation of Protection Activities

A total of 5 Protection activities were carried out in Visakhapatnam division during 2016-17, of which 1 activity was selected for monitoring. Visakhapatnam accounted for the maximum with 4 activities (1 sampled), Chodavaram with 1 (0 sampled). No Protection activities were reported from other ranges.

1 Casting of RCC Fence posts and Chain-link Fence fixing in Gandigudam PCA plantation, Mudasarlova beat of Visakhapatnam range

GPS location: N 17.832102 E 83.262901

SO no. and year: DSO 183 (2016-17)

A RCC fence was created and maintained at Gandigudem PCA plantation of Mudasarlova beat in Visakhapatnam range under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of RCC fence are width – 3 m, and length – 261 rmt and Depth with 0.5 below the ground. The field measurements matched those in the measurement book,

indicating no deviations. The visibility of the fence was clear, as it was established around the PCA plantation. Minor damages were observed, indicating that periodic maintenance is needed.



RCC Fence posts and Chain-link Fence fixing in Mudasarlova beat

4. Monitoring and Evaluation of Soil and Moisture Conservation (SMC) Activities

A total of three were carried out during 2016-17 in Visakhapatnam Division, of which 2 activities were selected for monitoring. Yellamanchili accounted for the maximum with 2 activities (1 sampled), Chodavaram with 1 (1 sampled). No soil and moisture conservation activities were reported from other ranges.

1. Estimate for digging of mini percolation tank at Kalavalapalli CA area of Yellamanchili

GPS Location: N 17.490154 E 82.90845

SO no. and year: DSO 231 (2016-17)

The total of thirty-five numbers of mini percolation tanks were created and maintained at Kalavalapalli CA area in Yellamachili range under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of mini percolation tanks are width – 0.50 m, and length – 10.0 m and Depth with 1.80. The field measurements matched those in the measurement book, indicating no deviations. While the structure remains not in intact, it is covered with silt and jungle growth. De-silting is necessary to restore its full storage capacity.

2. Construction of rock fill dams (RFDs) at Kandipudi (v) Chodavaram range

GPS Location: N 17.780279 E 82.90116

SO no. and year: DSO 242 (2016-17)

The total of nineteen numbers of Rock fill dams were created and maintained at Kandipudi area in Chodavaram range under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of rock fill dams are width – 1.0 m, and length – 10.0 m and Depth with 1.50 m. The field measurements matched those in the measurement book, indicating no deviations. While the structure remains in intact, it is covered with silt and jungle growth. De-silting is necessary to restore its full storage capacity and effective use.



Mini percolation tanks in Yellamanchili range



Rock fill dams in Chodavaram range

5. Monitoring and Evaluation of Construction Activities

There was only one construction activity in the division during 2016-17, of which one was sampled in Yellamanchili range 1 activity (1 sampled). No construction activities were recorded in other ranges of Visakhapatnam division.

1. Construction of RCC boundary pillars at around the Kalavalapalli CA area of Yellamanchili range

GPS Location: N 17.48999 E 82.908663

SO no. & year: DSO 245 (2016-17)

A total of 12 RCC boundary pillars were constructed with Height 1.20 m, Top width 0.30 m and Bottom width of 0.45 m to demarcate reserve forest from revenue land. All pillars were found intact, in good condition and effectively marking the boundary though some had partially submerged bases.



RCC Pillars in Yellamanchili range

6. Monitoring and Evaluation of Other activities

During 2016-17, a total of 95 activities were carried out under the “Others” category in Visakhapatnam Forest Division, of which 23 were sampled for monitoring and evaluation. Visakhapatnam range reported the highest number of activities with 36 (10 sampled), followed by Chodavaram with 27 (6 sampled), Yellamanchili with 18 (4 sampled), and Ananthagiri with 14 (3 sampled). Document verification and cross-checking were conducted in the presence of Division and Range Office staff. The types of documents reviewed included sanction orders, estimation sheets, and work registers. It was found that the sanctioned amounts were in alignment with actual expenditures, and all financial records were properly maintained and duly authenticated by the concerned officials, including the Divisional Forest Officer (DFO), Sub-Divisional Officer (SDO), and Forest Range Officer (FRO). The utilization of funds was appropriate and consistent with approved estimates and CAMPA guidelines. Internal audits by

the Conservator of Forests and external audits by the Accountant General's office ensured transparency and compliance with financial and administrative protocols under the CAMPA scheme. However, some discrepancies were noted during the verification process. In Visakhapatnam range, work registers for RSO 5 and RSO 43 (both 2016–17) were not available for verification. In Ananthagiri range, the estimate for DSO 15 (2016–17) was not presented. Similarly, in Yellamanchili range, the work registers for DSO 16 (2016–17) was not made available. These lapses highlight the need for improved documentation and record management across the division.

Key findings

- Plantations showed moderate survival but good growth, confirming ecological suitability of selected sites while underlining the need for better species–site matching.
- Maintenance works were implemented effectively but weakened by gaps in weed management, pruning, and plantation boards.
- Protection coverage was minimal, confined to limited fencing interventions.
- SMC structures were few in number and already impaired by siltation, requiring immediate upkeep.
- Construction of RCC boundary pillars was effective in demarcation, though limited in scale.
- Financial accountability was strong, but documentation gaps in work registers need redress.
- Community participation was partial, strong in some ranges but completely absent in others, limiting uniform sustainability.

Recommendations

- Consolidate plantations in ecologically suitable sites and strengthen monitoring of survival and growth.
- Extend maintenance cycles division-wide and intensify weeding, pruning, and replanting with drought-resistant species.
- Scale up protection measures, including fencing, fire lines, and fire watchers, across the division.
- Expand SMC coverage and establish systematic de-silting schedules for tanks and dams.
- Strengthen GIS-based area verification to reconcile recorded and actual plantation extents.
- Ensure availability of work registers and technical documents for all activities.
- Institutionalize VSS participation and FGDs across all plantations to ensure social ownership and long-term sustainability.
- Rebalance the CAMPA portfolio to reduce heavy reliance on “others” and channel more investment into plantations, SMC, and protection.

23. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN VIZIANAGARAM DIVISION

Introduction

The Vizianagaram Division spans 376.20 km² of forest cover as per ISFR 2023, all of which falls into Moderately Dense Forest (MDF; ~341.51 km²) and Very Dense Forest (VDF; ~34.69 km²) categories—there is no Open Forest in the current assessment. A substantial net gain of +34.71 km² in forest cover has been recorded in this division, marking it among the positive outliers in Andhra Pradesh for conservation and restoration efforts. Despite its relatively good forest status, there remains a significant area 77.29 km² under scrub, indicating zones of degraded or low canopy cover which may be targets for restoration. Ecologically, these woodlands are characteristic of tropical dry deciduous forest types dominated by teak and bamboo species. The division also benefits from less fire-prone conditions compared to many other districts. Along coastal fringes, mangroves and casuarina shelterbelts provide additional buffers and ecosystem services. On the economic and social side, plantations make up a meaningful fraction of the landscape, enhancing economic resilience. Community dependence remains high for fuelwood and Non-Timber Forest Products (NTFPs), driving participatory forest management and sustainable extraction practices. Soil and moisture conservation are ongoing priorities, especially in scrub-prone or regenerating areas, to bolster forest health.

In Vizianagaram Division during 2016-17, a total of 145 CAMPA activities were carried out, of which 34 activities (around 23 %) were selected for detailed monitoring and evaluation. In Vizianagaram range, 27 activities were implemented, and 6 were sampled. In Parvathi Puram range, 41 activities were implemented, and 10 were sampled. In Saluru range, 37 activities were implemented, with 9 sampled. In Kurupam range, 30 activities were implemented, and 7 were sampled. In Anantagiri range, 10 activities were implemented, and 2 were sampled. Among activity types, other works dominated with 94 activities (21 sampled), followed by maintenance (30; 7 sampled), plantations (15; 4 sampled), Protection (6; 2 sampled), there were no soil and moisture conservation works and construction activities were implemented.

1. Monitoring and Evaluation of Plantation Activities

In Vizianagaram division, a total of 15 plantation activities were carried out under CAMPA, of which 4 activities (about 26 %) were selected for monitoring and evaluation. Among the ranges equally distributed in Parvathi Puram range reported with 4 activities (1 sampled), Saluru and kurupam range with same (4; 1 sampled), Anantagiri range with 3 activities (1 sampled). No plantation activities were reported from Vizianagaram range.

1.1 Parvathipuram range

During 2016–17, a total of four plantation activities were carried out under the CAMPA scheme in Parvathi Puram range. In this monitoring and evaluation process, one plantation site constituting 25 % of the activities was randomly selected.

Table 160 Details of plantation selected in Parvathipuram range

Sl. no.	Plantation	SO no. and year
1	Raising 5 Ha Teak plantation at Chandalangi	DSO 68 (2016-17)

In Chandalangi Plantation is located on gently sloping land with black rocky soil, providing good drainage and nutrient retention. Situated within a dry deciduous forest biome, the site experiences distinct dry and rainy seasons, making it suitable for drought-resistant species and fostering regional biodiversity.

Survival percentage: In Chandalangi Plantation, *Tectona grandis* with survival rate of 85.54%, indicating strong adaptability and successful establishment.

Growth: Tree height ranged between 9.47 – 10.48 m and girth between 10.54 – 25.35 cm. showing strong growth, indicating healthy plantation across the site.

Table 161 Details of plantation enumerated in Parvathipuram range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Coordinates	Survival (%)	Average Growth	
						Height (m)	GBH (cm)
1	Chandalangi 5 Ha Teak plantation	1	<i>Tectona grandis</i>	N 18.827914 E 83.362469	85.54	9.47 ±0.94	38.33 ±4.99
		2	<i>Tectona grandis</i>	N 18.827876 E 83.382418	85.15	9.68 ±0.76	37.63 ±5.10
		3	<i>Tectona grandis</i>	N 18.827815 E 83.362677	82.81	9.51 ±0.66	41.16 ±4.94
		4	<i>Tectona grandis</i>	N 18.827791 E 83.362854	80.46	9.42 ±0.46	37.26 ±4.24
		5	<i>Tectona grandis</i>	N 18.827932 E 83.362301	80.85	10.48 ±9.10	39.81 ±24.42
Plantation average					82.962	9.712	38.838

1.2 Saluru range

A total of four plantation projects were implemented under the CAMPA scheme in Saluru range during 2016–17. For evaluation purposes, one plantation site constituting 25 % of the projects was randomly selected.

Table 162 Details of plantation selected in Saluru range

Sl. no.	Plantation	SO no. and year
1	Raising of 5 ha (NTSH) plantation at Raiguddivalasa	DSO 45 (2016-17)

The site is located on gently sloping terrain with sandy loam soil, providing good aeration and moisture retention, making it ideal for plant growth. Situated within a dry deciduous forest biome, the site experiences a clear distinction between dry and rainy seasons, creating a favourable environment for drought-resistant species to thrive.

Survival percentage: In Raiguddivalasa Plantation, *Syzygium cumini* showed the highest survival rate at 76.85%, followed closely by *Terminalia arjuna* at 76.03%, both indicating good adaptability to the site. *Azadirachta indica* recorded a lower survival rate of 72.72%, suggesting it requires more care due to possible sensitivity to soil and moisture. Overall, *Syzygium cumini* and *Terminalia arjuna* are well-suited to the site, while *Azadirachta indica* needs additional attention for better growth.

Growth: Average height – 1.97 m to 5.62 m; average girth – 16.39 cm to 28 cm, indicating healthy growth across the plantation.

Table 163 Details of plantation enumerated in Saluru range

Sl. no.	Plantation/ Village name	Plot no.	Species Name	GPS Coordinates	Survival (%)	Average Growth		
						Height (m)	Collar Girth (cm)	GBH (cm)
1	Raiguddivalasa 5 Ha NTSH plantation	1	<i>Syzygium cumini</i>	N 18.420432 E 83.186912	76.85	5.52 ±0.49	-	26.90 ±2.71
		2	<i>Terminalia arjuna</i>	N 18.420227 E 83.187290	71.07	5.62 ±0.68	-	28.00 ±3.52
		3	<i>Terminalia arjuna</i>	N 18.420217 E 83.187423	76.03	2.15 ±0.40	18.20 ±3.85	-
		4	<i>Azadirachta indica</i>	N 18.420745 E 83.187284	72.72	2.83 ±0.49	20.24 ±2.16	-
		5	<i>Syzygium cumini</i>	N 18.420778 E 83.187381	76.03	1.97 ±0.39	16.39 ±2.57	-
Plantation average					74.54	3.61	18.27	27.45

1.3 Kurupam range

A total of four plantation projects were implemented under the CAMPA scheme in Kurupam range during 2016–17. For evaluation purposes, one plantation site constituting 25 % of the activities was randomly selected for assessment.

Table 164 Details of plantation selected in Kurupam range

Sl. no.	Plantation	SO no. and year
1	Raising of 5 Ha NTHS plantation at Mantikonda (V) of Mondemkhal section	DSO 76 (2016-17)

The site is a sloping area with sandy loam and red soil, situated within a dry deciduous forest biome. This terrain requires careful drainage and moisture management due to the region's seasonal dry conditions.

Survival percentage: The site has shown good suitability for *Terminalia arjuna*, *Azadirachta indica*, and *Syzygium cumini*, with survival rates of 80.99%, 77.68%, and 78.51%, respectively. These figures indicate favourable growth conditions and successful establishment of the selected species.

Growth: Average tree height ranges from 2.58 m to 2.90 m, and average girth ranges from 20.19 cm to 22.06 cm. Growth variation across the plantation may be attributed to soil quality, water availability, tree spacing, and microclimatic differences.

Table 165 Details of plantation enumerated in Kurupam range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Coordinates	Survival (%)	Average Growth	
						Height (m)	Collar Girth (cm)
1		1	<i>Terminalia arjuna</i>	N 18.923621 E 83.711533	76.85	2.58 ±0.45	20.19 ±1.94

	Mantikonda 5 Ha NTSH plantation	2	<i>Terminalia arjuna</i>	N 18.923744 E 83.711286	80.99	2.87 ±0.46	20.58 ±1.75
		3	<i>Terminalia arjuna</i>	N 18.923713 E 83.711746	79.33	2.90 ±0.51	20.45 ±1.98
		4	<i>Azadirachta indica</i>	N 18.924241 E 83.711564	77.68	2.89 ±0.50	21.20 ±2.16
		5	<i>Syzygium cumini</i>	N 18.924055 E 83.712106	78.51	2.88 ±0.54	22.06 ±2.76
	Plantation average					78.67	2.82

1.4 Anantagiri range

A total of three plantation projects were implemented under the CAMPA scheme in Anantagiri range during 2016–17. For evaluation purposes, one plantation site constituting approximately 33 % of the projects was randomly selected for assessment.

Table 166 Details of plantation selected in Anantagiri range

Sl. no.	Plantation	SO no. and year
1	Raising 10 Ha NTSH plantation at Sangamguddi in Raba beat	DSO 80 (2016-17)

In Sangamguddi, within the Anantagiri Range, a 10-hectare plantation was established during the financial year 2016–17, comprising 11,150 seedlings of high-value Non-Timber Species (NTSH) such as *Pongamia pinnata*, *Syzygium cumini*, *Azadirachta indica*, and *Phyllanthus emblica*.

During the field visit, a complete perambulation of the site was carried out, and relevant records were reviewed. *Pattas* (land allotment documents) submitted by the beneficiary villagers were collected from the Vizianagaram Division Office. It was found that the land allocation had been jointly authorized by the District Collector, the Samagra Girijana Abhiruddi Officer, and the Divisional Forest Officer.

The concerned Forest Beat Officer informed that the plantation area had been allocated to the fringe villagers of Panukuvanivalasa. As a result, the entire plantation was removed, leaving no surviving plants. Consequently, sample plots could not be laid.

Comparative assessment of plantations in Vizianagaram division during 2016-17

The plantations showed mixed outcomes. Chandalangi Plantation performed best, with *Tectona grandis* showing high survival (85.54 %) and strong growth. Raiguddivalasa Plantation had moderate success, with *Syzygium cumini* (76.85 %) and *Terminalia arjuna* (76.03 %) adapting well, though *Azadirachta indica* (72.72 %) needed more care. Another site also showed good establishment of *Terminalia arjuna*, *Syzygium cumini*, and *Azadirachta indica* (77–81 % survival) with moderate growth. In contrast, the Sangamguddi Plantation failed completely as the entire area was removed by villagers after land allocation. Overall, Chandalangi showed excellent results, Raiguddivalasa and the second site moderate success, and Sangamguddi complete removal due to land use conflict.

The verification of plantation area and boundaries

In Vizianagaram division during 2016-17 measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

Table 167 Details of plantation area perambulation in Vizianagaram division

Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising 5 Ha Teak plantation at Chandalangi in Paravathi Puram range	5 Ha	5.16 Ha
2	Raising of 5 Ha NTSH plantation at Raiguddivalasa in Saluru range	5 Ha	5.25 Ha
3	Raising of 5 Ha NTHS plantation at Mantikonda (V) of Mondemkhal section in Kurupam range	5 Ha	14.03 Ha
4	Raising 10 Ha NTSH plantation at Sangamguddi in Raba beat of Anantagiri range	10 Ha	15.41 Ha

Perambulation of selected NTSH plantations was carried out with the assistance of the local Forest Beat Officer. In all cases, the perambulated area was found to exceed the recorded plantation area due to the presence of rocky terrain, trenches, and barren patches within plantation boundaries. Measurements were therefore taken along the outer boundary of these natural obstructions rather than the precise plantation limits. Plantation-wise Findings

- Chandalangi (5 Ha): 5.16 Ha (exceeded by 0.16 Ha)
- Raiguddivalasa (5 Ha): 5.25 Ha (exceeded by 0.25 Ha)
- Mantikonda (5 Ha): 14.03 Ha (exceeded by 9.03 Ha)
- Sangamguddi (10 Ha): 15.41 Ha (exceeded by 5.41 Ha)

Verification was carried out with the assistance of the local Forest Beat Officer, using QGIS software and further confirmed through Geo Tracker application. Geotagged images were documented as evidence.



Chandalangi plantation 5.16 Ha



Raiguddivalasa plantation 5.25 Ha



Mantikonda plantation 14.03 Ha



Sangamguddi plantation 15.51 Ha

Health Status of Plantations: Field inspections across plantation sites revealed no incidence of insect or pest damage affecting any species. All plants appeared healthy, with no visible signs of infestation, stress, or pest-related deterioration.

Protection Measures: Adequate protection measures were in place across the plantation areas. Fire lines had been created and were being maintained to act as a barrier against the spread of accidental forest fires. Inspection paths were also provided, ensuring ease of access for monitoring and management activities. Furthermore, the deployment of fire watchers played a crucial role in safeguarding the plantations, particularly during the fire-prone summer season. These collective efforts highlight a proactive approach toward minimizing environmental threats and securing the long-term survival of the plantations.

Biotic Pressure on Plantations: Plantations were found to be under negligible biotic pressure. Field observations revealed very limited evidence of grazing and browsing by cattle or other herbivores. Human interference was also minimal. This low level of disturbance is a positive indicator, as it reduces the risk of seedling mortality, soil compaction, and other negative impacts that typically arise from anthropogenic and livestock activities. The minimal biotic stress provides a conducive environment for healthy plantation establishment and growth.

Maintenance of Plantation Journals and Records: The plantation journals were found to be well maintained, with records of activities and observations documented satisfactorily. However, the periodic updating of key plantation parameters including survival percentage, height, girth measurements, and maintenance activities requires further strengthening to ensure accuracy and to support effective monitoring and evaluation. Plantation boards, which serve as important tools for transparency, public awareness, and easy identification of plantation details, were present in all plantations, though repainting is needed for better visibility and up keep. Plantation is inspected by concerned forest official and entered the observations.

Vana Samrakshan Samithi (VSS): Among the four plantations evaluated in the Vizianagaram Division, the involvement of Vana Samrakshana Samithi (VSS) or Joint Forest Management Committees (JFMCs) was recorded across all ranges during establishment and maintenance. Their active participation ensured smooth plantation implementation and better protection. VSS mobilized local communities, coordinated labour for planting and aftercare, and supported the Forest Department in preventing fire, grazing, and other pressures. They also created livelihood opportunities through wage employment and collective decision-making. This participatory approach improved transparency, accountability, and long-term sustainability of plantation management.



Chandalangi , Parvathipuram range



Raiguddivalasa, Saluru range



Mantikonda plantation, Kurupam range



Sangamguddi plantation, Anantagiri

2. Monitoring and Evaluation of Maintenance Activities

A total of 30 maintenance activities were carried out in Vizianagaram division during 2016-17, of which 7 activities were selected for monitoring. Parvathi Puram accounted for the maximum with 9 activities (2 sampled), followed by Saluru with 7 (2 sampled), Kurupam with 7 (1 sampled), Anantagiri with 4 (1 sampled), Vizianagaram range with least 3 activities (1 sampled).

Table 168 Maintenance activities selected for evaluation in Vizianagaram division

Sl. no.	Maintenance Activities	GPS Co-ordinates	SO no. and year
Parvathi Puram range			
1	First year maintenance of 5 Ha Teak plantation at Marriguda, Pujariguda beat Komarada section of Parvathipuram range	N 18.907701 E 83.513277	DSO 106 (2016-17)
2	Second year maintenance 5 Ha Teak plantation at Puligummi, Bobbili beat, Bobbili section of Parvathipuram range	N 18.456749 E 83.434732	DSO 111 (2016-17)
Saluru range			
3	First year maintenance of 5 Ha Teak plantation at Lovarakandi in Saluru range	N 18.935731 E 84.460465	DSO 60 (2016-17)
4	Second year maintenance of 5 Ha teak plantation at Pottigadabavalasa in Saluru range	N 18.731732 E 83.291429	DSO 51 (2016-17)
Kurupam range			
5	Third year maintenance of 5 Ha Teak plantation of Voppangi (V) of G.L. Puram section in Kurupam range	N 19.011182 E 83.62742	RSO 52 (2016-17)
Anantagiri range			
6	First year maintenance of 10 Ha teak Plantation at Karumamidivalasa in Anantagiri range	N 18.333653 E 83.22033	DSO 16 (2016-17)
Vizianagaram range			
7	Third year maintenance of 10 Ha NTSH plantation at Velagada in Vizianagaram range	N 18.180018 E 83.427805	DSO 256 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year (first, second and third) of implementation following plantation establishment. These activities include casualty replacement, weeding operations, soil tilling (inter-ploughing), coppice management, pruning of lower branches, fire line management, and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. However, in some sites, plantation boards

were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Weeding: Intensify weeding operations, particularly along plantation boundaries, to control Lantana and bushy grasses, reduce competition, and promote healthy plant growth.
- Fire Protection: Continue maintaining clear fire lines, ensuring they are regularly cleared before the dry season to improve effectiveness in preventing forest fires.
- Replanting: Undertake timely replanting with healthy bagged seedlings to maintain proper stocking density, enhance survival rates, and strengthen plantation health.
- Pruning: Increase the frequency and ensure proper timing of pruning operations to encourage healthy growth and better bole formation.
- Boundary Demarcation: Install and maintain plantation boundary stones and boards for accurate demarcation, better monitoring, prevention of encroachments, and reliable record-keeping.
- Records Management: Maintain accurate and regularly updated plantation journals, markers, and records to support effective monitoring and accountability.



Bobbili beat, Parvathi Puram range



Lovarkandi beat, Saluru range



Karivalasa beat, Kurupam range



Karumamidivalasa, Anantagiri range

3. Monitoring and Evaluation of Protection Activities

A total of 6 Protection activities were carried out in Vizianagaram division during 2016-17, of which 2 activities were selected for monitoring. Kurupam accounted for the maximum with 3 activities (1 sampled), followed by Vizianagaram with 1 (1 sampled), Saluru with 2 (0 sampled), No Protection activities were reported from Parvathi Puram and Anantagiri range.

3.1 Creation of new fire lines and wages to fire watcher for maintaining the fire lines and control burning in JK block RF of Kurupam range

GPS location: N 18.899751 E 83.710986 **SO no. and year:** DSO 238 (2016-17)

A fire line was created and maintained in J K block RF of Kurupam range under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of new fire line are width – 3 m, and length – 1000 rmt. The field measurements matched those in the measurement book, indicating no deviations. The visibility of the fire line was clear, as it was established along the inspection path. No dense grass or weed growth was observed, indicating that the fire line has been well-maintained.

3.2 Creation of fire lines at Kothapalem old teak plantation of Vizianagaram section/range

GPS location: N 18.210544 E 83.224686 **SO no. and year:** RSO 75 (2016-17)

A fire line was created and maintained in Kothapalem old teak plantations of Vizianagaram range under CAMPA-NPV (forest fire management) scheme was monitored and evaluated against the specifications recorded in the measurement book and the actual field measurements. The dimensions of new fire line are width – 3 m, and length – 2000 rmt. The field measurements matched those in the measurement book, indicating no deviations. The visibility of the fire line was not clear, as it was established along the inspection path. Moderate grass or weed growth was observed, indicating the need for periodic maintenance.



J K block RF, Kurupam range



Andra beat, Vizianagaram range

4. Monitoring and Evaluation of Other activities

During the period 2016-17, a total of 94 activities were carried out under the “Others” category in the Vizianagaram Forest Division, of which 21 were selected for sampling. Parvathi Puram range recorded the highest number of activities with 28 (7 sampled), followed by Saluru with 24 (6 sampled), Vizianagaram with 23 (4 sampled), Kurupam with 16 (4 sampled), and Anantagiri with 3 activities, none of which were sampled. Document verification and cross-checking were conducted in the presence of Division and Range Office staff. The documents reviewed included sanction orders, estimation sheets, and work registers. It was found that the sanctioned amounts matched the actual expenditures, and all financial records were properly maintained and duly authenticated by the concerned officials, including the Divisional Forest Officer (DFO), Sub-Divisional Officer (SDO), and Forest Range Officer (FRO). Fund utilization was appropriate and consistent with the approved estimates and CAMPA guidelines. Both internal audits (by the Conservator of Forests) and external audits (by the Accountant General’s

office) were conducted. This ensured transparency and compliance with the financial and administrative protocols under the CAMPA scheme.

Key Findings

- Plantations showed good survival and growth in Parvathipuram, Saluru, and Kurupam, while Anantagiri experienced a major setback due to land diversion, which nullified plantation outcomes.
- Significant and recurring mismatches were observed between recorded and actual plantation areas, raising concerns about the accuracy and reliability of records.
- Maintenance works were extensive and generally effective, though overall impact was weakened by missing plantation boards and inadequate boundary weeding.
- Protection measures were minimal, confined mainly to a few fire lines, indicating the need for broader protection coverage.
- No Soil and Moisture Conservation (SMC) or construction works were undertaken, resulting in ecological gaps in moisture retention and site stability.
- Financial accountability remained strong, but record verification processes need to be strengthened through GIS-based validation.
- Community participation through VSS involvement was consistent and constructive, contributing significantly to plantation success and protection efforts.

Recommendations

- Reconcile plantation area records through GIS-based mapping and systematic perambulation to ensure spatial accuracy and prevent reporting discrepancies.
- Replace and maintain plantation boards and boundary markers to strengthen monitoring, visibility, and accountability in the field.
- Ensure sustained upkeep of fire lines, including seasonal clearance and periodic inspection, to maintain their effectiveness in fire prevention.
- Prevent diversion of plantation sites for non-forestry purposes by enforcing land-use protection measures and ensuring compliance with plantation objectives.
- Expand VSS/JFMC participation in plantation protection, maintenance, and livelihood-linked activities to promote community ownership and long-term sustainability.

24. MONITORING AND EVALUATION OF CAMPA ACTIVITIES IN SRIKAKULAM DIVISION

Introduction

Srikakulam Division encompasses 585.22 km² of forest area, of which 81.16 km² is Very Dense Forest (VDF) and 504.06 km² is Moderately Dense Forest (MDF), with no Open Forest (OF) remaining the division registered a net gain of 6.81 km² in forest cover in the latest assessment, even as about 318.41 km² is classified as scrub forming a mixed mosaic of dry deciduous scrub and moderately dense vegetation. Dominant tree species include Teak, *Terminalia*, *Anogeissus*, and bamboo; in coastal zones, mangrove shelterbelts and casuarina and teak plantations add to ecological diversity and services. Srikakulam is categorized as less fire-prone in terms of forest fire risk under ISFR-2023. Local communities depend heavily on these forests for fuelwood, fodder, grazing, gums, honey, and medicinal plants; mangroves additionally play a crucial role in cyclone protection and supporting fisheries. Management priorities in the division include soil conservation, enrichment plantations, and promotion of participatory governance, especially through Vana Samrakshana Samithis (VSS).

In Srikakulam Division during 2016-17, a total of 84 CAMPA activities were carried out, of which 22 activities (around 26 %) were selected for detailed monitoring and evaluation. In Srikakulam range, 13 activities were implemented, and 4 were sampled. In Kasibugga range, 17 activities were implemented, and 3 were sampled. In Palakonda range, 21 activities were implemented, with 5 sampled. In Pathapatnam range, 18 activities were implemented, and 5 were sampled. In Tekkali range, 15 activities were implemented, and 5 were sampled. Among activity types, other works dominated with 55 activities (11 sampled), followed by maintenance (12; 5 sampled), plantations (10; 3 sampled), construction (6; 2 sampled), soil and moisture conservation (1; 1 sampled), there were no protection activities were implemented.

1. Monitoring and Evaluation of Plantation Activities

In Srikakulam division, a total of 10 plantation activities were carried out under CAMPA, of which 3 activities (about 30 %) were selected for monitoring and evaluation. Among the ranges equally distributed in Palakonda range reported with 3 activities implemented (1 sampled), Pathapatnam range with same (3 implemented; 1 sampled) and Tekkali range with 2 activities implemented (1 sampled). No plantation activities were reported from Srikakulam, and Kasibugga ranges.

1.1 Palakonda range

A total of three plantation activities were carried out under the CAMPA scheme in Palakonda range during 2016–17. For the monitoring and evaluation process, one plantation site constituting approximately 33 % of the activities was randomly selected.

Table 169 Details of plantation selected in Palakonda range

Sl. no.	Plantation	SO no. and year
1	Raising of 10 Ha Teak plantation at Vondurujola of Sarubujjili section	DSO 41 (2016-17)

Vondurujola plantation, covering an extent of 10 hectares, is characterized by red sandy loam soil, which is generally suitable for plantation activities. However, the presence of large boulders

and sheet rock within the site created considerable difficulties during site preparation and planting operations.

Survival Percentage: In Vondurujola plantation recorded a survival rate of 71.71%, for the species of *Tectona grandis* indicating moderate establishment. Soil depth and rocky terrain affected growth.

Growth: Tree height ranged between 2.76–3.24 m and girth between 19.96–26.53 cm. Growth variation was mainly due to shallow soil, moisture limitations, and plant competition.

Table 170 Details of plantation enumerated in Palakonda range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average	
						Height (m)	GBH (cm)
1	Vondurujola 10 Ha Teak plantation	1	<i>Tectona grandis</i>	N 18.576827 E 83.899162	66.40	2.76 ±0.42	22.68 ±2.67
		2	<i>Tectona grandis</i>	N 18.576224 E 83.899351	73.04	3.20 ±0.51	23.07 ±3.51
		3	<i>Tectona grandis</i>	N 18.576613 E 83.899229	60.93	3.09 ±0.46	19.96 ±2.48
		4	<i>Tectona grandis</i>	N 18.577471 E 83.899219	75.39	3.24 ±0.58	26.53 ±4.46
		5	<i>Tectona grandis</i>	N 18.577472 E 83.89913	82.81	2.91 ±0.37	21.29 ±1.89
Plantation average					71.71	2.98	23.06

1.2 Pathapatnam range

A total of three plantation projects were implemented under the CAMPA scheme in Pathapatnam range during 2016–17. For evaluation purposes, one plantation site constituting approximately 33 % of the projects was randomly selected.

Table 171 Details of plantation selected in Pathapatnam range

Sl. no.	Plantation	SO no. and year
1	Raising of 10 Ha Teak plantation at Dasaradha Puram village Pathapatnam section	DSO 52 (2016-17)

In Dasaradha Puram plantation, covering an extent of 10 hectares, is characterized by alluvial soil with good drainage, which is highly suitable for teak cultivation and supports healthy growth.

Survival Percentage: In Dasaradha Puram plantation *Tectona grandis* recorded a survival rate of 88.88%, indicating excellent establishment and high site suitability.

Growth: In Dasaradha Puram plantation trees attained a height range of 6.11–9.05 m and a girth of 25.01–33.50 cm, reflecting strong and healthy growth.

Table 172 Details of plantation enumerated in Pathapatnam range

Sl. no.	Plantation / Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average	
						Height (m)	GBH (cm)
1	Dasaradha Puram 10 Ha Teak plantation	1	<i>Tectona grandis</i>	N 18.746831 E 84.912089	88.28	7.80 ±0.47	26.45 ±2.95
		2	<i>Tectona grandis</i>	N 18.746317 E 84.111547	89.84	8.12 ±0.76	30.07 ±4.54
		3	<i>Tectona grandis</i>	N 18.746317 E 84.111154	87.8	6.11 ±0.55	25.01 ±2.11
		4	<i>Tectona grandis</i>	N 18.746805 E 84.111338	88.67	6.60 ±1.09	27.34 ±4.67
		5	<i>Tectona grandis</i>	N 18.747160 E 84.11144	89.84	9.05 ±0.86	33.50 ±4.71
Plantation average					88.86	7.53	28.47

1.3 Tekkali range

A total of two plantation projects were implemented under the CAMPA scheme in Tekkali Range during 2016–17. For evaluation purposes, one plantation site constituting 50 % of the projects was randomly selected.

Table 173 Details of plantation selected in Tekkali range

Sl. no.	Plantation	SO no. and year
1	Raising of 05 Ha Teak plantation work at Chendanagiri village limits of Narasingapalli beat of Tekkali section	DSO 67 (2016-17)

In Chendanagiri plantation in Tekkali Range, covering an extent of 5 hectares, is characterized by hardy gravel soil with rocky patches, which pose challenges for planting and root development, necessitating careful site preparation and suitable species selection.

Survival Percentage: In Tekkali range for the 5 Ha plantation at Chendanagiri exhibits moderate growth of *Tectona grandis* with a survival rate of 64.87%, likely influenced by the site's gravelly soil and rocky patches which limit optimal growth conditions.

Growth: In Tekkali range at the 5 Ha plantation in Chendanagiri shows an average tree height ranging from 3.55 to 8.80 m and girth ranging from 25.69 to 39.32 cm, indicating moderate and varied growth across the site.

Table 174 Details of plantation enumerated in Tekkali range

Sl. no.	Plantation/ Village name	Plot no.	Species name	GPS Co-ordinates	Survival (%)	Average	
						Height (m)	GBH (cm)
1	Chendanagiri 5 Ha Teak plantation	1	<i>Tectona grandis</i>	N 18.681943 E 84.168047	64.45	8.80 ±0.62	39.32 ±2.16
		2	<i>Tectona grandis</i>	N 18.682212 E 84.168244	64.84	8.14 ±0.71	30.19 ±3.19
		3	<i>Tectona grandis</i>	N18.682225 E 84.168755	62.28	6.90 ±0.65	30.31 ±4.10

		4	<i>Tectona grandis</i>	N18.682080 E 84.169081	67.18	7.34 ±0.76	31.70 ±5.50
		5	<i>Tectona grandis</i>	N 18.681792 E 84.168014	65.62	3.55 ±0.43	25.69 ±3.27
Plantation average					64.87	6.94	31.44

Comparative assessment of plantations in Srikakulam division during 2016-17

The performance of *Tectona grandis* varied across the plantations. In Palakondsa range Vondurujola plantation, with a survival rate of 71.71% was recorded, with tree heights of 2.76–3.24 m and girths of 19.96–26.53 cm; growth was constrained by shallow soil, rocky terrain, moisture limitations, and plant competition. In contrast, in Pathapatnam range, Dasaradha Puram plantation exhibited excellent establishment with 88.88% survival, tree heights of 6.11–9.05 m, and girths of 25.01–33.50 cm, reflecting strong and healthy growth under highly suitable soil conditions. At Chendanagiri (5 Ha, Tekkali Range), survival stood at 64.87%, with tree heights of 3.55–8.80 m and girths of 25.69–39.32 cm, indicating moderate and varied growth influenced by gravelly soil and rocky patches.

Verification of plantation area and boundaries

In Srikakulam division during 2016-17 measurement of plantation area was conducted using KML files for each location. These were processed to generate accurate maps and calculate the extent of the respective plantation areas.

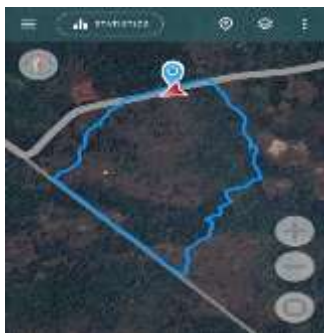
Table 175 Details of plantation area perambulation in Srikakulam division

Sl. no.	Plantations	Area as per records	Area as per field perambulation
1	Raising of 10 Ha Teak plantation at Vondurujola of Sarubujjili section	10 Ha	12.02 Ha
2	Raising of 10 Ha Teak plantation at Dasaradha Puram village Pathapatnam section	10 Ha	9.75 Ha
3	Raising of 05 Ha Teak plantation work at Chendanagiri village limits of Narasingapalli beat	05 Ha	5.82 Ha

Perambulation of the plantations revealed discrepancies between the recorded and actual areas due to dense jungle growth and trenches around the plantation boundaries. These natural obstructions made it difficult to trace the exact boundaries, leading to measurements being taken along the outer perimeters or likely due to rocky or waste patches within the plantation and possible shortcuts taken during survey.

- Vondurujola (10 Ha Teak Plantation): The measured area exceeded the actual plantation by 2.02 Ha.
- At Dasaradha Puram (10 Ha Teak plantation), the actual area was 0.25 Ha less than recorded,
- Chendanagiri Plantation: The perambulated area exceeded the recorded area by 0.82 Ha.

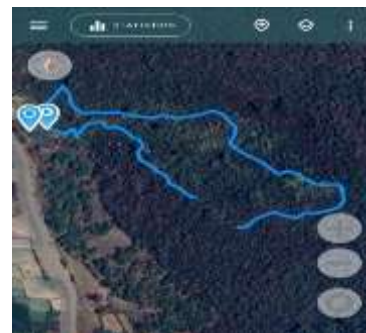
Verification was carried out with the assistance of the local Forest Beat Officer, using QGIS software and further confirmed through Geo Tracker application. Geotagged images were documented as evidence.



**Vondhuruju
plantation 12.02 Ha**



**Dasaradha
Puram plantation 9.75 Ha**



**Chendanagiri
plantation 5.82 Ha**

Health Status of Plantations: During the field inspections, the overall health of the plantations was found to be satisfactory. The seedlings and saplings exhibited good growth with healthy foliage, and no incidences of insect infestation or pest-related damage were observed. The absence of such biological threats indicates that the plantations are thriving under the prevailing ecological conditions, and the existing management practices are effectively supporting their growth.

Protection Measures: Adequate protection measures were in place across the plantation areas. Fire lines had been created and were being maintained to act as a barrier against the spread of accidental forest fires. Inspection paths were also provided, ensuring ease of access for monitoring and management activities. Furthermore, the deployment of fire watchers played a crucial role in safeguarding the plantations, particularly during the fire-prone summer season. These collective efforts highlight a proactive approach toward minimizing environmental threats and securing the long-term survival of the plantations.

Biotic Pressure on Plantations: The plantations were found to be under negligible biotic pressure. Field observations revealed very limited evidence of grazing and browsing by cattle or other herbivores. Human interference was also minimal. This low level of disturbance is a positive indicator, as it reduces the risk of seedling mortality, soil compaction, and other negative impacts that typically arise from anthropogenic and livestock activities. The minimal biotic stress provides a conducive environment for healthy plantation establishment and growth.

Maintenance of Plantation Journals and Records: The plantation journals were well maintained, with details of activities and observations recorded in a satisfactory manner. However, it was noted that the periodic updating of plantation parameters (such as survival percentage, height, girth measurements, and maintenance activities) needs further strengthening to ensure accuracy and support effective monitoring and evaluation. Additionally, plantation boards an important tool for transparency, public awareness, and easy identification of plantation details were not observed at Dasaradha Puram and Chendanagiri plantations. The absence of such boards reduces the visibility of plantation activities and should be addressed promptly. Plantation is inspected by concerned forest official and entered the observations.

Vana Samrakshan Samithi (VSS): Among the three plantations evaluated in the Srikakulam Division, the involvement of Vana Samrakshana Samithi (VSS) or Joint Forest Management Committees (JFMCs) was recorded in the Palakonda and Pathapatnam ranges for plantation establishment and maintenance. However, in the Tekkali range, there was no involvement of

VSS. Consequently, no Focus Group Discussions (FGDs) were conducted for community feedback or qualitative evaluation.



Vondhurujolu, Palakonda range



Dasaradha Puram, Pathapatnam



Chendanagiri plantation, Tekkali range

2. Monitoring and Evaluation of Maintenance Activities

A total of 12 maintenance activities were carried out in Srikakulam division during 2016-17, of which 5 activities were selected for monitoring. Kasibugga accounted for the maximum with 4 activities (1 sampled), followed by Palakonda with 3(1 sampled), Pathapatnam with 3 (1 sampled), Tekkali with 2 (1 sampled), Srikakulam range with least 1 activity (1 sampled).

Table 176 Maintenance activities selected for evaluation in Srikakulam division

Sl. no.	Maintenance Activities	GPS Co-ordinates	SO no. and year
Srikakulam range			
1	Estimate for second year maintenance of 10 Ha Casuarina plantation at Jeerupalem of Kandivalasa section	N 18.145717 E 83.775214	DSO 325 (2016-17)
Kasibugga range			
2	Second year maintenance of 10 Ha Teak plantation in Budarisingi	N 18.935731 E 84.460465	DSO 60 (2016-17)
Palakonda range			
3	Second year maintenance of 10 Ha Teak plantation at Jambada	N 18.567003 E 83.913478	DSO 47 (2016-17)
Pathapatnam range			
4	First year maintenance of 10.00 Ha Teak plantation at Dasaradha Puram village, Pathapatnam section	N 18.746918 E 84.112344	DSO 65 (2016-17)
Tekkali range			
5	Second year maintenace of 20 Ha Casuarina plantation at Pittavanipeta (V) Mulapeta section	N 18.472647 E 84.250363	DSO 291 (2016-17)

As per the approved maintenance plan, the type of maintenance activities undertaken depends on the year (first, second and third) of implementation following plantation establishment. These activities include casualty replacement, weeding operations, soil tilling (inter-ploughing), coppice management, pruning of lower branches, fire line management, and other contingency measures. During the monitoring visit, it was observed that all planned maintenance activities had been executed across the evaluated plantations. However, in some sites, plantation boards were found to be damaged or missing, requiring replacement to ensure proper identification and monitoring. Some of the general recommendations for better growth of the plantation are as follows;

General recommendations for maintenance activities

- Intensify weeding operations, particularly along plantation boundaries, to control Lantana and bushy grasses, reduce competition, and promote healthy plant growth.
- Continue maintaining clear fire lines, ensuring they are regularly cleared before the dry season to improve effectiveness in preventing forest fires.
- Undertake timely replanting with healthy bagged seedlings to maintain proper stocking density, enhance survival rates, and strengthen plantation health.
- Increase the frequency and ensure proper timing of pruning operations to encourage healthy growth and better bole formation.
- Install and maintain plantation boundary stones and boards for accurate demarcation, better monitoring, prevention of encroachments, and reliable record-keeping.



Kandivalasa beat, Srikakulam range



Budarisingi, Kasibugga range



Jambada beat, Palakonda rang



Dasaradha puram, Pathapatnam range

3. Monitoring and Evaluation of Soil and Moisture Conservation (SMC) Activities

A total of one activity was carried out during 2016-17 in Tekkali range, 20 % was sampled which is equivalent to single activity. No SMC works were recorded in other ranges of Srikakulam division.

3.1 Estimate for providing Bore Well at Telineelapuram Birds area of Tekkali Section & range

GPS location: N 18.573633 E 84.265497 **SO no. and year:** DSO 374 (2016-17)

Bore well was monitored and evaluated in the Telineelapuram birds' area in Tekkali range. The Bore well with the depth of 60 feet was drilled and structure is well maintained, and its measurements align with the recorded specifications. It demonstrates good water facility. However, periodic maintenance is recommended to enhance effectiveness.



Bore well at Telineelapuram birds' area in Tekkali range

4. Monitoring and Evaluation of Construction Activities

Under the CAMPA total six construction activities were reported in Srikakulam division during 2016-17, of which two were sampled in Tekkali range 4 activities (1 sampled) and Srikakulam range 2 activities (1 sampled). No construction activities were recorded in other ranges of Srikakulam division.

4.1 Estimate for erection of bamboo shelter for the protection of Turtle eggs at near Matchilesam (V), Matchilesam beat of Sreekurmam section of Srikakulam range

GPS Location: N 18.248552 E 84.011256 **SO no & year:** DSO 281 (2016-17)

A bamboo shelter measuring 140 ft × 28 ft was constructed at Sreekurmam, Matchilesam beat during 2016–17 to protect turtle eggs by providing a safe environment against predators, human disturbance, and environmental hazards. During the recent field visit, the shelter was not found at the site. The Beat Officer explained that it is re-constructed and relocated every nesting season based on turtle activity and site conditions.

4.2 Construction of (19) no's boundary pillars work at Meghavaram village limits to Kothalingudu village limits of Mulapeta beat/ section in Tekkali range

GPS Location: N 18.513823 E 84.294264 **SO no. and year:** DSO 367 (2016-17)

A total of 19 RCC boundary pillars were constructed with the measurements of Height 1.20 m, Top width 0.30 m and Bottom width of 0.45 m to demarcate reserve forest from revenue land. All pillars were found intact, in good condition and effectively marking the boundary though some had partially submerged bases.



Turtle hatching in Srikakulam range



RCC Pillars in Tekkali range

5. Monitoring and Evaluation of Other activities

During 2016–17, a total of 55 activities under the “Others” category were carried out, of which 11 were sampled for verification. The highest number of activities was reported in Palakonda (15, with 3 sampled), followed by Pathapatnam (14; 3 sampled), Kasibugga (11; 2 sampled), Srikakulam (10; 2 sampled), and Tekkali (5; 1 sampled). Document verification and cross-checking were conducted in the presence of Division and Range office staff. The verification process included reviewing sanction orders, estimation sheets, and work registers. It was observed that sanctioned amounts matched actual expenditures, and all financial records were properly maintained and duly authenticated by the respective officials (DFO, SDO, and FRO). Fund utilization was appropriate and adhered to approved estimates and CAMPA guidelines. Both internal and external audits, conducted by the Conservator of Forests and the Accountant General’s Office respectively, confirmed compliance with financial and administrative protocols.

Key Findings

- Plantation survival ranged between 65% and 89%, with site-specific factors such as soil conditions, slope, and maintenance intensity strongly influencing outcomes.
- Area discrepancies were observed across all sampled plantations, indicating the need for accurate mapping and verification.
- Plantations were generally healthy, showing negligible pest incidence and minimal grazing pressure, reflecting good overall site protection.
- Turtle protection measures and boundary demarcation works were relevant to site objectives and largely effective in implementation.

Recommendations

- Reconcile plantation area records through GIS-based mapping and systematic perambulation to ensure spatial accuracy and eliminate discrepancies.
- Introduce semi-permanent or modular turtle shelters to enhance durability and reduce annual reconstruction efforts while ensuring species protection.
- Ensure timely erection of bamboo shelters at appropriate nesting sites each season, following established ecological guidelines.
- Maintain detailed records of shelter installation, relocation, and reconstruction to strengthen monitoring and impact assessment.
- Intensify maintenance operations and update plantation records regularly to track survival, growth, and protection measures effectively.

- Install and maintain plantation signage and boards to improve visibility, transparency, and accountability during monitoring and audits.
- Expand participatory management through VSS/JFMC involvement, fostering community stewardship in both plantation protection and turtle conservation efforts.

V. ASSESSMENT OF VANA SAMRAKSHANA SAMITI INVOLVEMENT

The evaluation of CAMPA-funded activities during 2016–17 was undertaken to assess the social, environmental, and economic impacts achieved through plantation and allied works. The purpose was not only to measure the effectiveness of plantations in achieving ecological regeneration and livelihood support but also to identify undesirable impacts that were avoided. The evaluation placed emphasis on the role of community institutions, particularly Vana Samrakshana Samitis (VSS), in shaping sustainable outcomes.

Specifically, the evaluation focused on four dimensions

1. Social Impacts – Assessing community participation, employment generation, and inclusion of vulnerable groups.
2. Environmental Impacts – Improvement in forest cover, biodiversity conservation, soil and moisture protection, and fire prevention.
3. Economic Impacts – Wage employment, income opportunities through forest-based activities, and benefit-sharing mechanisms.
4. Institutional Strengthening – The role of VSS/JFMCs in planning, execution, monitoring, and sustaining plantation and protection works.

Role and Responsibilities of VSS

The Vana Samrakshana Samiti (VSS), operating under the Joint Forest Management (JFM) framework, serves as a vital link between the Forest Department and local communities. Its primary mandate is to protect forests from illegal felling, grazing, encroachment, and fire, while actively participating in forest regeneration and restoration programs. Beyond merely implementing departmental instructions, VSS plays an active role in the execution of various schemes, including CAMPA, watershed management, and soil and moisture conservation initiatives.

Functioning through participatory decision-making processes facilitated by the Gram Sabha, VSS ensures inclusive representation of women, Below Poverty Line (BPL) families, and fringe villagers. This participatory model integrates local ecological knowledge into planning and promotes equitable benefit sharing. Employment opportunities are generated through activities such as pitting, planting, weeding, pruning, and creation of fire lines, while livelihood enhancement is supported through non-timber forest produce (NTFP) collection and other income-generating activities.

In the long term, VSS fosters a sense of community ownership and shared responsibility towards forest conservation by enabling benefit-sharing mechanisms and promoting stewardship over regenerated areas. Awareness and capacity-building initiatives undertaken by VSS further enhance community understanding of climate change adaptation, sustainable resource use, and forest governance, thereby reinforcing the foundation for participatory forest management.

Significance of VSS

The significance of VSS lies in its ability to blend ecological priorities with socio-economic development. By providing communities with tangible benefits while protecting natural resources, the VSS model ensures that conservation is not an imposed activity but a mutually beneficial partnership. This approach contributes to the socio-economic development of stakeholders particularly the vulnerable and underprivileged while simultaneously drawing upon local wisdom to rejuvenate forests in an inclusive and sustainable manner.

By actively involving marginalized groups, VSS strengthens social inclusion and reduces inequities in resource management. Moreover, through vigilant monitoring and responsible use of forest resources, VSS helps mitigate man-animal conflicts and prevents further degradation of fragile ecosystems. The model thus represents a holistic approach, where ecological integrity and human welfare advance together.

Division-wise Assessment of VSS Involvement

A review of division-wise participation reveals varying degrees of VSS involvement across Andhra Pradesh. Out of the 24 forest divisions reviewed, approximately 18 divisions (around 75 %) reported active participation of Village Forest Committees (VSS) in plantation establishment and management, while about six divisions (25 %) had limited or no involvement. The highest concentration of active VSS participation was observed in Kakinada, Atmakur, Markapur, Vizianagaram, and Kadapa Divisions, where multiple ranges reported community engagement. These divisions benefited from strong grassroots coordination and effective implementation of Joint Forest Management (JFM) principles, leading to better integration between departmental initiatives and local needs. The widespread presence of VSS in these areas reflects high levels of awareness, robust institutional support, and a strong willingness among local communities to participate in forest regeneration efforts.

In contrast, divisions such as Tirupati, Krishna, and sections of Chittoor, Ananthapuramu, and Narsipatnam exhibited minimal or no VSS involvement. These sites were often associated with newly established plantations, remote or fragmented locations, or areas with weaker institutional presence. Spatially, coastal, and forest-rich divisions (e.g., Kakinada, Vizianagaram) showed higher VSS participation compared to interior dry divisions (e.g., Tirupati, Ananthapuramu), suggesting that socio-ecological and demographic factors play a key role in shaping community engagement. In divisions with weak participation, the absence of active VSS highlights the need for sustained awareness programs, capacity building, and targeted engagement strategies to improve local involvement and ownership. Without such interventions, the long-term sustainability of plantations in these areas may remain uncertain.

Overall, the findings reaffirm that community participation is a critical determinant of plantation success. Divisions with stronger VSS presence demonstrated better alignment of social, environmental, and economic objectives, resulting in more resilient and locally supported plantation outcomes. Conversely, where VSS involvement was weak or absent, plantations risked being perceived as externally driven projects rather than community-owned initiatives. Strengthening VSS capacity, revitalizing inactive committees, and integrating them more closely into monitoring, protection, and benefit-sharing mechanisms will be essential to sustain plantation health and foster long-term community stewardship.

General Observations

The implementation of CAMPA activities across various divisions demonstrated strong community participation and effective collaboration between the Forest Department and local institutions such as the Joint Forest Management Committees (JFMCs) and Vana Samrakshana Samithis (VSS).

The VSS played an active role in project planning, implementation, and monitoring of plantation, maintenance, soil and moisture conservation (SMC), protection, and construction activities. Fringe villagers were well-informed about CAMPA objectives and operational

processes through special meetings conducted by the *Grama Sabha* and VSS, ensuring transparency and local awareness.

Species selection was carried out jointly by the Forest Department and local communities through the VSS, reflecting both ecological suitability and community preferences. The plantation activities provided multiple socio-economic benefits, particularly through employment generation. Local villagers were engaged in activities such as pitting, planting, weeding, pruning, and creating fire lines each contributing not only to plantation establishment and protection but also to livelihood enhancement.

The Focus Group Discussions (FGDs) revealed that community members were aware of the project budgets, records, and technical supervision processes. Both the Forest Department and VSS jointly oversaw the progress and quality of works, and FGD participants expressed overall satisfaction with the implementation and outcomes of CAMPA interventions.

The tangible benefits to local communities were evident in the form of consistent employment opportunities and skill development. Activities such as pitting, planting, and pruning provided income to local labourers, while the creation of fire lines supported forest protection and offered additional seasonal work. This participatory approach not only strengthened the ecological success of plantations but also promoted socio-economic development and fostered a sense of shared ownership and responsibility toward forest resources.

Furthermore, this inclusive model draws upon local wisdom and participation, contributing to the dual goals of ecological restoration and community empowerment. It has been particularly beneficial for vulnerable and underprivileged groups residing in forest fringes.

Local stakeholders also expressed interest in expanding the scope of future plantations to include Non-Timber Forest Product (NTFP) species, enabling sustained livelihood opportunities through the collection and sale of forest produce. To further enhance the effectiveness and inclusiveness of CAMPA activities, there is a recognized need for structured awareness and capacity-building programs to educate the local population about CAMPA objectives, benefits, and long-term ecological importance.

Conclusions

The evaluation underscores that active VSS participation is central to the long-term success of CAMPA-funded plantations. Where VSS was effectively engaged, plantations not only contributed to ecological regeneration but also delivered socio-economic benefits to forest-dependent communities. However, divisions with weak or absent VSS reveal gaps in community engagement that require urgent attention. Strengthening awareness campaigns, expanding inclusion of NTFP species, and enhancing institutional capacity of VSS will ensure that CAMPA objectives are fully realized. Ultimately, community-driven forest management remains the cornerstone of sustainable afforestation and ecological security in Andhra Pradesh.



VSS in Bailuty range, Athmakur division



VSS in Turimella range, Giddalur division



VSS in Vinukonda range, Guntur division



VSS in Mamillapalli beat, Kadapa range



VSS in Labbarthi beat, Rajavommangi range



VSS in Tuggali beat, Adoni range



VSS in Gotlagattu beat, Markapur range



VSS in Y Palem range, Markapur division

VI. DIVISION WISE SUMMARY OF CAMPA ACTIVITIES

The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) was established to promote afforestation and ecological restoration in areas affected by forest diversion, thereby compensating for environmental loss and enhancing forest ecosystem services. During 2016–17, the 24 forest divisions of Andhra Pradesh implemented a diverse range of CAMPA activities encompassing plantations, maintenance, protection, soil and moisture conservation (SMC), construction, and other ancillary works. This chapter presents a detailed division summary on assessment of these activities, including implementation status, field verification of plantation survival and growth, maintenance and protection measures, and financial and administrative compliance. Emphasis is placed on ecological effectiveness, species–site matching, community participation (notably by Vana Samrakshana Samithis, VSS), and documentation standards.

1. Chittoor East Division

During 2016–17, Chittoor East division implemented 218 CAMPA activities, of which 48 (22.02 %) were sampled for monitoring. The distribution of works reflected an imbalance, with “*Other works*” (125 activities) dominating, while ecologically critical components such as maintenance (49), plantations (21), protection (19), and construction (4) were fewer. The most significant shortcoming was the absence of Soil and Moisture Conservation (SMC) activities, a critical omission for a landscape characterized by undulating terrain, erosion-prone red soils, and recurring drought stress.

Plantations achieved high survival (85–95%), but growth outcomes varied from location to location. Mixed plantations of *Pterocarpus santalinus*, *Syzygium cumini*, and *Hardwickia binata* on rocky soils survived well but showed modest growth (height: 2.3–4.7 m; girth: 5–36 cm). In contrast, pure Red Sanders plantations on coarse sandy soils demonstrated remarkable adaptability, with survival above 94% and vigorous growth (height: 5.3–6.9 m; girth: 28–36 cm). These results highlighted the importance of species–site matching, with rocky soils supporting stable mixed plantations and sandy soils favoring accelerated Red Sanders growth. However, GIS verification revealed area mismatches, plantation journals were incomplete, and signage or boundary boards were often missing or damaged, weakening transparency.

Maintenance works (49 activities) contributed to improved bole formation and weed suppression through weeding, coppicing, pruning, fertilizer application, and fire line upkeep. Nevertheless, irregular journal entries, uneven fertilizer distribution, and poor upkeep of boundary boards were noted. Protection works (19 activities) primarily involved fire line creation (3–6 m wide; 2,000–10,000 m long). While lines were laid to specification, their effectiveness was uneven, often reduced by weed and *Lantana camara* invasion due to inadequate seasonal upkeep. Construction was a marginal component (4 activities), with the RCC water tank at Kurinjalam noted as well-built and functional. Though useful, these works offered limited ecological value compared to core plantation and protection measures. On the financial side, records were robust and audit-compliant, reflecting sound expenditure management. However, technical documentation is weak, with incomplete plantation journals with no data on survival/ growth.

2. Chittoor West Division

In 2016–17, Chittoor West division implemented 175 CAMPA activities, of which 41 (23 %) were sampled across all five ranges. The portfolio was dominated by maintenance activities (60) and other works (83), while plantations (24), protection (7), and a single SMC intervention formed smaller components. This reflects a focus on sustaining earlier plantations, but also a critical neglect of soil and moisture conservation measures, essential in the semi-arid terrain of the division.

Plantations performed well, with survival rates ranging between 80–97 %, though species–site variability was evident. *Hardwickia binata*, *Terminalia arjuna*, and *Pterocarpus santalinus* generally showed high survival and healthy growth (up to 6.3 m height and 37 cm girth) in suitable sites. However, *P. santalinus* survival fell to 57.8% at Marripadu, highlighting the sensitivity of the chosen locations. GIS verification revealed that plantation areas often exceeded sanctioned extents, pointing to strong ground-level execution but also discrepancies in official records. Pest infestations were evident at Kangundi and Muthukur, and community involvement by VSS groups was not consistent in the various ranges.

Undertaking maintenance activities was seen to improve plantation health through weeding, pruning, and fire line upkeep. However, plantation performance rates were significantly low in Kangundi, where plantations diminished due to excessive grazing and spread of lantana. Adequate protection measures were not observed throughout, all though it was effective in certain locations, such as fire lines at Punganur and fencing at Marripadu. The sole SMC intervention, was the construction of a percolation tank at Damarakunta, which was functional but affected due to siltation, reflecting both utility and the consequences of neglecting routine upkeep. No construction works were reported. Financial record keeping was adequate and audit-compliant, but technical documentation remained lacking, with improper plantation journal maintenance, missing boards, and faulty updating of survival and growth figures.

3 Rajampet Division

During the period under reference Rajampet division implemented 79 CAMPA activities, of which 22 (25 %) were sampled for detailed evaluation. The interventions composed of a balanced mix of plantations, maintenance, soil and moisture conservation (SMC) works, and ancillary activities, though no significant construction or protection works were reported. The division's heterogeneous forest conditions - ranging from moderately dense patches to degraded and semi-arid tracts reflected both a success and a challenge.

Plantation development was the central focus, with seven plantations raised and four sampled. Species included *Pterocarpus santalinus*, *Hardwickia binata*, *Azadirachta indica*, *Syzygium cumini*, and *Holoptelea integrifolia*. In fertile sites, plantations performed well, with survival rates often above 90 % with a healthy growth in height and girth. *Pterocarpus santalinus* showed resilience and adaptability. However, in fragile semi-arid zones, survival dropped to around 55%, and growth was stunted, underscoring the importance of SMC in supporting plantations under stress conditions. GIS verification revealed area discrepancies with some plantations exceeding records due to natural boundaries, and others falling short due to rocky or barren terrain highlighting the need for stronger geo-referencing.

Maintenance activities predominated the interventions (34 works; 9 sampled) and generally strengthened plantation health through casualty replacement, soil working, pruning, coppice management, and fire line upkeep. Evaluations confirmed positive impacts on survival and growth, though fertilizer application was uneven, plantation boards were missing or damaged, and fire lines required more frequent clearance. SMC interventions were relatively well-represented, with 12 works implemented and 2 sampled. Saucer pits and check dams were generally constructed as per specifications and contributed effectively to soil conservation, runoff reduction, and water availability, especially in semi-arid tracts. Minor issues such as silt accumulation and wear in cemented portions indicated the need for periodic desilting and repairs to sustain efficiency. Under “Other” works, 26 activities were undertaken (7 sampled), which provided miscellaneous support to plantation and protection functions. Financial and administrative systems were found to be robust, with proper documentation and audit compliance, ensuring transparency.

4 Tirupati Division

Tirupati division during 2016-17, implemented 76 CAMPA activities, of which 19 (25 %) were sampled for monitoring. The interventions covered plantations, maintenance, protection works, soil and moisture conservation (SMC), construction, and other ancillary activities.

Plantation activities were the major focus, with three Red Sanders plantations undertaken (two sampled in Tirupati and Chamala ranges). However, both sampled plantations expressed low performance: Lakshmipuram (25 ha, Tirupati range). The poor performance was due to the heavy grazing, coupled with a very low survival rate. Perambulated extent exceeding the recorded area (41.42 ha vs. 25 ha). Bhakarapet (25 ha, Chamala range) unsuccessful under poor soils, recurring fires, and insufficient rainfall, with stunted growth and poor survival (average height 25 cm; girth 2 cm).

Maintenance works were limited to two activities (one sampled) in Papavinasanam beat (20 ha), where weeding, coppice cutting, and pruning were properly executed. However, plantation boards were damaged, reducing monitoring efficiency. Protection measures included seven fire lines (two sampled). The Mamandur beat fire line (10 m × 5,000 m) was well maintained and effective, while the Papanasam beat fire line (10 m × 10,000 m) had become overgrown, undermining its utility. Under SMC, a rock-fill dam at Balapalli range was evaluated. While functional, it exhibited seepage, apron damage, and siltation, requiring urgent repair to maintain effectiveness. Construction included a reception counter at Nagaravanam (Alipiri beat), which was found to be well-constructed and functional at the time of inspection. Other works formed the bulk of the portfolio, with 57 activities (12 sampled). Records were generally well maintained, though some work registers were missing in Balapalli and Chamala ranges, indicating lapses in documentation.

5 Nellore Division

Nellore division in 2016–17, implemented 306 CAMPA activities, of which 64 (20%) were sampled for evaluation. Activity distribution was even across ranges, with the largest shares in Kavali (69, 16 sampled) and Atmakur (61, 12 sampled), followed by Udayagiri (52, 10 sampled), Nellore (49, 10 sampled), Venkatagiri (46, 10 sampled), and Rapur (29, 6 sampled). The portfolio of CAMPA activities was dominated by other works (153 activities), followed by

maintenance (97), with smaller allocations to plantations (26), construction (11), SMC (10), and protection (9).

Plantations (26; 5 sampled): *Terminalia arjuna* at Veliganda (Kavali) showed strong survival (86.3%), while *Hardwickia binata* fared poorly at Marripadu (49%) and moderately at Kothacheruvu (63%). *Sterculia urens* at South Mopuru (Nellore) performed exceptionally well, with survival above 93% and healthy growth (3.5–4.5 m). A Red Sanders plantation at KM Palem (Kavali) faced encroachment threats, with plantation board missing. Perambulation revealed actual plantation areas consistently exceeded sanctioned extents, indicating expanded ground coverage. Biotic pressures, mainly grazing, were noted but partly controlled through trenches and watchers. VSS involvement was strong across sites.

Maintenance (97; 20 sampled): Activities included casualty replacement, weeding, coppice regulation, pruning, soil tilling, and fire line upkeep. Implementation was generally satisfactory, though absence of plantation boards and recurring lantana growth were common gaps. Recommendations emphasized intensified weeding (especially invasive control), proper boundary demarcation, timely replanting, coppice management, and fertilizer use to strengthen plantation health.

Protection (9 implemented; 2 sampled): Chain-link fencing at Nagaravanam (260 m, Nellore) was intact and effective. A fire line in SR Puram (Udayagiri) was dimensionally correct but overgrown with weeds, limiting functionality. Regular upkeep was recommended. SMC (10; 2 sampled): Structures were functional but already impacted by siltation and wear. The Kesavaram check dam (Kavali) required desilting, while the mini percolation tank at Arlapadia (Udayagiri) showed weed growth and stone displacement. Maintenance was identified as critical to ensure long-term utility. Construction (11 implemented; 2 sampled): Both sampled works in Nellore range were well executed. A walking track in Nellore R.F. (290 m) was sturdy, regularly maintained, and promoted eco-tourism. Children's play equipment at Nagaravanam was safe, ecologically sensitive, and in active use. Other works (153 implemented; 32 sampled): These dominated the division's portfolio. Document verification confirmed that sanction orders matched expenditures, records were generally well maintained, and both internal and external audits ensured financial transparency. Minor gaps were noted in site-specific record maintenance, but overall compliance was strong.

6 Kadapa Division

Kadapa division implemented 122 CAMPA activities, of which 29 (23%) were sampled for detailed evaluation. Distribution across ranges was: Kadapa (35 implemented; 9 sampled), Sidhout (32; 8), Vempalli (29; 7), and Vontimitta (26; 5). The portfolio was dominated by "other works" (91; 18 sampled), followed by maintenance (22; 6), plantations (7; 4), and protection (2; 1). No construction or soil and moisture conservation (SMC) works were undertaken in this year.

In Kadapa range, the Mamillapalli (20 ha) *Pterocarpus santalinus* plantation achieved 92.56% survival, with robust growth (5.56–6.94 m height; 29.73–38.66 cm girth). In Vempalli range, the Idupulapaya plantation (8 ha) displayed good survival of *Hardwickia binata* (84.29%), *Dolichandrone crispera* (80.99%), and *Sterculia urens* (76.03%), with moderate growth (2.11–4.40 m height; 20.3–34.1 cm girth). At Gorlapalli (10 ha), *Pterocarpus santalinus* excelled with 95.04% survival and excellent growth (7.99–9.98 m height; 31.04–36.25 cm girth). In Vontimitta

range, the Chintalakunta plantation (20 ha) achieved strong survival and growth for *Dalbergia latifolia* (94.21%) and *Hardwickia binata* (87.60%). Verification through KML and QGIS showed perambulated areas consistently exceeded recorded extents (by 0.32–7.01 ha). Plantations were generally healthy, free of pest damage, and supported by fire lines and watchers, with strong VSS participation. Minor issues included missing records for Gorlapalli and damaged boards.

Operations included casualty replacement, soil working, pruning, coppice regulation, weeding, and fire line upkeep. Implementation was satisfactory, though plantation boards were often missing and journals required more regular updating. Recommendations emphasized intensified pruning, coppice management, and replanting with healthy seedlings to maintain plantation vigor. At Rollabodu beat (Sidhout), a fire line (1,900 rmt × 6 m) was dimensionally correct and well maintained, though natural regrowth reduced the width slightly, requiring periodic clearance.

Verification confirmed that activities were consistent with sanction orders, financial records were well maintained, and audits (internal and external) ensured compliance and transparency. Minor gaps were observed in divisional estimates and registers.

7 Proddatur Division

Proddatur division implemented 146 CAMPA activities, of which 37 (25%) were sampled for monitoring and evaluation. Range-wise distribution showed Badvel (41; 9 sampled), Porumamilla (36; 8), Onipenta (29; 7), Proddatur (23; 9), and Muddanur (17; 4). Activity composition was dominated by “other works” (102; 24 sampled), followed by maintenance (29; 8), plantations (9; 4), and protection (6; 1). None of the soil and moisture conservation (SMC) or construction works were reported.

Outcomes were mixed across ranges. In Porumamilla (Siddavaram, 20 ha), plantations of *Pterocarpus santalinus* and *Hardwickia binata* showed moderate survival (59.3% and 65%, respectively), with variable growth (0.96–4.72 m height; 7.8–37.2 cm girth). In Badvel (Ganugapenta, 20 ha), the plantation completely failed due to invasion by *Acacia pycnantha*, leaving no surviving *P. santalinus*. In contrast, Onipenta (Muddireddypalli, 20 ha) achieved high success, with *P. santalinus* survival of 87.4%, strong growth (5.5–6.8 m height; 30–33 cm girth), and only localized pest damage. In Proddatur (Nagasanipalle, 20.83 ha), plantations performed well, with survival above 78% across *Hardwickia binata*, *Azadirachta indica*, and *Dolichandrone crispera*, and good growth (3.2–5.2 m height; 29.3–34.6 cm girth). GIS-based verification revealed that perambulated areas exceeded recorded extents in all sites (e.g., Siddavaram +6.81 ha, Ganugapenta +5.12 ha, Nagasanipalle +2.33 ha). Plantation journals were maintained, boards were present at many sites, and VSS participation was noted at three plantations, though absent at Muddireddypalli.

Maintenance works included casualty replacement, weeding, soil tilling, pruning, and fire line upkeep at sites such as Muddanur (B.K. Mala, 25 ha), Onipenta (Kothapalli, 20 ha), Badvel (Lothuvanka, 25 ha), and Porumamilla (B.K. Mala road diversion, 3.224 ha). Implementation of maintenance activities was satisfactory, but plantation boards were often damaged or missing, and records needed more regular updating.

Protection work at Settivaripalli beat (Muddanur range), a fire line (2,843 rmt × 3 m) was dimensionally correct but had overgrown with weeds and grass, limiting its effectiveness. This underscored the need for regular upkeep. Verification confirmed that activities matched sanction orders, expenditures were accounted for, and audits ensured financial transparency and compliance. However, typographical errors in expenditure entries were observed in divisional records, particularly for DSOs in Onipenta, Porumamilla, and Proddatur ranges.

8 Ananthapuramu Division

In Ananthapuramu division 222 CAMPA activities were implemented, of which 47 (≈21%) were sampled for detailed monitoring and evaluation. Activity distribution across ranges was: Kadiri (84), Kalyandurg (52), Ananthapuramu (30), Bukkapatnam (21), Gooty (19), and Penukonda (16). The portfolio comprised 127 maintenance works, 56 “other works”, 31 plantations, 3 SMC works, 3 construction activities, and 2 protection works.

A few species are suited to semi-arid conditions were planted, including *Hardwickia binata*, *Pongamia pinnata*, *Sterculia urens*, and *Azadirachta indica*. Overall plantation performance was encouraging, with survival rates above 80 % at most sites. Examples include *Hardwickia binata* at Yellutla (83.12 % survival) and *Azadirachta indica* at Setturu (91.35% survival). Tree growth was generally positive, with heights between 3–4 m and girths of 20–40 cm. Field verification revealed discrepancies between recorded and actual plantation extents, with some sites showing deficits (Yellutla: -7.08 ha) and others exceeding records (Setturu: +2 ha). Plantations were largely healthy, with limited pest attacks, though grazing pressures caused some stunting. Fire lines were present, watchers deployed, and plantation journals maintained, though many required more frequent updating.

Maintenance formed the largest category of activities and was critical for sustaining plantations in semi-arid conditions. Works included weeding, coppice management, pruning, soil working, casualty replacement, and fire line upkeep. Field verification confirmed satisfactory implementation, though damaged or missing boundary boards and outdated journals were noted. Recommendations emphasized intensified weeding (particularly Lantana control), timely replanting, consistent fertilizer application, and regular journal updates.

Fire lines were created to protect plantations in fire-prone areas. Verification confirmed specifications were met, lines were clear, visible, and well maintained, with no excessive weed growth. Though few, SMC activities provided significant ecological benefits, including water retention, soil stabilization, and support for plantation regeneration. Structures were built as per specifications and verified in the field. One notable activity included a bird enclosure at Thimmamma Marrmanu (Kadiri range). Field evaluation confirmed proper construction, good maintenance, and adherence to recorded dimensions. It is suggested that drainage and cement plastering of the basement can enhanced durability. Based on a thorough review of the registers, it was observed that actual expenditures matched sanctioned amounts. Records were properly maintained, authenticated, and audited, ensuring transparency and accountability.

9 Giddalur Division

In Giddalur division during 2016-17, 53 CAMPA activities were undertaken, of which 12 (22%) were sampled for detailed monitoring and evaluation. Activity composition was dominated by

“other works” (36; 8 sampled), followed by plantation (4; 1 sampled), maintenance (3; 1 sampled), protection (4; 2 sampled), and soil and moisture conservation (SMC, 6; 1 sampled). No construction works were reported.

All plantations were established in Turimella range, primarily under the Assisted Natural Regeneration (ANR) model. The Papinenipalli (20 ha) *Hardwickia binata* gap plantation achieved 69% survival, with average heights of 2.8–2.96 m and girths of 20–22 cm. Plantation health was generally satisfactory, though cattle grazing posed minor pressure. GIS verification revealed a substantial discrepancy between recorded and actual areas (20 ha recorded vs. 47.2 ha perambulated), highlighting the need for reconciliation of spatial records.

Maintenance operations, including pruning, coppice management, and fire line upkeep, were implemented satisfactorily at sites such as Madhavapuram (13 ha). Plantation boards were present, and works contributed positively to plantation establishment. Fire lines, measuring 3–5 m in width and 7,500–9,300 m in length, were generally laid to specification. While some lines were well maintained, the Velagalapaya fire line exhibited weed growth, reducing its effectiveness and indicating the need for regular seasonal upkeep. SMC works were entirely in Turimella range. A check dam at Thallapaya matched design specifications (4 m × 1.3 m × 0.45 m) but required repairs for seepage and desilting to maintain functionality. Financial audits confirmed that expenditures matched sanctioned amounts, and records were properly maintained, ensuring transparency.

10 Kurnool Division

In Kurnool division 85 CAMPA activities were implemented, with 19 (22%) sampled for monitoring and evaluation. The activity portfolio included plantations (3; 1 sampled), maintenance (38; 7 sampled), construction (8; 2 sampled), protection (1), and other works (35; 8 sampled). No soil and moisture conservation (SMC) activities were reported. Plantations (3; 1 sampled): Plantations were implemented in Adoni range (Tuggali beat, 20 ha) and exhibited excellent survival rates: *Hardwickia binata* 91.7%, *Azadirachta indica* 89.8%, and *Soymida febrifuga* 90.1%. Growth was healthy, with tree heights of 2.2–3.0 m and girths of 21–28 cm. GIS verification revealed significant discrepancy between recorded and perambulated areas (+10.7 ha). No pest, disease, or grazing damage was observed, and fire protection measures were effective.

Maintenance works across Dhone, Adoni, and Kurnool ranges included weeding, pruning, coppice management, and fire line upkeep, executed satisfactorily. Plantation boards were missing or damaged at some sites, reducing monitoring effectiveness. A fire line in Dhone range (4,839 m × 3 m) met specifications and was clear and effective. Structures, including a vehicle parking area and an open-air theatre at City Forest, Gargeyapuram, were built to specifications and functional. Overgrowth of weeds/grass suggested weak ongoing maintenance. Financial verification confirmed that expenditures matched sanctioned amounts, confirmed by internal and external audits and proper record-keeping.

11 Nandyal Division

Nandyal division covers 1,109.66 km² of forest land, comprising moderately dense forest (797.10 km²), open forest (266.14 km²), very dense forest (46.42 km²), and scrubland (442.63

km²), indicating ecological fragility. Recent forest loss of 2.84 km² was attributed to grazing, fire incidence, and degradation. In 2016–17, 10 CAMPA activities were implemented, of which 5 (25 %) were sampled for monitoring. Activities were evenly distributed across Panyam (5; 2 sampled) and Banaganapalli (5; 3 sampled) ranges. The activity portfolio was dominated by maintenance (9; 4 sampled), with only one protection work. No plantation, SMC, or construction activities were undertaken during the year.

Maintenance (9; 4 sampled): Works were carried out in Konidedu beat (Panyam) and leased safety zone plantations (Banaganapalli). Activities such as weeding, soil tilling, and fire line upkeep were implemented according to sanctioned orders. Plantation boards were missing or damaged, limiting site identification and monitoring effectiveness. Protection (1): A fire line in GA Bad beat (Banaganapalli range) measured 10 m × 5,000 m, conforming to specifications. Visibility was clear, but moderate weed regrowth indicated the need for periodic clearance to maintain functional effectiveness.

12 Atmakur Division

Atmakur division implemented 120 CAMPA activities during 2016-17, of which 29 (24%) were sampled for detailed monitoring and evaluation. Activities were distributed across plantations, maintenance, soil and moisture conservation (SMC), and other support works, reflecting the division's ecological diversity and operational priorities. No construction or protection works were reported during the year.

Plantations were primarily bamboo (*Dendrocalamus strictus*) under the Assisted Natural Regeneration (ANR) model. Performance varied widely, moderate survival (~65%) with healthy growth; clump girths >3 m, culm girths >14 cm, demonstrating bamboo adaptability under favorable conditions in P.A. Puram and Pangidi. Poor survival (29% and negligible, respectively); Pecheruvu had scattered seedlings <1 m tall, indicating near-complete downfall in Siddapuram plantation and Pecheruvu. 42% survival, constrained by poor soils and heavy grazing pressure in Venkatapuram. Area verification via KML mapping and field perambulation showed mismatches between recorded and actual extents, emphasizing the need for accurate boundary demarcation and geospatial monitoring.

Maintenance operations included soil working, weeding, pruning, and fire line management. Implementation was confirmed, but plantation boards were absent and journals inadequately updated. The limited scale of maintenance was insufficient to safeguard the plantations, leaving them vulnerable to weeds, grazing, and fire. Only one intervention in the form of a water absorption trench in Indireswaram West beat was well executed and it was found effective in conserving moisture. However, the limited number of SMC works constrained their impact across the division, underscoring their importance for plantation resilience in shallow-soil, low-rainfall zones. The largest share of activities fell under “other works.” Document verification confirmed that sanction orders, estimates, and work registers were generally well maintained, with expenditures aligned with sanctioned amounts. Internal and external audits verified transparency. Nevertheless, missing or incomplete records in several ranges (Nagaluty, Atmakur, Bairluty, Velgode, Srisailam) reduced accountability.

13 Markapur Division

In Markapur division 122 CAMPA activities were implemented, with 27 activities (22%) evaluated through field verification. Activities were unevenly distributed across ranges, with GV Palli and Dornala accounting for the highest number of works, while Y. Palem and V.P. South carried fewer. The portfolio was dominated by “other works” (90), with plantations (19) and maintenance/construction activities forming a smaller share. Notably, no protection or soil and moisture conservation (SMC) activities were undertaken, indicating a portfolio skewed away from ecological restoration and resilience-building functions.

Results were highly variable, Gotlagattu (Markapur range, 20 Ha): Notable success with *Azadirachta indica* and *Syzygium cumini* achieving survival above 85%; *Sterculia urens* showed moderate growth (~69%). Proper site-species matching and adequate care contributed to healthy canopy establishment. GV Palli and Dornala ranges: Bamboo plantations underperformed; Nekkanti (GV Palli) survival 43 %, Regumanupenta (GV Palli) and Chinnamanthanala (Dornala, 5 Ha) plantations largely failed. Causes included rocky soils, poor water availability, grazing, and inadequate post-planting care. Y. Palem (Komarolu): Mixed outcomes, with survival ranging 43–55%, indicating inconsistent establishment. Verification via KML and QGIS mapping revealed that perambulated areas consistently exceeded recorded extents (e.g., Gotlagattu +4.58 Ha, Komarolu +4.28 Ha), pointing to inadequacies in initial survey techniques and the need for stricter geospatial monitoring.

Activities included weeding, inter-ploughing, and fire line creation, but shortcomings such as missing plantation boards were observed (e.g., K.J. Padu). The low number of maintenance operations relative to plantation activities suggests insufficient support during critical establishment phases. RCC pillars were erected effectively, with 89 pillars at Jammanapalli and 42 at Bommalapuram. Structures were intact and functional, though minor issues with plastering and width consistency were noted. Financial and administrative records were well maintained, expenditures aligned with sanctioned amounts, and audits confirmed compliance. However, the emphasis on administrative tasks may have diluted focus from ecological restoration priorities.

14 Guntur Division

Guntur division witnessed the implemented 127 CAMPA activities, of which 26 activities (20.47%) were sampled for monitoring and evaluation. The range-wise distribution was: Guntur (55 activities, 9 sampled), Vinukonda (48, 11 sampled), Macherla (20, 5 sampled), and Repalli (4, 1 sampled). By activity type, the portfolio was dominated by “other works” (75, 15 sampled), followed by maintenance (41, 8 sampled), plantations (5, 1 sampled), construction (4, 1 sampled), and protection (2, 1 sampled). No soil and moisture conservation (SMC) activities were undertaken.

At Badrupalem (Vinukonda range, 20 Ha), a mixed plantation of *Terminalia arjuna* and *Holoptelea integrifolia* was established on gravelly red soils. Survival rates were 84.95% and 85.12%, respectively, with moderate growth (heights 2.25–4.41 m; girths 21.72–34.80 cm). Field verification (KML/QGIS) showed the perambulated area slightly exceeded the recorded area (20.51 Ha vs. 20 Ha). Plantations were healthy, free from pests, and well protected with fire

lines and watchers. VSS participation and focus group discussions were recorded. Plantation journals were maintained, but boards were absent.

Maintenance activities included casualty replacement, soil working, coppice management, pruning, fire line upkeep, and fertilizer application across Guntur, Macherla, and Vinukonda ranges. Field verification revealed missing/damaged plantation boards and inconsistencies in journal updates. Recommendations emphasized systematic weeding, coppice regulation, replanting, and improved signage. Protection at Kotappakonda (Vinukonda), a 700 rmt chain-link fence (1.2 m height) was erected and found intact, effectively reducing grazing pressure.

Construction of bird enclosure at Kotappakonda (5 m × 3.5 m × 2.85 m) was constructed for iguanas. The structure matched specifications, was functional, and well-maintained, though periodic upkeep was advised for durability and hygiene. Other activities were primarily administrative or facilitative. Verification confirmed that sanctioned amounts matched expenditures, records were maintained, and audits (internal/external) confirmed compliance. However, some documentation gaps and irregularities were noted: Macherla: Estimates and work registers for RSO 60 (2016–17) not available. Vinukonda: Work register for DSO 233 (2016–17) incomplete; lacked seal/signature. Head Office (IT component): Payment to outsourcing agency without DSO number. Guntur Range: Estimates and work registers not presented; only cash book available.

15 Krishna Division

In 2016–17, Krishna division implemented 94 CAMPA activities, of which 20 activities (21%) were sampled for detailed monitoring and evaluation. The activity portfolio comprised plantations, maintenance, fire line creation, and other support works, with no soil and moisture conservation (SMC) or construction activities reported.

Six plantations were undertaken, with one sampled in Mylavaram. At A. Konduru (1.2 ha NTSH), survival was only 10 %, and the plantation was declared as letdown. Contributing factors included red loamy gravel soils, heavy *Prosopis juliflora* invasion, and absence of VSS involvement. Area verification (KML/perambulation) showed 3.24 ha perambulated vs. 1.2 ha recorded, indicating overestimation in records.

Maintenance activities included casualty replacement, weeding, pruning, coppice management, and fire line upkeep across all ranges. Field verification confirmed that operations were largely executed, though damaged or missing plantation boards hindered site monitoring. Protection, fire lines in Mylavaram and Vijayawada were dimensionally compliant and clear, though periodic trimming was required to maintain effectiveness. Other Works (27 implemented; 7 sampled): Verification confirmed that records were consistent, expenditures aligned with sanction orders. Internal and external audits confirmed transparency.

16 Eluru Division

In 2016–17, Eluru division implemented 182 CAMPA activities, of which 42 (23%) were sampled for monitoring and evaluation. Range-wise, activities were distributed as follows: Eluru 81 implemented (19 sampled), J.R. Gudem 38 implemented (9), Polavaram 38 implemented (9), Kannapuram 15 implemented (3), and Kukunoor 10 implemented (2 sampled).

Plantations included Tadikalapudi (20 Ha, *Pterocarpus marsupium* and *Dalbergia latifolia*) with survival of 71.6–74.4 % and heights of 2.95–6.24 m, Jeelugumilli (30 Ha, *Albizia chinensis*, *Dalbergia latifolia*, *Terminalia arjuna*, *Terminalia elliptica*) with 65–74.5% survival and heights up to 12.1 m, and Lankalapalli (20 Ha bamboo) with 87.2% survival and culm heights of 4.8–6.0 m. KML/QGIS verification revealed area discrepancies: Jeelugumilli +4.46 Ha, Tadikalapudi –0.9 Ha, Lankalapalli –1.5 Ha. Plantations were generally healthy, with minimal pest issues, though grazing pressures were observed. Fire lines, watchers, plantation boards, and journals were in place, and VSS participation was noted.

Maintenance works included casualty replacement, weeding, coppice management, pruning, soil tilling, fire line upkeep, and fertilization, executed largely as planned, though some boards were damaged or missing and records required occasional updating. Fire lines in Gullapudi and Kondrukota beats (3 m × 1,700–3,352 rmt) were well-maintained, though minor inconsistencies with measurement books were noted. SMC activities involved percolation tanks and staggered trenches across multiple beats. While specifications were largely met, siltation, bund erosion, and *Prosopis juliflora* infestation reduced effectiveness, requiring maintenance and de-silting. “Other works” accounted for a large portion of activities, with expenditures aligned to sanctions, records authenticated, and audits completed, though some estimates and work registers were missing in J.R. Gudem range.

17 Eluru WLM Division

During 2016–17, of the 72 CAMPA activities implemented in Eluru WLM Division, 10 activities (22%) were sampled for monitoring and evaluation. By type, activities were dominated by “other works” (66; 13 sampled), followed by construction (5; 1 sampled) and maintenance (1; 1 sampled). No plantation, protection, or soil and moisture conservation works were undertaken in this year.

First-year maintenance of a 10 Ha mangrove plantation in Nachugunta beat, Avanigadda range, comprising *Avicennia officinalis*, *Excoecaria agallocha*, and *Avicennia marina*. Field inspection revealed satisfactory survival and growth, with all operations casualty replacement, cultural practices, and fertilizer application executed as planned. Recommendations emphasized routine monitoring, timely replacement of dead plants, regular weeding, proper tidal flushing to prevent waterlogging and salinity, and community involvement to ensure long-term sustainability.

The sampled construction involved boundary pillars at Lakavanidibba beat, Avanigadda range. Field verification confirmed dimensions matched records: 1.20 m above ground, top width 0.45 m, bottom width 1.20 m, depth 1.20 m below ground. Pillars were intact and effectively demarcated boundaries, supporting site identification and protection functions. Other works verification of sanction orders, estimates, and work registers confirmed that expenditures aligned with sanctioned amounts. Records were authenticated by responsible officials, and both internal and external audits were conducted. However, work registers for several DSOs and RSOs (DSO 15, 17, 18, 19; RSO 8, 35, 73, 90) were not presented during verification, reflecting gaps in documentation.

18 Chintur Division

Chintur division implemented 60 CAMPA activities during 2016-17, of which 13 activities (21 %) were sampled for detailed monitoring and evaluation. Both sampled plantations in Kunavaram (Bodunuru, 20 Ha) and V.R. Puram (Darapally, 10 Ha) failed completely. Bodunuru teak stump plantation: No survival due to unsuitable sandy soils, heavy grazing, and lack of VSS participation. Darapally teak plantation: Failed due to poor red soils and biotic stress, despite VSS involvement. Area verification revealed minor discrepancies: Bodunuru +0.56 Ha, Darapally -2.45 Ha. No surviving plants were recorded in the sampled plots; however, natural regeneration of *Hardwickia binata* was observed at Bodunuru. Plantation boards were missing, and records did not reflect actual ground conditions. Fire lines (3 m × 3,000–6,950 m) were present, but maintenance varied. Well-maintained: E.D. Pally, Lakkavaram. Overgrown with grass: Maredupudi. Overall effectiveness depended on upkeep, and regular clearing was recommended. No construction or SMC activities were undertaken during the year. Verification confirmed expenditures matched sanctioned amounts, and records were maintained and audited properly.

19 Kakinada Division

In 2016–17, Kakinada division implemented 136 CAMPA activities, of which 31 (22%) were sampled for monitoring and evaluation. Range-wise distribution was: Kakinada (30, 6 sampled), Rajavommangi (27, 5), Sudikonda (23, 7), Yeleswaram (17, 4), Rampachodavaram (15, 3), Addatheegala (14, 3), and Gokavaram (10, 3). Activities included plantations, maintenance, protection, soil and moisture conservation (SMC), construction, and other works. Plantation performance varied across sites. Rampachodavaram (Maredumilli South, 11 Ha) recorded high survival of 86.7–93.8% with heights 6.91–7.18 m and girths 34–41 cm. In Yeleswaram (Peddipalem, 5 Ha), teak (*Tectona grandis*) showed moderate survival of 48.7–50% with heights 4.88–6.49 m and girths 29.21–42.07 cm. Addatheegala (Chavididibbalu, 5 Ha) bamboo (*Dendrocalamus strictus*) had 52–68% survival with heights 2.12–5.13 m and clump girths 0.18–0.79 m. Sudikonda's bamboo plantations (Bheemavaram & Thirumalayapalem, 2.5 Ha each) had survival of 48–56% with heights 2.14–4.31 m. Rajavommangi's teak at Labbarthi (12 Ha) survived 85.9–90.6% with heights 5.88–7.02 m, while bamboo at Thimmapuram (5 Ha) had 64–76% survival and heights 5.22–7.25 m. KML/QGIS verification revealed some area excesses (e.g., Maredumilli +10.12 Ha) and shortfalls (e.g., Peddipalem -0.39 Ha). Plantations were generally healthy, with minimal pests except at Peddipalem. Fire lines and watchers were in place, journals maintained though irregular, and boards mostly missing. VSS participation was strong except at Thirumalayapalem.

Maintenance works were carried out as planned, though some plantation boards were missing and journals required updating. Fire lines at Bheemavaram (3,500 rmt × 3 m) and Burugubanda (4,000 rmt × 3 m) matched specifications but were partially obscured by grass and weeds, requiring regular clearance. Inspections of rock-fill dams at Geddada and Lakkonda confirmed compliance with length and width specifications, though depth and capacity were reduced due to siltation, and the Lakkonda dam apron was damaged with seepage, necessitating urgent maintenance and desilting. Construction of RCC boundary pillars at S. Pydipala (86) and Nelakota (5) matched specifications and were intact, effectively demarcating boundaries. Financial verification confirmed that sanctioned amounts matched expenditures, with records

authenticated and audited. However, records for Sudikonda (RSO 2 & RSO 3) were not presented, indicating minor documentation gaps.

20 Narsipatnam Division

Narsipatnam division implemented 126 CAMPA activities, of which 28 (21%) were sampled for monitoring and evaluation. Range-wise distribution was: Sileru (54; 12 sampled), Narsipatnam (24; 6), KD Peta (18; 4), Chintapalli (18; 8), Lothugedda (10; 2), Marripakala (1; none), and RV Nagar (none).

Three plantations were evaluated. In Narsipatnam (Krishnapuram, 10 ha), survival was low for *Dalbergia latifolia* (33%), *Terminalia arjuna* (35–41%), *Adina cordifolia* (43%), and *Terminalia tomentosa* (32%), with heights 0.87–6.83 m and girths 13.54–41.55 cm. Chintapalli (Chilakalamamidi, 10 ha) recorded high survival for *Toona ciliata* (74%), *Pterocarpus marsupium* (71%), and *Dalbergia latifolia* (75%), with heights 3.7–5.0 m and girths 30–44 cm. Sileru (Gummirevula, 10 ha) teak performed well, with *Tectona grandis* survival of 79.9%, height 4.9–5.1 m, and girth 36–40 cm. Area verification showed minor mismatches: Krishnapuram (–0.31 ha), Chilakalamamidi (–1.55 ha), and Gummirevula (+0.67 ha). Overall plantation health was good, with minimal grazing and absence of major pest outbreaks. VSS participation was strong in Narsipatnam and Chintapalli but absent in Sileru, and journals were maintained though periodic updating was needed.

Maintenance works included weeding, casualty replacement, coppice management, pruning, saucer formation, fire line upkeep, and thinning. Execution of these activities were satisfactory, though some plantation boards were missing or damaged, limiting monitoring. Protection comprised a single fire line in T. Gannavaram beat (Sileru, 3 m × 2,000 rmt), which was compliant with specifications and well-maintained. Other activities showed proper financial compliance, with sanctioned amounts aligning with expenditures; records were authenticated, and both internal and AG audits were conducted. However, documentation gaps were noted in Chintapalli (SDSO 11), KD Peta (RSO 14 & DSO 349), and Narsipatnam (DSO 130).

21 Paderu Division

During 2016–17, Paderu division implemented a total of 232 CAMPA activities, of which 47 (20 %) were sampled for detailed monitoring and evaluation. Plantations included *Pongamia pinnata*, *Acrocarpus fraxinifolius*, *Toona ciliata*, and *Grevillea robusta* under the NTS scheme at Pedabayalu (T), Paderu FRO-IV, Pedabayalu FRO-V, and other ranges. Survival ranged from 63–84%, with *Pongamia pinnata* at Jangamputtu achieving 84.29% and *Grevillea robusta* at Ramachandrapuram 80.16%. Tree heights ranged from 3–11 m and girths from 25–55 cm. Discrepancies noted Jangamputtu marginally exceeded records (20.41 ha vs. 20 ha), while Borrabakuru significantly exceeded its recorded area (46.18 ha vs. 20 ha), emphasizing the need for GIS-based mapping. Plant health was satisfactory; minimal pest/disease incidences observed. Fire lines and watchers were present at sampled sites.

Maintenance activities execution was largely satisfactory; however, plantation boards were sometimes missing or damaged. Journals were maintained but required more frequent updates. Protection, fire line at Chinna Sindhiputtu tall plantation (Pedabayalu T range) measured 3 m × 2,600 m, matching specifications. Line was clear and maintained, with no dense weed growth.

Other activities, Sanctioned amounts aligned with expenditures; records were authenticated and maintained by DFOs, SDOs, and FROs. Internal audits (Conservator of Forests) and external audits (AG's office) confirmed transparency and accountability.

22 Visakhapatnam Division

Visakhapatnam division, covering 315 km² of dense and moderately dense forest, implemented 156 CAMPA activities, with 38 (24%) sampled for detailed monitoring and evaluation. Plantations included *Acrocarpus fraxinifolius*, *Syzygium cumini*, *Pongamia pinnata*, *Grevillea robusta*, *Azadirachta indica*, *Adina cordifolia*, *Terminalia arjuna*, *Dalbergia latifolia*, and *Terminalia elliptica*. Survival ranged between 55–82%; heights averaged 2.9–4.9 m and girths 22–37 cm, reflecting moderate ecological suitability and steady establishment. Discrepancies were noted Duvvapalem exceeded sanctioned area by 4.57 ha, Narendrapuram fell short by 1.1 ha, largely due to rocky outcrops, trenches, and barren patches. Plantations were generally healthy, free from significant pest or insect damage.

Maintenance activities largely effective, reducing weed competition and improving tree growth. Damaged or missing plantation boards weakened site identification. Strengthen record-keeping, enhance weed control along boundaries, replant gaps with healthy seedlings, and extend maintenance cycles beyond the initial years.

Protection activities, with sampled RCC fencing at Gandigudam PCA plantation meeting specifications. Minor damages noted; periodic repairs recommended. Coverage remains inadequate relative to the division's forest area and local dependence on resources. SMC interventions including mini percolation tanks and rock-fill dams. Structurally sound but siltation and jungle growth reduced effectiveness. Regular desilting and upkeep recommended to maintain ecological value. Construction activity, RCC boundary pillars at Kalavalapalli, (Yellamanchili range) conformed to specifications; effectively demarcated forest boundaries. Financial and documentation compliance, sanction orders, estimates, and expenditure records were consistent and authenticated. Internal audits (Conservator of Forests) and external audits (Accountant General) confirmed compliance. Gaps in work register availability in certain ranges were noted, and plantation journals require periodic updating for survival and growth tracking.

23 Vizianagaram Division

In 2016–17, the Vizianagaram division implemented 145 CAMPA activities, with 34 (23 %) sampled for detailed monitoring and evaluation. Plantations species included *Tectona grandis*, *Syzygium cumini*, *Terminalia arjuna*, and mixed species. Chandalangi (Parvathipuram): *Tectona grandis* – 85.54 % survival, Raiguddivalasa (Saluru): *Syzygium cumini* & *Terminalia arjuna* – 71–77 % survival, Mantikonda (Kurupam): Mixed species – 77–81 % survival. In general growth, heights: 2–10 m; girths: 16–41 cm. In Sangamguddi (Anantagiri): Plantation removed due to allocation to fringe villagers

Discrepancies observed Mantikonda (5 ha recorded vs. 14.03 ha perambulated), Sangamguddi (10 ha vs. 15.41 ha). Plantations were generally healthy, free from pests, with negligible grazing pressures. Maintenance activities were executed satisfactorily, missing or damaged plantation boards affected monitoring. Protection activities fire lines (3 m × 1000–2000 m) matched records and were mostly clear, though some sections required weed management. Other activities

verification confirmed proper record-keeping, adherence to sanctioned amounts, and audit compliance.

24 Srikakulam Division

Srikakulam division implemented 84 CAMPA activities, of which 23 (27%) were sampled for detailed monitoring and evaluation. Ten teak plantations were undertaken, with three sampled in Palakonda, Pathapatnam, and Tekkali ranges. Survival ranged from 64.87% at Chendanagiri to 88.88% at DasaradhaPuram, and growth varied between 2.7–9.0 m in height and 19–39 cm in girth. Area verification revealed discrepancies, including Vondurujola (10 ha recorded vs. 12.02 ha perambulated), DasaradhaPuram (10 ha vs. 9.75 ha), and Chendanagiri (5 ha vs. 5.82 ha). Overall plantation health was good with no pest, although plantation boards missing.

Twelve maintenance works were carried out, with five sampled, covering weeding, pruning, coppice cutting, soil working, and fire line upkeep. Execution was generally satisfactory, but missing or damaged boards limited effective monitoring. Recommendations included intensified weeding, strengthened boundary demarcation, and regular updating of records. No protection activities were undertaken, while one borewell was established in Tekkali range for soil and moisture conservation, which was functional and well maintained, but periodic servicing is advised. Six construction works were implemented, including bamboo turtle shelters and RCC boundary pillars, which were found intact; semi-permanent shelters were recommended for improved durability. Fifty-five “Other” activities were carried out, with 11 sampled, and verification confirmed that sanctioned amounts matched expenditures, records were properly maintained, and both internal and external audits were conducted.

VII. SUMMARY OF FINDINGS

Introduction

The Monitoring and Evaluation of CAMPA activities implemented and sampled across Andhra Pradesh in 2016–17 revealed a rich mix of successes, challenges, and opportunities, highlighting the critical interplay between site selection, species choice, management practices, and community engagement. The observations provided valuable insights into the factors influencing plantation success, ecological resilience, and sustainability. While some divisions recorded exemplary survival and growth, others faced challenges related to grazing pressure, poor site selection, inadequate maintenance, and mismatched documentation.

These lessons underscore that successful afforestation and forest restoration depend not merely on planting trees but on scientific planning, consistent management, accurate documentation, and active community involvement. Recognizing both the strengths and recurring challenges across divisions allows for evidence-based recommendations to improve future CAMPA interventions, enhance long-term ecological outcomes, and strengthen community stewardship of forest resources.

Activity Wise Observations

Plantation success varied widely across divisions, reflecting the importance of species–site matching. *Pterocarpus santalinus*, *Hardwickia binata*, *Terminalia arjuna*, and *Sterculia urens* performed well in fertile or ecologically suitable soils, while Red Sanders, bamboo, and other species struggled in rocky, drought-prone, or semi-arid sites. Some divisions, such as Chittoor East, Kadapa, and Guntur, achieved excellent survival, whereas Chintur, Krishna, and some bamboo sites in Markapur and Atmakur failed completely. Area verification frequently revealed discrepancies between recorded and actual extents, highlighting the need for accurate GIS-based monitoring.

Maintenance operations were implemented across most divisions but varied in quality and consistency. While divisions like Anantapuramu, Rajampet, and Kadapa maintained plantations effectively, gaps in record-keeping, missing plantation boards, and weak signage undermined accountability in many ranges, including Chittoor East, Guntur, and Markapur. In some cases, such as Nandyal and Atmakur, minimal maintenance limited the survival and growth of plantations.

Protection measures, including fencing, fire lines, and monitoring against grazing or illicit felling, were essential but often insufficient. Divisions like Guntur, Kadapa, and Narsipatnam effectively used fencing and fire lines to reduce grazing pressure, whereas Tirupati, Chintur, and parts of Nellore suffered plantation losses due to poor protection. In many areas, fire lines were created but became ineffective over time due to inconsistent upkeep.

Soil and Moisture Conservation (SMC) structures were unevenly implemented and frequently compromised by siltation. While Rajampet, Anantapuramu, and Giddalur had functional SMC works, most divisions, including Chittoor East, Kadapa, Guntur, and Vizianagaram, had minimal or absent SMC measures, limiting ecological resilience. Desilting and minor repairs were often needed to maintain effectiveness.

Construction activities, including eco-tourism facilities, bird enclosures, RCC boundary pillars, and urban forestry works, were implemented in select divisions. Nellore, Kurnool, Guntur, Kakinada, and Visakhapatnam executed construction projects successfully, while many divisions had no construction interventions. These assets enhanced ecological infrastructure but required periodic upkeep to remain effective.

Financial compliance was generally strong across divisions, with audits confirming proper use of funds. However, documentation gaps existed in some ranges, particularly for “other works,” which sometimes limited traceability and verification. Divisions with strong record-keeping, such as Kadapa and Visakhapatnam, demonstrated both ecological and administrative accountability.

Community engagement through VSS/JFMC was inconsistent across divisions. Where present, as in Paderu, Vizianagaram, and some sites in Narsipatnam, community participation strengthened plantation protection, maintenance, and livelihood support. In many divisions, including Chittoor East, Tirupati, Krishna, and Chintur, absence or minimal involvement of local communities increased vulnerability to grazing, encroachment, and poor long-term sustainability.

Division Wise Insights

Chittoor East and West divisions showcased contrasting outcomes. In Chittoor East, plantations of *Pterocarpus santalinus*, *Syzygium cumini*, and *Hardwickia binata* thrived, particularly in sandy soils, though rocky sites limited growth despite high survival. Maintenance and fire protection were implemented, but uneven quality, weak signage, and missing records undermined effectiveness. Soil and moisture conservation (SMC) works were absent, and community engagement was minimal, leaving the plantations vulnerable to grazing. Chittoor West fared slightly better with strong survival of *Hardwickia binata* and *Terminalia arjuna*, but area mismatches, inconsistent maintenance, and insufficient SMC work reduced overall resilience. Community participation was partial, and ecological monitoring was irregular.

Rajampet and Tirupati divisions highlighted the importance of fertile soils and proper management. Rajampet plantations flourished in fertile areas, with *Pterocarpus santalinus* showing excellent growth, whereas semi-arid zones struggled. Soil and moisture conservation structures proved effective but required periodic maintenance, and biotic pressures like grazing reduced growth where fencing was absent. Tirupati experienced poor performance in redsanders plantations due to inadequate protection and grazing, coupled with area mismatches and weak fire protection.

Nellore, Kadapa and Proddatur divisions presented mixed outcomes. In Nellore, *Sterculia urens* performed well, while *Hardwickia binata* and Red Sanders struggled; encroachment and grazing were persistent threats. Kadapa demonstrated strong plantation performance, particularly *Pterocarpus santalinus* and *Dalbergia latifolia*, but area discrepancies and limited SMC and construction works reduced ecological impact. Proddatur saw variable success, with some sites thriving while others failed, and poor maintenance of fire lines and plantation boards hampered sustainability.

Anantapuramu, Giddalur, Kurnool, Nandyal and Atmakur divisions further illustrated the interplay of environmental and management factors. Anantapuramu plantations survived well but faced grazing pressures and weak community engagement, despite solid SMC and fire line construction. Giddalur achieved moderate survival, but area discrepancies and maintenance gaps persisted. Kurnool exhibited outstanding survival yet suffered recurring area mismatches, and Nandyal implemented only maintenance and fire protection activities. Atmakur's bamboo plantations showed inconsistent results, with poor soils and grazing contributing to lacunae; limited maintenance and community involvement constrained long-term success.

Markapur, Guntur and Krishna divisions reflected the critical importance of species-site matching and record accuracy. Markapur experienced high variability, with bamboo failing in rocky, drought-prone sites. Guntur's plantations thrived where maintenance and fencing were robust, but absent SMC works limited ecological benefits. Krishna Division faced total plantation collapse due to unsuitable sites and invasive weeds, further complicated by poor GIS verification.

Eluru, Eluru WLM and Chintur divisions demonstrated ecological and management contrasts. Eluru's bamboo plantations achieved moderate success, though silted SMC structures required urgent maintenance. Mangrove maintenance in Eluru WLM succeeded in species survival and boundary demarcation, but lack of additional plantations or SMC works limited restoration. Chintur plantations completely failed in 2016–17 due to poor site selection, grazing, and weak community participation.

Kakinada, Narsipatnam, Paderu, Visakhapatnam, Vizianagaram and Srikakulam divisions reflected the final set of lessons. Kakinada saw mixed survival with some teak plantations failing, while fire lines and SMC structures required upkeep. Narsipatnam's plantations varied in survival, but grazing pressures were minimal and maintenance generally executed well. Paderu exhibited moderate to high survival, with minimal biotic pressure and some VSS participation supporting protection. Visakhapatnam had moderate survival and good growth, but gaps in maintenance, protection, and SMC reduced ecological resilience. Vizianagaram achieved good outcomes in most sites, though Anantagiri suffered from land diversion, and SMC and construction works were missing. Srikakulam showed variable survival but plantations were healthy, with negligible pest or grazing pressures, and protective measures like turtle conservation and boundary demarcation were largely effective.

VII. RECOMMENDATIONS

The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) initiative plays a pivotal role in restoring forest ecosystems, enhancing ecological security, and compensating for forest land diverted to non-forest purposes. The implementation of CAMPA activities across Andhra Pradesh during recent years has demonstrated commendable financial compliance and administrative effort. However, field evaluations reveal that ecological outcomes such as survival rates, growth performance, and habitat restoration remain uneven across divisions, largely influenced by site–species mismatch, limited maintenance cycles, and variable protection measures. To ensure that CAMPA investments yield sustained ecological and social benefits, it is essential to strengthen planning, execution, monitoring, and community participation mechanisms. The following strategic recommendations based on monitoring and evaluation done during 2016-17 are designed to enhance the ecological effectiveness, transparency, and long-term sustainability of CAMPA interventions across the state.

Strategic Recommendations for Strengthening CAMPA Implementation

1. **Prioritize Site Species Matching:** Adopt scientific and GIS-based planning tools that integrate soil, rainfall, and topography data to guide species selection. Avoid unsuitable combinations (e.g., teak on sandy soils) and promote mixed and native species models to enhance ecological resilience.
2. **Rebalance the Activity Portfolio:** Rationalize expenditure by reducing the disproportionate share of “other works” and ensuring minimum thresholds for plantations, soil and moisture conservation (SMC), and protection works in every division to maintain ecological balance and maximize forest outcomes.
3. **Mainstream Soil and Moisture Conservation (SMC):** Make SMC structures a mandatory component of plantation and regeneration projects, particularly in semi-arid and erosion-prone districts such as Chittoor, Ananthapuramu, and Kadapa. Institutionalize annual desilting, structural repairs, and performance monitoring to sustain their ecological functionality.
4. **Extend Maintenance and Protection Cycles:** Provide sustained maintenance for 3–5 years additionally, emphasizing invasive weed control, pruning, gap filling, and consistent fire line upkeep. Strengthen fencing, fire prevention, and community-based patrolling to reduce grazing and fire risks in vulnerable areas.
5. **Strengthen Documentation, Transparency, and Monitoring:** Digitize plantation journals, integrate records with GIS-based verification systems, and ensure signage and boundary boards at all sites—preferably with QR codes linking to digital data. Conduct regular area verification through satellite or GPS mapping to eliminate mismatches and improve accountability.
6. **Enhance Community Engagement:** Deepen the role of VSS/JFMC groups in plantation care, protection, and ecological monitoring. Promote shared ownership through incentive-based participation, eco-tourism opportunities, and livelihood-linked initiatives such as nurseries or bamboo-based enterprises.
7. **Institutionalize Ecological Monitoring and Audits:** Move beyond financial audits to include periodic ecological performance audits assessing survival, growth, and habitat

improvement. Establish adaptive monitoring frameworks to identify and address issues such as pest outbreaks, grazing pressure, or soil degradation.

8. **Build Capacity and Accountability:** Conduct regular training for field staff and community members on SMC design, invasive species management, ecological restoration, and digital monitoring. Introduce performance-based evaluation metrics emphasizing survival, growth, and ecological recovery rather than only financial utilization.
9. **Leverage Technology for Real-Time Oversight:** Deploy mobile-based applications for field data collection, survival assessment, and maintenance tracking. Integrate these systems with GIS dashboards to enable real-time decision-making, transparency, and adaptive management at both divisional and state levels.
10. **Overcome Implementation Challenges:** Procedural bottlenecks and administrative delays in the release and utilization of CAMPA funds may be address to ensure timely implementation. Approval processes, strengthen fund flow mechanisms, and improve coordination between field and administrative units may be streamlined to prevent disruptions in plantation scheduling, maintenance, and synchronization of SMC activities.