CONCURRENT MONITORING REPORT

2024-2025

CAMPA

Uttarakhand CAMPA

Executive Summary
Uttarakhand CAMPA Concurrent Monitoring Report 2024-2025

This report presents the findings of the concurrent monitoring and evaluation of forestry operations conducted under the Uttarakhand Compensatory Afforestation Fund Management and Planning Authority (CAMPA) for the Annual Plan of Operations (APO) 2024-25. The evaluation, combining extensive field inspections, remote sensing data analysis (GIS and NDVI), and stakeholder consultations, assessed a wide range of activities including afforestation, nursery management, soil and moisture conservation (SMC), and wildlife habitat improvement across 32 forest divisions.

The APO 2024-25 represents a significant investment in Uttarakhand's ecological health, with **5,121 hectares** of new plantations established, involving the planting of approximately **4.07 million saplings**. The program's design was comprehensive, integrating afforestation with critical support activities to ensure long-term ecosystem resilience.

Key Achievements and Successes:

- **Exceptional Plantation Survival:** The program achieved an outstanding average sapling survival rate of approximately **90%**, significantly exceeding the government-mandated benchmarks. Top-performing divisions like Narendranagar and Mussoorie recorded survival rates above 95%, highlighting the effectiveness of field implementation and site management.
- **Robust Foundational Work:** A strong positive correlation was identified between intensive Soil and Moisture Conservation (SMC) activities and high plantation survival rates. Divisions that prioritized the construction of structures like check dams, contour trenches, and gully plugs demonstrated greater plantation resilience.
- **Effective Site Protection:** The consistent use of protective measures such as chain-link fencing and stone walls at new plantation sites was a major operational strength, proving critical in mitigating threats from grazing and human-wildlife conflict.
- **Massive Nursery Production:** The state's network of over 80 departmental nurseries produced more than **5.5 million saplings**, creating a substantial supply that not only met current demands but also provided a strategic surplus for future initiatives.
- **Strategic Species Diversity:** The program utilized a sophisticated and ecologically sound approach, planting over 70 different species. This balanced portfolio included native timber species for ecosystem restoration (Baanj, Deodar), as well as fruit, fodder, and medicinal plants to support local livelihoods and biodiversity.

Critical Challenges and Strategic Gaps:

Despite these successes, the monitoring identified significant strategic vulnerabilities that require immediate attention:

- **Systemic Lack of Nursery Security:** The most critical risk identified is the pervasive absence of basic security measures (fencing, walls) for departmental nurseries. These high-value assets, which are the foundation of the entire afforestation program, are left exposed to preventable threats like animal damage and theft, creating single points of catastrophic failure.
- **Fragmented Sapling Supply Chain:** A pronounced misalignment exists between nursery production and plantation needs at the divisional level. This has resulted in

massive sapling surpluses in some divisions and complete deficits in others, indicating logistical inefficiencies and strategic dependencies that increase costs and risks.

- **Critical Data Monitoring Gaps:** A significant blind spot exists in the long-term evaluation of the program's impact. There is a widespread absence of survival rate data for over 1,200 hectares of older, maintained plantations, making it impossible to assess the true return on investment for long-term maintenance expenditures.

Core Recommendations:

To build upon the program's strengths and mitigate its risks, the following strategic recommendations are proposed:

1. **Institute a Universal Nursery Security Policy:** Immediately implement a mandatory policy to secure all departmental nursery perimeters, prioritizing the highest-value and highest-output facilities to safeguard the program's foundational assets.
2. **Develop an Integrated Sapling Supply Chain Strategy:** Formalize a regional supply chain to manage surpluses and deficits efficiently. Designate high-production divisions as official supply hubs while simultaneously building nursery capacity in dependent divisions to foster self-sufficiency.
3. **Overhaul Data and Monitoring Protocols:** Establish a mandatory, standardized digital reporting system. Crucially, this must include a multi-year schedule for tracking survival rates in all maintained plantations to enable evidence-based assessment of long-term ecological and financial ROI.
4. **Replicate Successful Integrated Models:** The "SMC-First" approach, where intensive land treatment precedes afforestation, has proven highly effective. This model should be standardized and replicated, particularly in divisions with challenging terrain.

In conclusion, the APO 2024-25 was a significant operational success. By addressing the identified strategic gaps in nursery security, supply chain logistics, and long-term data monitoring, the Uttarakhand Forest Department can transform a successful program into a truly resilient, efficient, and enduring investment in the state's ecological and economic future.

About the Department

Forest Department in Uttarakhand is responsible for managing some of the richest forest and biodiversity in India. The Department has Territorial Entities like ; Beat , Section, Range, Sub-division, Division , Circle, Mandal/Zone and State headed by different officials. There are different wings for specific works like; CAMPA, HRD, Planning and Finance Management, Fire Protection and Disaster Management, Monitoring Evaluation IT & Modernization, Wildlife, NTFP, Projects, Research Training & Management, Vigilance & Legal cell, Van Panchayat and Working Plan etc.

Message

Uttarakhand, blessed with over 65% forest cover, plays a vital role in maintaining the ecological balance not just for the state, but for the entire nation. Our forests are home to rich biodiversity, including several endemic and endangered species, and are critical for water conservation, climate regulation, and livelihoods of forest-dependent communities.

It gives me immense pleasure to share this message as we present the Concurrent Monitoring Report on CAMPA Works for the year 2024–25. This report reflects our commitment towards sustainable forest management, biodiversity conservation, and ecological restoration in the pristine Himalayan state of Uttarakhand.

The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) has been a pivotal mechanism in channelling resources towards afforestation, forest regeneration, wildlife habitat improvement, and eco-development initiatives. In 2024–25, CAMPA funds have supported a wide range of activities including Afforestation/Assisted Natural Regeneration to strengthen degraded forest areas, Soil and Moisture Conservation Works to preserve critical watersheds, Protection and Fire Control Measures to mitigate forest fires, a significant concern in our state, Wildlife Habitat Improvement with focus on corridors and protection of endangered fauna and Capacity Building and Community Engagement to integrate local stakeholders in conservation etc.

The concurrent monitoring undertaken during this period provides critical insights into the quality, progress, and impact of CAMPA activities. It is heartening to note improvements in transparency, timely implementation, and ecological outcomes as captured in the findings. We remain committed to acting on the recommendations of the report to enhance efficiency and ensure long-term ecological gains.

I extend my appreciation to the dedicated officers of the Forest Department, the monitoring agencies, and our community partners for their unwavering support. As we move forward, let us reaffirm our collective responsibility to protect Uttarakhand's green legacy for future generations.

Subodh Uniyal
Hon'ble Minister of Forests
Government of Uttarakhand

Message

The forests of Uttarakhand are integral to the ecological stability of the Indian Himalayan Region and serve as critical reservoirs of biodiversity, water resources, and carbon sequestration. Managing these landscapes demands not only ecological sensitivity but also robust planning, scientific management, and constant evaluation of outcomes.

The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) framework enables us to systematically restore ecosystems affected by diversion of forest land, while also strengthening infrastructure for forest protection, wildlife management, and community-based conservation.

The Concurrent Monitoring Report on CAMPA Works for the year 2024–25 serves as a vital tool to assess ground-level progress, identify gaps, and guide mid-course corrections. This year's findings offer valuable insights into the effectiveness of various interventions—ranging from afforestation and enrichment planting to fire management, wildlife habitat restoration, and infrastructure development.

Key takeaways from the monitoring exercise include The need to further integrate spatial data and digital monitoring tools for real-time tracking of works, Encouraging results from convergence efforts with other schemes for watershed and catchment area treatment, Strengthened emphasis on quality parameters, survivability of plantations, and post-implementation care, Improved inter-departmental coordination and decentralised planning through active involvement of field formations and Van Panchayats.

The feedback from independent monitoring agencies not only ensures transparency and accountability but also helps us refine strategies and prioritize future interventions. This evidence-based approach is central to our mission of ensuring that every rupee spent under CAMPA contributes to long-term ecological gain.

I commend the efforts of the Uttarakhand Forest Department, field staff, partner institutions, and community stakeholders for their dedication to implementing CAMPA objectives effectively. Moving ahead, we will continue to adopt a results-oriented, participatory, and adaptive approach to forest governance.

R.K. Sudhanshu
Principal Secretary
Environment & Forests
Government of Uttarakhand

Message

TThe forests of Uttarakhand are a cornerstone of ecological balance in the central Himalayas, providing essential ecosystem services including water regulation, carbon sequestration, biodiversity conservation, and livelihood support for forest-dependent communities. Protecting and enhancing these forest landscapes is a shared responsibility—one that requires sustained investment, collaborative planning, and rigorous monitoring.

The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) is designed to channel compensatory resources into meaningful ecological restoration and forest development activities. In Uttarakhand, CAMPA works span a wide range of interventions—from afforestation and forest fire management to wildlife habitat improvement and capacity building of local communities.

The Concurrent Monitoring Report for 2024–25 is a crucial evaluative tool that ensures the effectiveness of CAMPA investments by providing transparent, third-party assessments of ongoing projects. The current report brings forward an evidence-based understanding of how well resources are being translated into outcomes on the ground.

This year's findings highlight important trends:

Better planning alignment between proposed activities and field conditions has improved execution in many forest divisions.

Increased use of technology platforms—such as geotagged monitoring apps and progress dashboards—has enhanced transparency and tracking.

However, the report also flags areas for improvement, especially in post-plantation care, documentation practices, and inter-agency coordination for integrated landscape-level planning.

As the PCCF HOFF & CEO of Uttarakhand CAMPA, I view this report as a vital feedback mechanism that guides future prioritization and capacity development efforts. In the coming year, our focus will be on improving planning cycles, refining activity design based on ecological indicators, and strengthening convergence with other forestry and rural development programs to maximize landscape resilience.

I extend my sincere appreciation to the implementing divisions, monitoring partners, and support staff for their continuous commitment. Let us continue to uphold the integrity of CAMPA by ensuring that every rupee spent translates into long-term ecological gain.

Dr. Samir Sinha
PCCF (HOFF)/Chief Executive Officer
CAMPA Uttarakhand

Acknowledgement

We extend our sincere gratitude to all stakeholders whose continued support and collaboration have been instrumental in the successful completion of the CAMPA Concurrent Monitoring works. We acknowledge the valuable guidance and facilitation provided by the Principal Chief Conservator of Forests (HoFF), Uttarakhand, and the Chief Executive Officer, CAMPA, whose leadership has ensured alignment with the broader objectives of forest conservation and sustainable management.

The consistent cooperation from Forest Divisions, Range Officers, and Beat Staff has been crucial during field-level activities. We also appreciate the role of the Statistical Officer and Office Team, whose efforts have contributed to seamless coordination and data consolidation.

We acknowledge the dedicated contribution of GIS Analyst, Data Analyzer, Report Writer, and Publishing Team in transforming raw data into actionable insights and presenting the findings in a structured and accessible format.
A special note of thanks is due to the Monitoring teams and Field Staffs whose unwavering commitment, meticulous field work, capturing ground realities and timely reporting were instrumental in achieving our objectives.
Finally, we express our gratitude to all the stakeholders and participants both directly and indirectly involved in this Concurrent Monitoring work.

Rahul
Chief Conservator of Forests,
Monitoring, Evaluation, IT and Modernization,
Uttarakhand, Dehradun

01

CHAPTER

INTRODUCTION

CHAPTER 1
INTRODUCTION

Uttarakhand, nestled in the central Himalayan region, is renowned for its exceptional ecological diversity, dramatic mountainous landscapes, and abundant forest resources. According to the India State of Forest Report (ISFR) 2023, Uttarakhand boasts a significant forest cover of 24,547.24 sq. km, representing approximately 45.58% of its total geographical area. These forests, stretching from alpine meadows at higher altitudes to tropical deciduous forests at lower elevations, play an essential role in biodiversity conservation, climate regulation through carbon sequestration, and the sustainability of major river systems including the Ganga and Yamuna. Moreover, these forests support crucial ecosystem services that underpin rural livelihoods and provide resilience against environmental hazards such as soil erosion, landslides, and floods.

In recent years, accelerated infrastructure development and economic expansion have increased pressure on these forests, resulting in significant diversion of forest lands for non-forestry purposes including road construction, hydropower development, transmission lines, and tourism-related infrastructure. To address and balance ecological losses resulting from such diversions, the Compensatory Afforestation Fund Management and Planning Authority (CAMPA) was established under the Compensatory Afforestation Fund Act, 2016. This legislative and institutional framework provides systematic financial and administrative mechanisms to implement forestry and ecological restoration initiatives, including compensatory plantations, assisted natural regeneration, soil and moisture conservation measures, fire prevention strategies, wildlife habitat enhancement, and capacity building of forest department personnel.

In Uttarakhand, the Forest Department operationalizes CAMPA funds through carefully structured Annual Plans of Operation (APOs). These APOs outline detailed implementation strategies, covering diverse ecological interventions aligned with state and national environmental objectives.

Concurrent Monitoring has emerged as a critical mechanism within the CAMPA framework, distinct from traditional retrospective evaluations. It enables real-time assessment and rapid feedback on the ongoing implementation of ecological projects, facilitating immediate adjustments and ensuring adherence to ecological standards and project objectives. The principal advantages of concurrent monitoring include:

1. Timely Identification of Issues: Promptly identifying gaps in species selection, planting techniques, or site preparation, allowing for quick remedial actions.
2. Effective Feedback Loops: Establishing direct communication channels with field functionaries and policy makers, facilitating mid-course corrections.
3. Enhancement of Accountability: Fostering a monitoring-oriented culture, thereby reducing performance discrepancies or inaccuracies in reporting.
4. Data-Driven Decision Making: Providing comprehensive data to support informed resource allocation and adaptive management planning.

In Uttarakhand, concurrent monitoring involves systematic field assessments across selected forest divisions and ecological zones, focusing particularly on high-investment plantations and

ecologically sensitive areas. Field assessments are supported by modern technological tools, including geo-tagged photography, GPS-based location validation, structured data collection formats for capturing survival rates, site maintenance statuses, fencing efficacy, protection measures, and overall site quality.

This report presents findings from concurrent monitoring undertaken during the Annual Plan of Operation 2024–25, focusing specifically on CAMPA-supported afforestation and ecological restoration activities. It highlights implementation strengths, identifies critical gaps based on rigorous data collection and analysis, and provides actionable recommendations for enhancing ecological outcomes and sustainability of these initiatives.

1.1 FOREST SCENARIO

Forests form the ecological and economic backbone of Uttarakhand, contributing significantly to biodiversity preservation, climate resilience, water regulation, and rural economic stability. Due to the state's unique Himalayan terrain, forest ecosystems are integral in buffering against natural disasters such as landslides and floods.

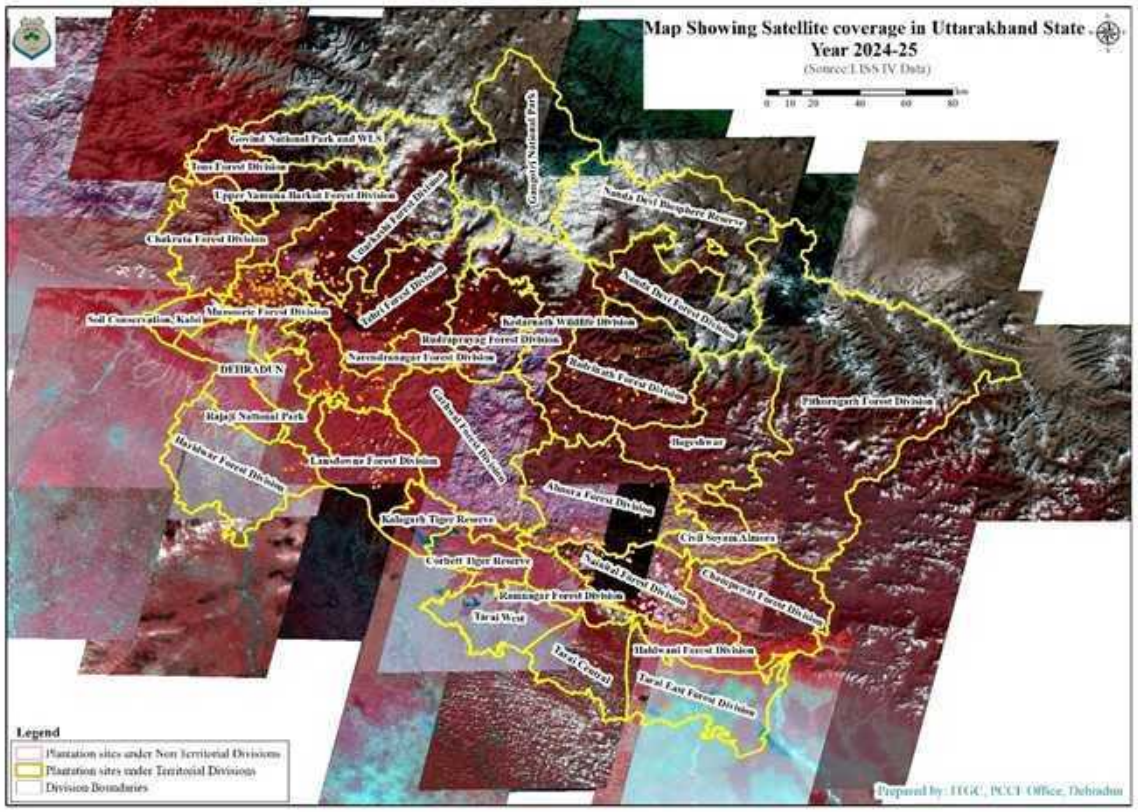


Figure 1: Map indicating CAMPA plantation sites in Uttarakhand

1.1.1 Forest Extent and Classification

According to ISFR 2023, Uttarakhand's total forest cover spans 24,547.24 sq. km (45.58% of its geographical area), further augmented by 3,249 sq. km of tree cover outside recorded forests. The detailed breakdown of forest cover is:

Forest Cover Type	**Area (sq. km)**	**% of Geographical Area**
Very Dense Forest (VDF)	4,944.34	9.19%
Moderately Dense Forest	14,062.37	26.13%
Open Forest	5,540.53	10.26%
Total Forest Cover	24,547.24	45.58%
Scrub	652.31	1.21%
Tree Cover (outside RFA)	3,249	6.07% (approx.)

1.1.2 Major Forest Types (Champion & Seth, 1968)

S.No.	Forest Type Code	Forest Type Name	Altitude Range (Approx.)
1	5B/C2	Northern Dry Mixed Deciduous Forest	300–900 m
2	12/C1	Himalayan Moist Temperate Forests	1,800–3,000 m
3	12/C2	Ban Oak Forests (Quercus leucotrichophora)	1,500–2,400 m
4	13/C1	West Himalayan Dry Temperate Deodar Forest	2,000–3,200 m
5	15/C1	Sub-Alpine Birch/Fir Forests	3,200–3,800 m
6	16/C2	Alpine Scrub	>3,800 m

1.1.3 Growing Stock, Biomass, and Carbon Stock (FSI Assessments)

S.No.	Parameter	Value	Unit
1	Growing Stock in Recorded Forest Area	154.74	Million cubic meters
2	Growing Stock in Trees Outside Forests (TOF)	43.09	Million cubic meters
3	Total Biomass	~1,070	Million tonnes
4	Total Carbon Stock (above & below ground)	~470	Million tonnes CO_2 eq.

1.1.4 Species Commonly Planted under CAMPA in Uttarakhand

A diverse range of tree species is selected for afforestation and restoration under CAMPA to suit various ecological zones, including Shorea robusta, Cedrus deodara, Quercus leucotrichophora, and Pinus roxburghii among others, reflecting careful ecological considerations to maximize survival and ecological benefit.

In summary, this report aims to provide a comprehensive assessment of CAMPA implementation effectiveness in Uttarakhand, serving as a guide for future ecological interventions and sustainable forest management strategies.

02

CHAPTER

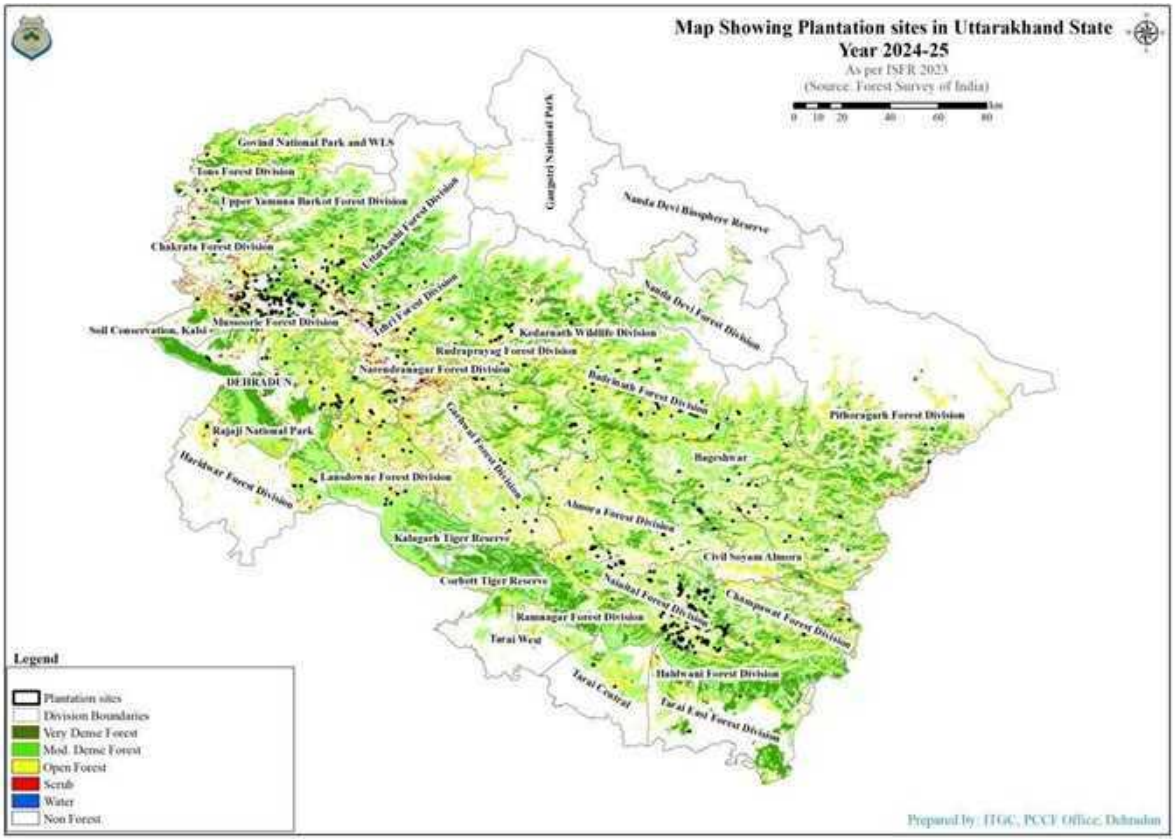
MONITORING & EVALUATION FRAMEWORK

Chapter 2
Monitoring and Evaluation Framework

Concurrent monitoring under the Compensatory Afforestation Management and Planning Authority (CAMPA) is a critical process to ensure that afforestation and forest conservation efforts are implemented effectively and transparently. In Uttarakhand – a state renowned for its rich forest ecosystems and biodiversity – the CAMPA program for 2024–25 involved plantation activities across 32 forest divisions, covering a total of **5,121.22 hectares** with approximately **4.07 million** saplings planted. This chapter outlines a comprehensive Monitoring and Evaluation (M&E) framework designed to track the progress and outcomes of these interventions in real-time. By integrating field assessments with modern technology (including GIS and satellite-based tools), the framework aims to uphold accountability, facilitate timely decision-making, and align with national guidelines and legal mandates for afforestation. Notably, Section 16 of the Compensatory Afforestation Fund (CAF) Act, 2016 requires establishing an independent system for **concurrent monitoring and evaluation** of CAMPA-funded works(pib.gov.in). The Uttarakhand Forest Department's Monitoring, Evaluation, IT & Modernization (MEIT&M) wing, led by the Chief Conservator of Forests (MEIT&M), has spearheaded this initiative in accordance with the national CAMPA framework and the CAF Act. The following sections detail the objectives, methodology, institutional setup, and key findings of the concurrent monitoring exercise for 2024–25, highlighting how it contributes to improved forest management, biodiversity conservation, and transparency in Uttarakhand.

2.1 Study Sites

Uttarakhand spans a remarkable range of geographical and ecological zones, from the **Terai** grasslands and moist deciduous forests in the southern foothills to alpine meadows and glaciers



in the high Himalayas(en.wikipedia.orgfao.org). This diversity means plantation sites cover varied terrains – fertile lowland **Bhabhar** plains, subtropical **chir pine** slopes, temperate oak and conifer forests, and high-altitude scrub. Such ecological breadth influences both the species planted and the challenges of afforestation in each area. Administratively, the state's forests are managed across **10 forest circles** (including wildlife divisions) comprising **32 forest divisions** in the **Garhwal** and **Kumaon** regions. The CAMPA 2024–25 plantations were spread across virtually all these divisions, ensuring representation from the Shivalik foothills up to alpine zones.

Figure 2.1(a): Map showing Plantation sites in Uttrakhand

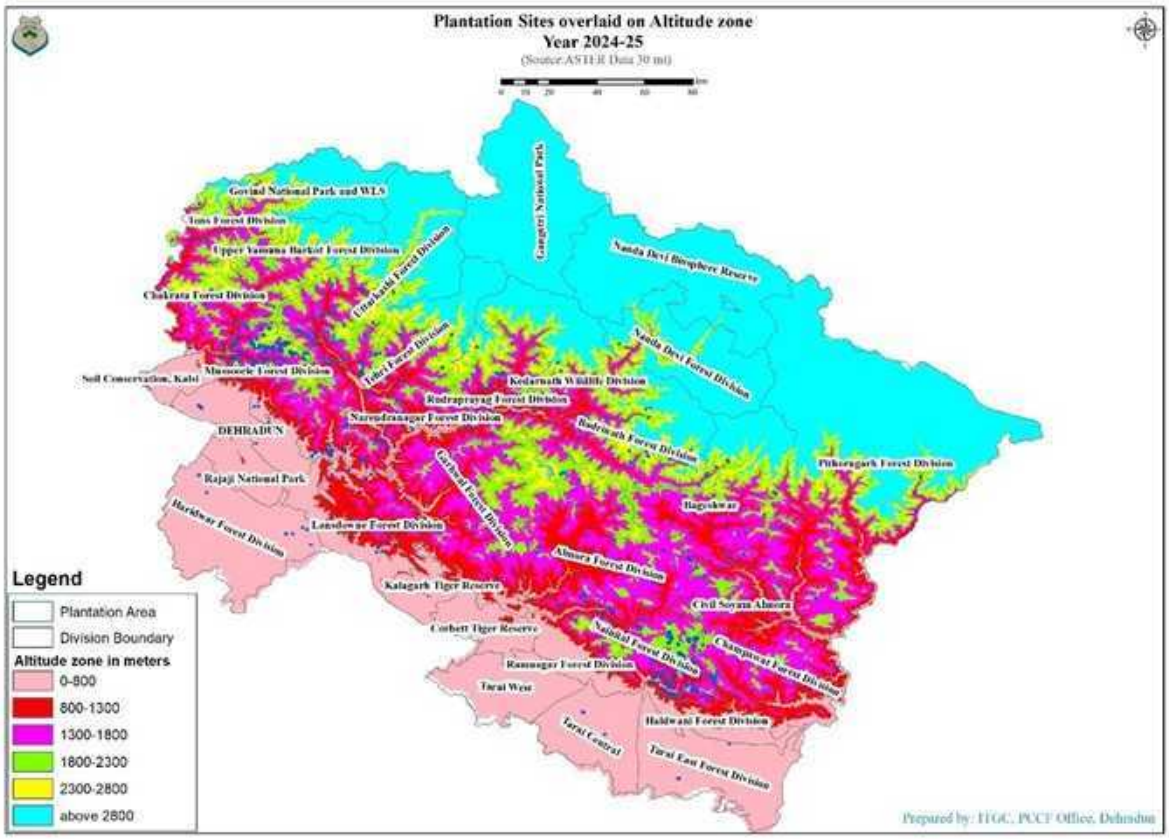


Figure 2.1(b): Plantation sites overlaid on altitude zones

Overall, **5,121.22 ha** of new plantations (about **4.07 million** saplings) were taken up under CAMPA in 2024–25. These plantation sites span **Kumaon** and **Garhwal** regions, which contributed roughly 41% and 59% of the total plantation area respectively (about 2,085 ha in Kumaon vs. 3,036 ha in Garhwal). The distribution of plantation effort is uneven: for instance, **Mussoorie division** in Garhwal alone implemented **950.14 ha** of plantations (the largest of any division, ~18.5% of the state total), while a few divisions in difficult terrain (e.g. **Nanda Devi** in Chamoli) had under **5 ha**. Most divisions, however, planted on the order of a few tens to a few hundred hectares each. This is detailed in **Table 2.1**, which breaks down the plantation area and number of saplings by region and division. Notably, the **Nainital** division (Kumaon) also had a substantial program (~431.8 ha), as did **Tarai Central** (~410.9 ha) and **Uttarkashi** (~383.7 ha). In contrast, divisions like **Dehradun** (~32.9 ha) and **Tons** (10 ha) had relatively

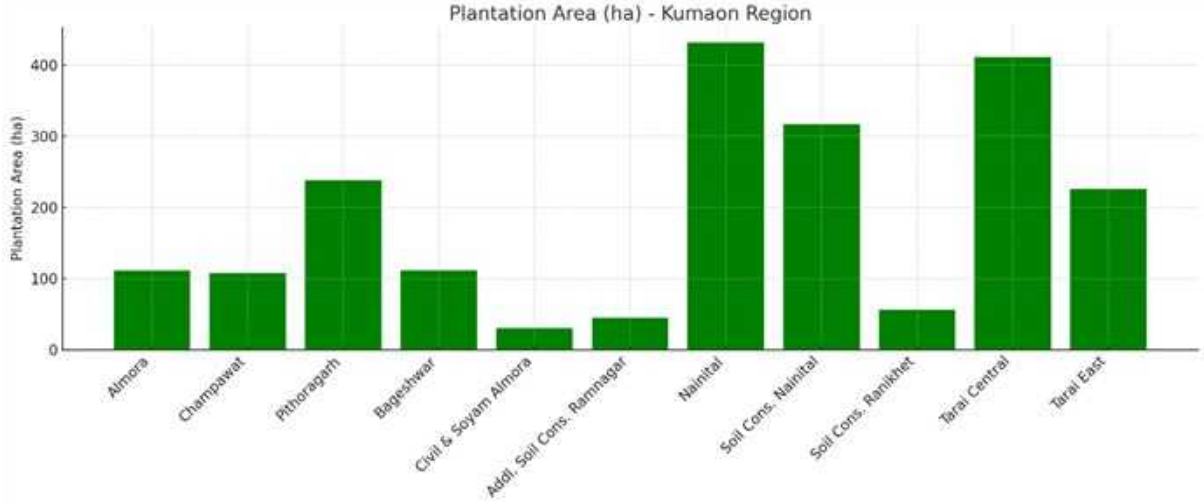
small plantation areas. This wide range reflects varying availability of suitable land and differing CAMPA project allocations across divisions.

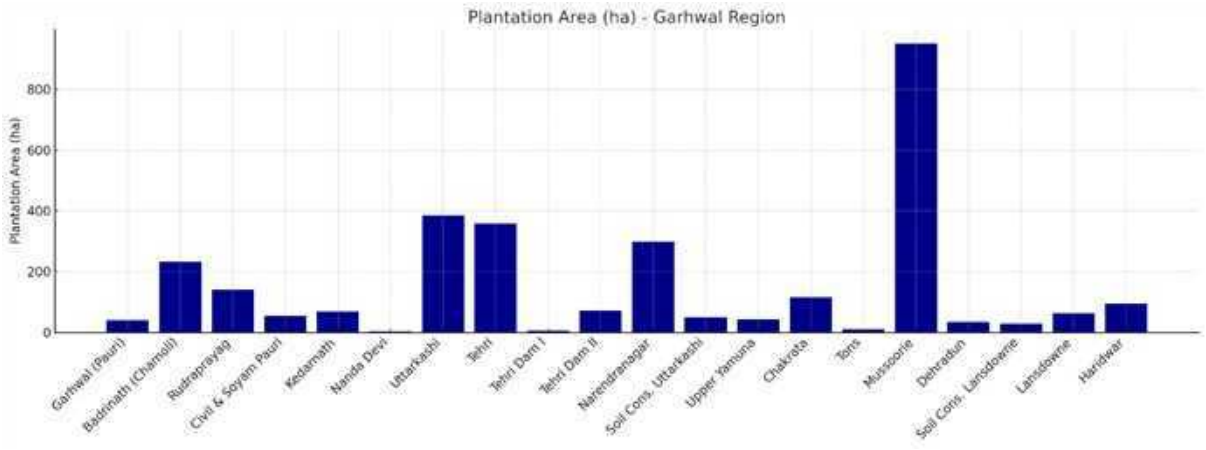
Table 2.1: CAMPA 2024–25 Plantation Area and Saplings by Division (Zone-wise)

Region/Zone	**Plantation Area (ha)**	**Saplings Planted (No.)**
Kumaon Region		
... Kumaon divisions ...		
Almora	111.23	119,700
Champawat	107.60	46,360
Pithoragarh	237.70	247,970
Bageshwar	112.01	123,215
Civil & Soyam Almora	30.00	6,000
Addl. Soil Cons. Ramnagar	44.62	48,478
Nainital	431.82	222,106
Soil Cons. Nainital	317.30	193,750
Soil Cons. Ranikhet	56.00	56,000
Tarai Central	410.93	436,165
Tarai East	225.70	204,210
Total Kumaon	*(11 divisions)* **2,084.91**	**1,703,954**
Garhwal Region		
Garhwal (Pauri)	39.32	43,252
Badrinath (Chamoli)	232.00	252,000
Rudraprayag	140.34	143,570
Civil & Soyam Pauri	53.53	51,900
Kedarnath	68.64	57,504
Nanda Devi	3.27	3,596
Uttarkashi	383.65	336,515
Tehri	358.00	346,300
Tehri Dam I	5.00	5,500
Tehri Dam II	70.00	70,000

Narendranagar	297.67	288,580
Soil Cons. Uttarkashi	50.00	72,100
Upper Yamuna	43.00	21,500
Chakrata	115.31	123,838
Tons	10.00	11,000
Mussoorie	950.14	331,180
Dehradun	32.90	33,284
Soil Cons. Lansdowne	28.54	31,393
Lansdowne	61.31	45,839
Haridwar	93.69	101,000
Total Garhwal	*(20 divisions)* **3,036.31**	**2,369,851**
Grand Total	*(32 divisions)* **5,121.22**	**4,073,805**

As seen above, Garhwal region (20 divisions) slightly outweighs Kumaon (11 divisions) in total plantation area and saplings, largely due to a few high-contribution divisions like Mussoorie and Uttarkashi. The data also illustrate the mix of **territorial divisions** (e.g. Almora, Dehradun), **wildlife divisions** (e.g. Badrinath, Kedarnath, Nanda Devi N.P.) and **soil conservation divisions** (e.g. Soil Cons. Nainital, Lansdowne) involved in CAMPA plantations. The diversity of sites – from **riverine Tarai forests** to **mountainous alpine zones** – underscores the need for customized species and techniques in each area. It also highlights the importance of a robust monitoring approach that can adapt to this spatial heterogeneity.





2.3 Objectives and Scope of Monitoring

Objectives: The primary objective of the concurrent monitoring framework is to verify that compensatory afforestation and related CAMPA activities are executed as planned and yield the intended ecological benefits. This involves tracking the establishment of new plantations, the maintenance of past plantations, survival and growth rates of saplings, and the implementation of soil and moisture conservation works. Ensuring **compliance with CAMPA guidelines** in terms of site selection, species composition, and quality of work is a key goal. The monitoring also seeks to identify any issues (such as low survival, pest attacks, encroachment, or forest fire damage) early on so that corrective measures can be taken promptly. Another important objective is to measure progress against **Key Performance Indicators (KPIs)** (see Section 2.7) and assess contributions to broader environmental targets like carbon sequestration, biodiversity enhancement, and livelihood support for local communities.

Scope: The scope of monitoring for 2024–25 encompasses all afforestation and related interventions funded under CAMPA in Uttarakhand during the year. This spans **32 divisions** across both Garhwal and Kumaon regions, including territorial forest divisions, civil soyam forest divisions, soil conservation divisions, and wildlife divisions involved in CAMPA plantations. Plantations under various schemes – such as compensatory afforestation (for diverted forest land), catchment area treatment, assisted natural regeneration, and others – are included. Geographically, the monitoring covers a diverse range of sites from the Tarai grasslands in the south to high-altitude areas in the north. The timeframe of this concurrent monitoring runs parallel to project implementation: field visits and remote sensing analyses were conducted in phases between late 2024 and mid-2025 to capture the status of plantations soon after planting and through the first growing season. By defining a clear objective and wide scope, the framework ensures that **every CAMPA plantation site** in 2024–25 is subject to systematic evaluation, thereby providing a comprehensive performance picture for the state's afforestation efforts.

2.4 Institutional and Legal Framework

The monitoring framework operates within the institutional structure established by the national CAMPA guidelines and the CAF Act, 2016. At the national level, a **National CAMPA Authority** (under the Ministry of Environment, Forest and Climate Change) oversees policy

and funding, while the **State CAMPA** (chaired by the State's Chief Secretary or Principal Chief Conservator of Forests) is responsible for implementation of CAMPA projects in Uttarakhand. Section 16 of the CAF Act, 2016 specifically mandates the formation of a Monitoring Group to evolve an independent system for concurrent monitoring and evaluation of workspib.gov.in. In line with this mandate, Uttarakhand constituted a dedicated monitoring mechanism under the State CAMPA. The MEIT&M wing of the Forest Department acts as the nodal agency for this concurrent monitoring exercise. It coordinates between the CAMPA Executive Committee, the forest divisions, and any third-party experts or agencies involved in the evaluation.

Legally, the framework draws authority from the **Compensatory Afforestation Fund Act, 2016** and its Rules (2018), which provide elaborate guidelines on utilization of CAMPA funds and require strict oversight of outcomespib.gov.in. The CAF Act and associated rules emphasize transparency and accountability – for instance, they stipulate that states must conduct internal monitoring, commission third-party evaluations, and upload progress data to the national **e-GreenWatch** web portal for public disclosurepib.gov.in. Uttarakhand's approach aligns with these requirements by combining internal monitoring (through departmental monitoring teams) with external elements (such as independent GIS analysis and potential third-party audits). An institutional **Monitoring & Evaluation Committee** at the state level reviews periodic reports and provides feedback to implementing divisions. The Chief Executive Officer (CEO) CAMPA Uttarakhand and the Principal Chief Conservator of Forests (HoFF) provide leadership to ensure that findings from concurrent monitoring are acted upon. This institutional framework establishes clear lines of responsibility: Division Forest Officers (DFOs) facilitate field monitoring in their jurisdictions; the CCF (MEIT&M) supervises the overall process and data management; and the State CAMPA Governing Body reviews the outcomes to inform future planning. By embedding the concurrent monitoring in the legal and organizational structure, Uttarakhand ensures that it is not a one-off exercise but a sustained system integral to CAMPA implementation.

2.5 Stakeholder Engagement

Effective monitoring and evaluation under CAMPA rely on the active engagement of multiple stakeholders at different levels. **Local communities** are crucial partners, as they often participate in plantation activities and have on-ground knowledge of site conditions. During the 2024–25 monitoring, local villagers and Van Panchayat members were consulted during field visits; their feedback on plantation success, challenges (such as grazing or water availability), and any instances of damage provided valuable context. Involving community stakeholders helps validate the findings and fosters a sense of shared responsibility for the plantations' survival.

The framework also emphasizes coordination with **field staff and local authorities**. Beat Guards and Range Officers accompanied the monitoring teams to each site, ensuring access and providing records of planting (e.g. species planted, date of planting). Regular interaction with these field functionaries allowed cross-verification of reported progress. Divisional Forest Officers were kept in the loop about observations in their division, enabling immediate corrective actions where needed. Such collaboration ensures that monitoring is not perceived as an external audit alone, but as a collaborative process aimed at mutual goal of improving plantation outcomes.

At the state level, the findings from concurrent monitoring were shared with senior forest officials and the CAMPA Steering Committee. Stakeholder workshops were conducted (virtually or in-person) to discuss preliminary findings – bringing together the monitoring team, DFOs, and representatives from the State CAMPA office. These engagements provided a platform to highlight best practices from divisions that performed well and to brainstorm solutions for issues found elsewhere. The **engagement of stakeholders from community to administration** thus created a feedback loop: field insights informed higher-level decisions, and policy directives (like focusing on survival improvement or protective measures) were communicated back to the grassroots for implementation. This inclusive approach underpins the credibility and success of the concurrent monitoring framework, as it leverages the strengths and knowledge of all stakeholders involved in Uttarakhand's afforestation efforts.

2.6 Technology Integration in Monitoring

One of the pillars of the Uttarakhand CAMPA monitoring framework is the **use of advanced technology** to complement traditional field surveys. In 2024–25, the Monitoring & IT wing implemented **remote sensing and GIS tools** on a significant scale to evaluate plantation status across vast and difficult-to-access areas. High-resolution satellite imagery and geospatial analysis enabled the team to assess vegetation growth and detect changes with objectivity and precisionfile-rn7ewwgthe1wvguxjpdcke. Key technological components of the framework include:

- **Remote Sensing (Satellite Imagery):** Satellite data was acquired for all plantation sites. The primary datasets were from the **LISS-IV** sensor (Linear Imaging Self-Scanner IV) on ISRO's Resourcesat satellites and very high resolution commercial satellites like **WorldView-3**. LISS-IV provides multispectral imagery at ~5.8 m spatial resolution, which is detailed enough to analyze plantation plotsfile-q6xgwgfxkyvor3fgbsct8w. WorldView-3 imagery (with sub-meter resolution) was used selectively for fine-scale validation in certain areas (for example, small or scattered plantation sites, or to zoom into areas flagged as problematic on LISS imagery). The satellite images covered key periods of the plantation growth cycle – an initial set from October–December 2024 (post-monsoon, when plantations had recent growth) and a second set planned for post-monsoon 2025 to assess one-year changes.

- **Geographic Information System (GIS):** All plantation site boundaries were obtained as digital polygons (KML/shape files) from the divisions and loaded into a GIS platform. This allowed overlaying the plantation boundaries on satellite images. Using GIS, the monitoring team could precisely extract vegetation index values for each site and generate map-based outputs. A central GIS database was maintained to store spatial data for each CAMPA plantation, enabling efficient retrieval and analysis.

- **Mobile Data Collection:** Field teams were equipped with GPS-enabled mobile devices for data collection. A simple mobile app or form was used to record observations at each site (such as survival count, height of saplings, signs of threats) along with geo-tagged photos. This real-time data collection fed into the central database and was cross-checked against remote sensing findings for consistency. Mobile tools improved the accuracy of field data and sped up reporting, as observations could be uploaded from the field itselffile-rn7ewwgthe1wvguxjpdcke.

- **e-GreenWatch Portal Integration:** Data from the concurrent monitoring have been integrated with the **e-GreenWatch** system – a nationwide web portal for CAMPA project monitoringpib.gov.in. Plantation details (area, species, year, geolocation) and progress updates are being uploaded to this portal. The integration ensures that Uttarakhand's CAMPA plantations are visible to national authorities and the public, enhancing transparency. It also means that anyone can view the plantation status and even see satellite-based updates through the portal's interface, aligning the state's efforts with the central monitoring mechanism.

By leveraging these technologies, Uttarakhand's monitoring framework achieves a higher scale and accuracy than traditional methods alone. Remote sensing allows **wall-to-wall assessment** of plantations, identifying areas of healthy growth versus areas of concern (e.g., patches where vegetation cover remains low). GIS facilitates the synthesis of large volumes of spatial data into interpretable maps and statistics. Mobile and web tools ensure that data flows quickly from the field to decision-makers, enabling near real-time monitoring. In summary, the infusion of technology has made CAMPA monitoring more **efficient, objective, and transparent**, as illustrated in the subsequent sections on data analysis and results.

Remote Sensing Workflow and NDVI Analysis

A core part of the technology integration is the use of remote sensing to calculate the **Normalized Difference Vegetation Index (NDVI)**, which is a well-established indicator of vegetation health and greenness. The workflow adopted for satellite-based monitoring can be summarized as follows:

- **Data Acquisition:** Obtain cloud-free satellite images covering all plantation polygons. For 2024–25, LISS-IV multispectral imagery (green, red, NIR bands) and select WorldView-3 scenes were acquired for the period October 2024 to March 2025. This timing captures the post-monsoon flush of vegetation in plantations. The spatial resolution (5.8 m for LISS-IV) is sufficient to distinguish plantation plots and even row structures in many casesfile-q6xgwgfxkyvor3fgbsct8w. High-resolution images (<0.5 m) were used where more detail was needed, such as verifying small plantations or resolving mixed land use areas.

- **Pre-processing:** The raw satellite images underwent standard preprocessing to ensure accuracy in analysis. This included **radiometric correction** (to normalize pixel intensity and remove sensor noise), **geometric correction** (to align the imagery with true ground coordinates so that plantation boundaries match exactly), and atmospheric corrections as required (removing haze or atmospheric effects on NDVI values). These steps provided a clean and spatially accurate base for computing NDVI.

- **NDVI Computation:** NDVI was calculated for each image using the formula NDVI = (NIR – Red) / (NIR + Red). This index ranges from -1 to +1 and correlates with live green vegetation. Healthy, dense vegetation reflects strongly in NIR and less in red, yielding higher NDVI values, whereas sparse or stressed vegetation yields lower NDVIfile-q6xgwgfxkyvor3fgbsct8w. The output is an NDVI map (raster) where each pixel's value indicates vegetation vigor. Plantation site boundaries were used to extract mean NDVI values and NDVI distribution within each site.

- **Classification of Vegetation Health:** For interpretation, the continuous NDVI values were classified into qualitative categories of vegetation health. The following threshold scheme was used (calibrated to local forest conditions):
    - **Very High Vegetation:** NDVI > 0.6 (indicative of very healthy, dense tree cover or lush foliage)
    - **High Vegetation:** NDVI 0.4 – 0.6 (good vegetation status, likely well-growing young plantations or secondary forests)
    - **Moderate Vegetation:** NDVI 0.2 – 0.4 (average growth, sparse canopy; typical of young plantations with open areas or moderate ground vegetation)
    - **Low Vegetation/Scrub:** NDVI 0.0 – 0.2 (poor vegetation cover – could be recent planting with most area as bare soil, or degraded/browsed sites)
    - **Non-Vegetated:** NDVI < 0.0 (no green vegetation – areas of rock, soil, or failed plantation patches)

These classes were mapped for each plantation site. Figure 2.1 illustrates an example NDVI classification map of plantation sites in one region (darker greens representing high NDVI and reds/orange indicating low NDVI). Such maps allow quick visual identification of which plantations are thriving and which are struggling.

- **Change Detection:** Although the full evaluation of growth will occur over longer periods, an initial change detection was planned by comparing NDVI of late 2024 versus the next available imagery (e.g., post-monsoon 2025). This will help estimate the **survival percentage** and growth in the first year. Any significant drop in NDVI in a plantation area could indicate mortality or disturbance, whereas stable or increased NDVI would confirm healthy growth.
- **GIS-Based Visualization:** All results from the remote sensing analysis (NDVI maps, classification outputs, etc.) were compiled into GIS for creating thematic maps and statistical summaries. Each division received maps of their CAMPA plantations with color-coded NDVI classes, and an aggregated map for the whole state was prepared to be included in the report (see placeholder Figure 2.1). These visualizations serve as evidence-based documentation of plantation status, supporting the field observations and enabling data-driven discussions with stakeholders.

Using NDVI and satellite monitoring in this manner provides an **objective, repeatable measure** of plantation health across the entire landscape. It supplements field data by covering areas that might not have been physically visited (ensuring no site is overlooked) and can often highlight issues not immediately evident on the ground (for example, gradual canopy loss due to pests might be caught early through a drop in NDVI). In the 2024–25 monitoring, this approach was particularly useful in remote or large plantation sites where conducting a 100% ground survey was impractical. It also establishes a quantitative baseline for each plantation that can be referred to in subsequent years, thereby fitting into a long-term monitoring strategy under CAMPA.

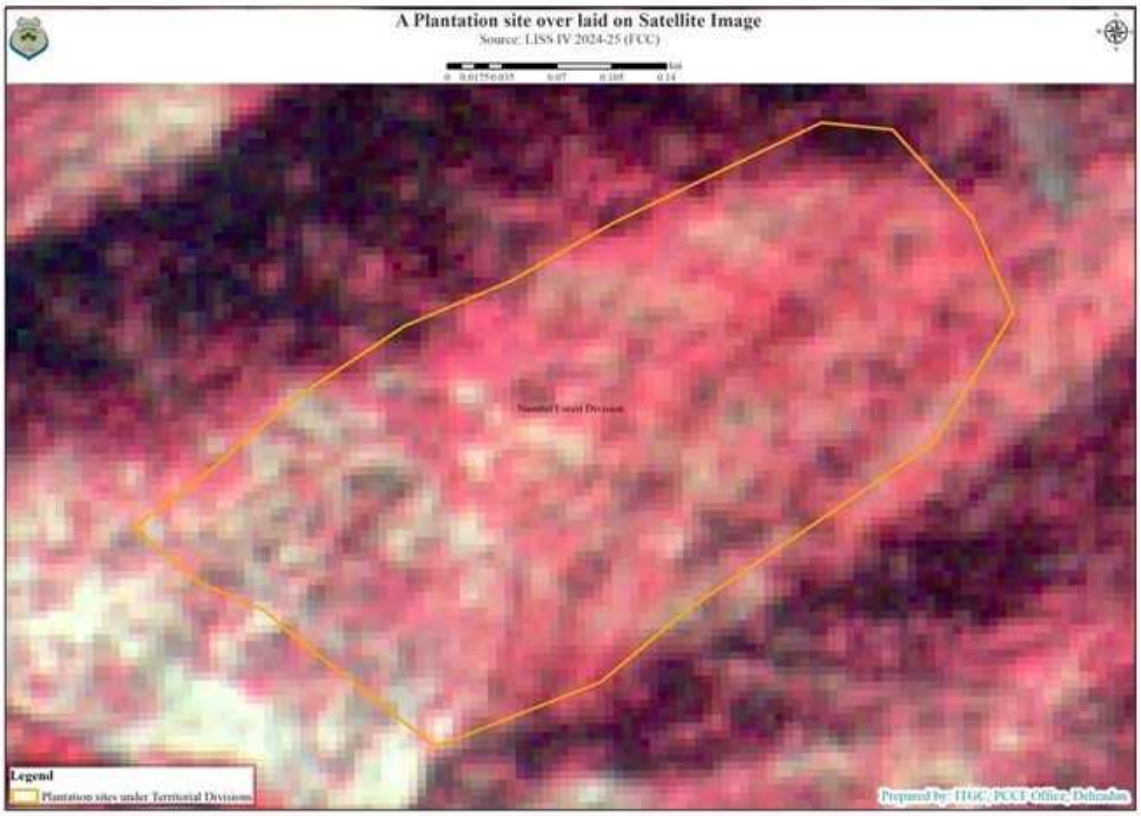


Figure 2.2(a): Plantation site over laid on satellite image

Figure 2.2(b): Plantation site over laid on high resolution satellite data

2.7 Field Inspections and Ground Verification

While technology provides powerful tools, **on-site field inspection** remains an irreplaceable component of concurrent monitoring for CAMPA. During 2024–25, dedicated monitoring teams carried out structured field visits across all divisions to ground-truth the plantation works. Each team followed a pre-decided itinerary to sample a representative portion of plantation sites in every division. Given the extensive area (over 5,000 ha planted), a **sampling approach** was adopted wherein roughly **20–30% of the plantation sites/area** in each division were visited and evaluated in detail. This sampling intensity – averaging about one-third of the area – ensured a balance between coverage and practicality, and is considered sufficient to extrapolate general findings (in many divisions, more than one quarter of the plantation area was directly inspected, providing high confidence in the observations).

During field inspections, the teams used standardized checklists to record various parameters: survival count (number of live saplings vs. originally planted), average height and vigor of saplings, any signs of stress or damage (from drought, frost, pests, diseases, fire or grazing), condition of fencing or protection measures, and the presence of any associated work like water conservation structures. Photographs were taken as evidence at each site, and GPS coordinates were logged to confirm the location. In many cases, local villagers or plantation caretakers were interviewed to obtain anecdotal insights – for instance, whether they had watered the plants regularly, or if wildlife browsing was observed.

Ground verification also entailed checking plantation records against reality. For example, if division records indicated that **1,000 saplings** of species X were planted in a compartment, the field team counted surviving plants and noted species composition to see if it matched. Any discrepancies (such as significantly fewer saplings on site than reported, or a different mix of species) were documented for follow-up. Fortunately, the concurrent monitoring found that in most sites the records were largely accurate and the reported numbers were honest; however, a few cases of minor discrepancies were flagged for clarification. Additionally, field teams evaluated whether the plantations were carried out following best practices – e.g., proper spacing, pit size, weeding and soil working, etc. – as these factors influence the survival and long-term success.

The **field inspections** provided nuanced understanding that purely remote methods cannot offer. For instance, an NDVI map might show a low vegetation index in a site – the field visit can reveal whether this is because plants have died or simply because they are dormant/small and will grow later. Ground observations also help identify causes of any poor performance: the teams reported issues like water scarcity in some sites, monkey damage in others, or late planting (which gave saplings less time to establish before winter) as reasons for low initial survival in certain areas. Such insights are crucial for recommending adaptive measures.

In summary, the field verification component of the monitoring framework ensured **accountability at the grassroots level**. By physically inspecting a substantial sample of plantations and involving local staff in the process, the Forest Department underlined that CAMPA plantations are being closely watched and evaluated. This not only encourages field functionaries to maintain diligence (knowing that their work will be checked), but it also builds confidence in the accuracy of the monitoring data. The combination of ground truthing with remote sensing provides a robust picture – where they agree, we gain high certainty in the

findings; where they diverge, it signals areas that need further investigation or continuous watch.

2.8 Key Performance Indicators (KPIs)

To systematically evaluate the success of CAMPA interventions, the monitoring framework employs a set of **Key Performance Indicators (KPIs)**. These KPIs serve as quantitative metrics against which progress can be measured and compared across sites or over timefile-rn7ewwgthe1wvguxjpdcke. The main KPIs considered for the 2024–25 plantations include:

- **Survival Rate of Planted Saplings:** This is the proportion of saplings that are alive at a given time (for instance, at the end of the first year) compared to the number originally planned. It is a critical indicator of short-term success. Survival rates are typically assessed at 1-year, 3-year, and 5-year milestones. In concurrent monitoring, early survival observations were made; for example, in sampled plots, survival after ~6 months was noted to gauge initial establishment. This early check can identify sites that may require replanting or additional care. The aim is to achieve high survival (ideally >80% after one year) through proper maintenance and protection.
- **Area Afforested or Restored:** The total area (in hectares) that has been brought under plantation or assisted natural regeneration is a fundamental KPI, reflecting the scale of intervention. For 2024–25, Uttarakhand achieved **over 5,121 ha** of new plantations (as shown in Table 2.1). This KPI is often broken down by category (e.g., area under compensatory afforestation vs. area under catchment treatment plantations) and by geography (area in each division or circle). It helps ensure that annual targets in the Annual Plan of Operations (APO) are met in terms of extent.
- **Planting Density and Stocking:** This refers to the number of saplings planted per hectare and how many of those remain per hectare after some time. In our context, roughly **4.07 million** saplings were planted on 5121 ha, averaging about 800 saplings per hectare on paper. The monitoring checked whether the effective stocking (live saplings per ha) is adequate and as planned. Areas with very low stocking due to failures will need gap planting.
- **Species Diversity and Composition:** A qualitative KPI, it looks at how many different species were planted and whether native/local species are given priority. A diverse species mix is preferable for ecological resilience. The monitoring teams noted species information – for instance, whether a plantation was monoculture of one species or a mix of 3–4 species. This information will be used to correlate survival with species and to ensure biodiversity goals are considered.
- **Biodiversity and Ecosystem Health Indicators:** Over the longer term, CAMPA plantations aim to improve biodiversity and ecosystem services. Indicators such as natural regeneration (appearance of wild seedlings or ground flora), return of fauna (birds, insects) to the plantation sites, and improvements in soil moisture or reduced erosion can be considered. In concurrent monitoring, these are mostly observational due to the short timeframe, but any signs like growth of grass cover, presence of earthworms in soil, or sighting of herbivores using plantation for shelter are noted as positive signs. Future evaluations will monitor these aspects more closely to see if the plantations are developing into functional ecosystemsfile-rn7ewwgthe1wvguxjpdcke.

- **Soil and Water Conservation Impact:** Especially for plantations done under catchment area treatment or on hill slopes, one KPI is whether supporting measures like contour trenches, check dams, or mulching have aided in moisture retention and soil stabilization. Field teams checked the condition of such structures where present. Metrics like improved soil moisture (qualitatively assessed) or absence of fresh erosion gullies are indicators that plantations are contributing to soil and water conservationfile-rn7ewwgthe1wvguxjpdcke.
- **Community Participation and Livelihood Generation:** Although harder to quantify immediately, the monitoring framework also looks at the social KPI of how many local people were employed or benefited during the plantation activities (nursery raising, planting, maintenance). While this is not a direct ecological indicator, it ties into the success of the program by measuring community support and economic impact.

Each KPI provides insight into a specific dimension of success, and together they give a holistic evaluation. The concurrent monitoring report will use these indicators to identify which plantations are on track (high survival, good growth, etc.) and which are lagging. For example, a site with low survival and poor growth (low NDVI) clearly flags an issue, whereas a site with high survival but perhaps slow growth might indicate need for maintenance inputs (like fertilization or weeding). By monitoring KPIs, the forest department can direct attention and resources efficiently – rewarding or learning from high-performing sites and improving or reworking the low-performing ones. The KPIs also form the basis for reporting to the National CAMPA authority, demonstrating compliance with expectations that CAMPA funds yield tangible, measurable outcomes.

2.9 Plantation Data Summary 2024–25

To appreciate the scale and distribution of CAMPA plantations in Uttarakhand during 2024–25, Table 2.1 provides a summary of the plantation area and number of saplings planted in each forest division. The data encapsulate all types of CAMPA-funded plantations for the year (including compensatory afforestation for diverted land, catchment treatments, etc.). A total of **31** forest divisions (including territorial, wildlife, civil soyam, and soil conservation divisions) carried out plantations, and the aggregated totals are also shown.

From Table 2.1, it is evident that **CAMPA plantations in 2024–25 were widespread across Uttarakhand**, with every major forest division participating. The *Mussoorie* Forest Division stands out with the largest plantation effort – about 950 ha and over 331,000 saplings – likely due to catchment area treatments in that region. Other divisions with significant plantation area include *Nainital* (431.8 ha), *Terai Central* (410.9 ha), *Uttarkashi* (383.7 ha), and *Tehri* (358 ha). In fact, these top five divisions together account for a large fraction of the total area, indicating a focus of efforts in those jurisdictions (see Figure 2.2). On the lower end, some divisions like *Nanda Devi* (which is largely a National Park area) had smaller plantations (3.3 ha) – this could be due to limited available non-forest land for compensatory afforestation in those areas or focus on quality over quantity (e.g., enrichment planting). The presence of **Soil Conservation divisions** (e.g., Soil Cons. Nainital, Ranikhet, Lansdowne) and **Dam specific divisions** (Tehri Dam I & II) reflects that a portion of CAMPA funds were used in soil stabilization and catchment projects, not just traditional forest plantations.

It's also notable that the **number of saplings** does not always scale linearly with area across divisions, because planting density can vary by site conditions and objectives. For instance, Terai Central's ~411 ha has over 436,000 saplings (densely planted operational areas, possibly agroforestry or fuelwood species), whereas Mussoorie's 950 ha has ~331,000 saplings (an average lower density, possibly because some areas might be enrichment planting in existing forests or spread over difficult terrain). Overall, about **4.07 million saplings** were planted statewide, at an average density of ~800 saplings/ha.

Figure 2.2: Top five forest divisions by plantation area in CAMPA 2024–25 (hectares planted). Mussoorie division led by a wide margin in area covered, followed by significant efforts in Nainital, Terai Central, Uttarkashi, and Tehri. Such visualizations help identify where major afforestation investments were concentrated.

The above summary provides context for the monitoring results – larger plantation programs like in Mussoorie or Terai Central might require more intensive monitoring due to their scale, whereas smaller ones like Nanda Devi can be managed with focused attention. In subsequent analysis (Section 2.9 and beyond), the condition and performance of these plantations are evaluated, combining field observations with NDVI remote sensing data. This ensures that not only the *quantity* of plantations (as in Table 2.1) is reported, but also the *quality* and health of these plantations are assessed.

2.10 NDVI-Based Vegetation Health Assessment

Utilizing the NDVI methodology described in Section 2.5, the concurrent monitoring provided a snapshot of vegetation health for the CAMPA plantations of 2024–25. The NDVI analysis enabled the team to classify each plantation site into the categories of vegetation vigor (Very High, High, Moderate, Low, Non-vegetated) based on satellite imagery. This section highlights the findings from that assessment, offering an overview of how well the young plantations are establishing green cover across the state.

Overall, the NDVI results were encouraging for many areas but also flagged some concerns. On analyzing the NDVI maps generated (see Figure 2.1 for an example segment), it was found that a **majority of plantation sites fell into the Moderate to High vegetation category** by the end of the first growing season. This indicates that in many sites, saplings have leafed out and there is sufficient ground or understorey vegetation contributing to NDVI (often assisted by monsoon rains and protective measures). Several pockets of **High vegetation (NDVI 0.4–0.6)** were observed especially in divisions like Terai Central and parts of Nainital – these correspond to areas where either the plantations were supplemented by existing vegetation or fast-growing species (like certain bamboos or indigenous trees) responded very well, creating a closed canopy quickly. A few small patches even registered **Very High NDVI (>0.6)**, likely where plantations are adjacent to intact forest edges or where older CAMPA plantations (from previous years, now 2–3 years old) were also captured in the imagery.

On the other hand, **Low vegetation (NDVI 0–0.2)** areas were identified in some newly planted sites, for instance in the higher elevations of Uttarkashi and portions of degraded grasslands in Mussoorie division. In these cases, the low NDVI is not unexpected – newly planted saplings, often deciduous, may not have significant leaf cover yet or might have shed leaves in winter when the imagery was taken. These sites will need to be monitored in the next season to ensure that NDVI values improve as the plants establish. Areas remaining in low NDVI might indicate

problems such as planting failures or inadequate site preparation. Importantly, **virtually no large plantation site was entirely classified as "non-vegetated"**, which is reassuring – it suggests that plantations did take place and there is at least some vegetation cover everywhere (even if some of it may be weeds or natural regrowth). Only small patches within some sites were non-vegetated (NDVI <0) possibly due to rocky outcrops or recent disturbances like fire.

By comparing NDVI between the initial imagery (late 2024) and a follow-up image in early 2025 (where available), preliminary **change detection** indicated that most plantations maintained or slightly improved their greenness. This is notable because a decline in NDVI shortly after planting could signal withering of saplings, whereas stable or increasing NDVI suggests survival and even new growth (for instance, winter wheat cover crop or grasses could raise NDVI too if they were used for soil cover). A few sites in Champawat and Dehradun divisions showed minor NDVI declines in the late winter image; field teams correlated these with sites where some mortality was observed due to frost. These insights allow for targeted remedial actions such as replanting frost-hardy species in those locations.

In summary, the NDVI-based assessment provided an **objective verification** of field observations. It generally corroborated the field reports: divisions that reported good survival also showed healthy NDVI levels, and those with challenges (like some high altitude or arid sites) showed lower NDVI. It serves as a powerful visualization for communicating results – for instance, presenting a **statewide NDVI map** of CAMPA plantations makes it easy to spot where the green cover is flourishing versus where it is sparse. This kind of evidence is invaluable for stakeholders and can be used to justify interventions. Going forward, these NDVI benchmarks set in 2024–25 will be the baseline to measure future growth. An increase in NDVI in 2025–26 would confirm the positive trajectory of these plantations, while any decrease would raise a red flag needing investigation. Thus, the NDVI analysis not only assesses current health but also sets the stage for **long-term monitoring** of these afforestation efforts through remote sensing.

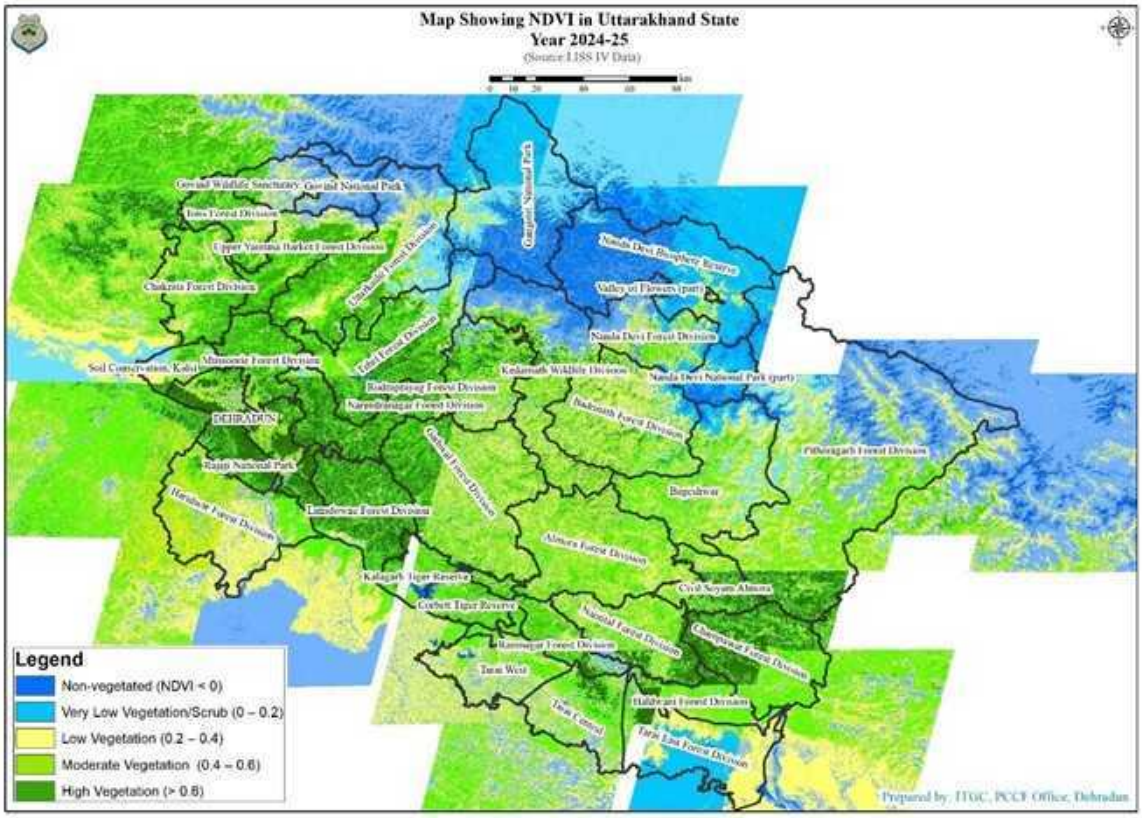


Figure 2.3: NDVI Classification Map

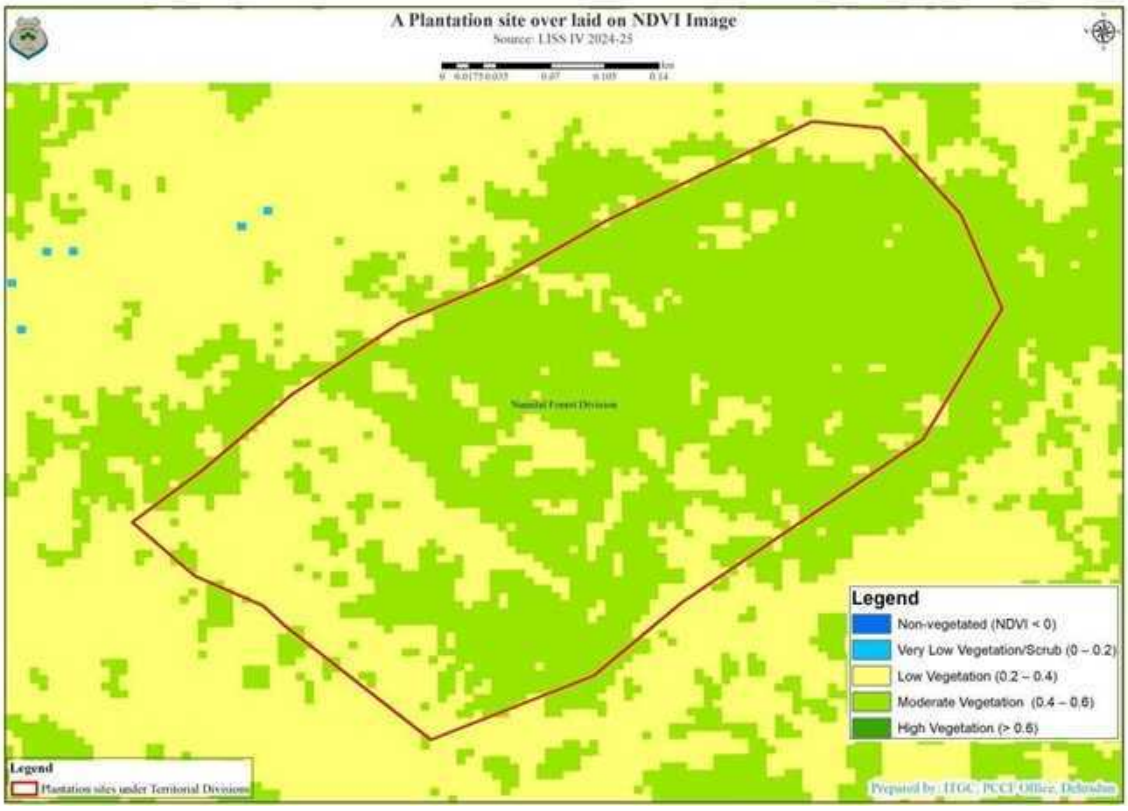


Figure 2.4: NDVI of one of Plantation Site

2.11 Benefits of Concurrent Monitoring

The implementation of concurrent monitoring for CAMPA in Uttarakhand has yielded multiple benefits that enhance the overall effectiveness of the afforestation program. By "concurrent" monitoring, we refer to the process of continuously tracking project progress in real-time (or near real-time) rather than waiting for an end-of-year or post-project evaluation. Some of the key benefits observed are:

- **Timely Issue Detection and Alerts:** Perhaps the most immediate advantage is the ability to detect problems early and issue alerts for corrective action. For example, if a particular plantation site is found during monitoring (field or remote sensing) to have a very low survival or was affected by drought, this information is available to the Department within months of planting. This enabled timely interventions such as arranging watering, reinforcing protection, or planning **supplementary planting** in the same planting season, rather than discovering the failure a year later. Essentially, concurrent monitoring serves as an early warning system for plantation performancefile-q6xgwgfxkyvor3fgbsct8wfile-q6xgwgfxkyvor3fgbsct8w.
- **Improved Transparency and Accountability:** The process has increased transparency at all levels – field staff know that outcomes are being recorded and reported, which incentivizes diligent work. Simultaneously, the data (including geotagged photos and e-GreenWatch updates) are accessible to senior officials and even the public, ensuring there is an open record of what was achieved and how well it survived. This openness builds trust among stakeholders (from villagers to funding agencies) that CAMPA funds are being utilized properly. It also meets the **accountability requirements** set forth in CAMPA guidelines and the CAF Act by providing evidence-based verification of workspib.gov.in.
- **Data-Driven Decision Making:** Having quantitative data and maps from the monitoring allows the Forest Department to make informed decisions. For instance, analyzing which species showed better survival or which planting techniques worked best in certain regions helps refine future practices (adaptive management). Resource allocation can be data-driven – e.g., divisions that are struggling can be provided additional support or training, while successful models can be replicated in other areas. Over time, a historical database of monitoring results will help in forecasting outcomes and in **planning APOs more realistically** (e.g., knowing what survival rate to expect, how much replanting stock to keep in nurseries, etc.).
- **Efficiency and Cost-Effectiveness:** While monitoring does incur costs (teams, travel, technology), it is cost-effective in the long run because it helps ensure that the much larger investments in plantations are not wasted. By catching failures early, one can replant within the same year when the compensatory fund allocation is still available, thereby saving the cost of a failed plantation and subsequent new planting on the same site years later. Remote sensing monitoring, in particular, enables large-scale oversight with fewer field personnel – covering areas that would take weeks to traverse on foot can be done in hours on a computerfile-q6xgwgfxkyvor3fgbsct8wfile-q6xgwgfxkyvor3fgbsct8w. The 2024–25 exercise demonstrated that a combination of

one centralized GIS analyst and a few field teams could monitor thousands of hectares quite effectively, which is a good return on investment.

- **Compliance with National Standards:** Concurrent monitoring helps the state fulfill the monitoring and reporting obligations mandated by the National CAMPA Authority. The CAF Rules require states to have third-party monitoring and to host information on e-GreenWatch; Uttarakhand's framework checks these boxes and thus stands as a model of compliance. It was noted during this year that having the systems in place made it much easier to compile the annual report for National Authority review, since data was already collected and verified concurrently rather than scrambled at the last minute.
- **Stakeholder Confidence:** Knowing that there is a robust monitoring mechanism in place also boosts the confidence of those involved and external observers. Communities see that the Forest Department is serious about ensuring the plantations survive (which can motivate them to care for saplings too). Higher officials and funding bodies get confidence that results are being tangibly measured. Even researchers or auditors (like CAG) can refer to the monitoring data to perform their assessments. This culture of concurrent evaluation contributes to a more results-oriented approach in forestry programs, moving away from just "planting targets" to **"survival and impact targets."**

In essence, concurrent monitoring acts as a feedback and control mechanism that keeps the CAMPA program on track. It instills a practice of regular checking, learning, and adjusting, which is invaluable in ecological projects where outcomes are influenced by many factors (weather, wildlife, human actions, etc.). By the time the planting year closes, Uttarakhand already has a clear picture of which plantations are doing well and which are not, and can plan the next steps accordingly (maintenance, replantation, etc.), ensuring continuous improvement in afforestation success rates.

2.12 Reporting, Documentation and Data Management

A crucial aspect of the monitoring framework is how the findings are documented and reported. In 2024–25, Uttarakhand established a streamlined **reporting system** to ensure that information flows efficiently from field and analysis units to decision-makers and stakeholders. The reporting mechanism functioned at multiple levels:

- **Periodic Progress Reports:** Monitoring teams prepared brief progress reports on a monthly basis during the monitoring phase. These reports highlighted which divisions had been covered in field visits, any critical observations (e.g., "high mortality observed in X range, likely due to drought"), and interim statistics such as area surveyed and average survival observed. These periodic reports were submitted to the CCF (Monitoring) and shared with the PCCF and CAMPA CEO to keep them updated. Such frequent reporting allowed for mid-course corrections – for example, when early reports indicated fire damage in a few Garhwal plantations, an advisory was immediately sent out to all divisions to strengthen fire watch in and around CAMPA sites.
- **Central Data Repository:** All data collected – field forms, GPS points, photographs, satellite analysis outputs – were stored in a centralized digital repository managed by the MEIT&M cell. A **GIS database** was a core part of this repository, where each plantation site is an entry linked to attributes (area, species, division) and monitoring

results (survival %, NDVI value, etc.). The use of a centralized database (with backups on departmental servers) ensures data integrity and easy retrieval for future analysisfile-rn7ewwgthe1wvguxjpdcke. It also allows different users (with permission) to query and generate reports, for instance, getting a list of all sites where survival <50% or mapping all sites of a particular scheme.

- **Integration with e-GreenWatch:** As mentioned earlier, the e-GreenWatch web portal is used for sharing CAMPA progress with the Ministry and public. Uttarakhand's monitoring results have been progressively uploaded to e-GreenWatch. Each plantation's details (geo-coordinates, species, year) were already on the portal; now additional fields like survival status, monitoring remarks, and photos were attached. This serves as a **permanent online record** of the status of 2024–25 plantationspib.gov.in. Anyone – from a citizen to a policymaker – can log in and see, for example, that "Division X planted 100 ha, current survival ~70%, monitored in Feb 2025". This level of transparency through reporting deters false reporting and encourages accuracy at all levels.

- **Division-Level Feedback Reports:** After completing monitoring in each division, a **division-specific report** or note was prepared and sent to the respective DFO. This report summarized the findings for that division: listing sites visited, their survival rates, issues noted (if any), and recommendations. For instance, a division report might say "Out of 10 sites visited in Y Division, 8 have survival >75%, 2 sites (names) have ~40% survival – recommend gap filling in monsoon 2025; common weed infestation observed – intensify weeding around saplings; community participation is good in 5 village plantations, etc." These targeted reports served to formally communicate to each field manager how their division fared and what actions are expected. DFOs were requested to submit action-taken reports, especially where issues were highlighted.

- **Final Comprehensive Report:** All the gathered information culminates in a comprehensive monitoring report (essentially Chapter 2 of which this content is a part). This report will be submitted to the State CAMPA governing body and also shared with the National CAMPA Authority. It includes consolidated statistics, maps, tables (like Table 2.1), and analyses of what factors influenced success or failure. By documenting everything in detail, the report ensures institutional memory – so that next year's officers can learn from 2024–25 without starting from scratch.

- **Use of Digital Platforms:** The department also made use of digital communication (WhatsApp groups, email) for quick sharing of updates and photos from the field in real time, even before formal reports were written. This enabled an ongoing conversation among monitoring team members and with division staff, creating a community of practice around concurrent monitoring. All such communications were ultimately archived as part of the documentation process.

By establishing a robust reporting and data management framework, the monitoring exercise achieved more than just data collection – it ensured that the data translated into knowledge and action. The documentation created will feed into subsequent planning (for example, the 2025–26 APO can be better informed by the 2024–25 monitoring results). Moreover, it creates a **culture of record-keeping and openness**, where successes are recorded to be replicated and failures are not hidden but documented to be fixed

03

CHAPTER

FIELD FINDINGS, OBSERVATIONS, AND ACHIEVEMENTS

Chapter 3
Field observation, Findings and Achievements

3.1 Approach

The plantation sites evaluation activities across the Garhwal, Kumaon, and Tarai regions were strategically executed by different teams, each assigned specific plantation areas to cover comprehensively. The team-wise allocation of plantation areas was designed to optimize efforts and ensure thorough coverage.

Team Composition and Assigned Plantation Area:

- **Team 1:** This team was responsible for the largest area, covering approximately 276 hectares. Their primary activities were concentrated within Bhagirathi zone divisions, notably Uttarkashi (160 ha) and Tehri Dam-2 (45 ha), along with significant areas in Narendranagar and Soil Uttarkashi.

- **Team 2**: Managed a smaller yet vital section totaling 68.4 hectares, focusing primarily on strategic locations within Garhwal and Shiwalik circles, including critical sites at Dugadda, Kotdwar, and Pokhra.

- **Team 3:** Responsible for 249.85 hectares, team 3 concentrated their efforts mainly in the South Kumaon region, particularly around Nainital, soil conservation areas in Nainital, and various sites within the Tarai East and Tarai Centre regions.

- **Team 4:** Covered approximately 174.08 hectares, focusing predominantly on the North Kumaon divisions. Notable plantations were executed in Almora, Bageshwar, Champawat, and Pithoragarh, ensuring diversified regional coverage.

Team 5: Tasked with an extensive 178.858 hectares, this team operated primarily in Narendranagar and Shiwalik circles, including key areas such as Haridwar, Mussoorie, and Dehradun, highlighting both ecological and strategic locations.

- **Team 6**: Managed a substantial 207.254 hectares, focusing on Garhwal's critical ecological zones, including significant plantations within Badrinath, Kedarnath, Rudraprayag, and Yamuna circle locations.

The figure 3.1 illustrates the spatial distribution of plantation sites across Uttarakhand, delineating both territorial and non-territorial forest divisions. It highlights the diverse ecological zones where afforestation activities have been undertaken under various forest circles, showcasing a comprehensive state-wide restoration effort.

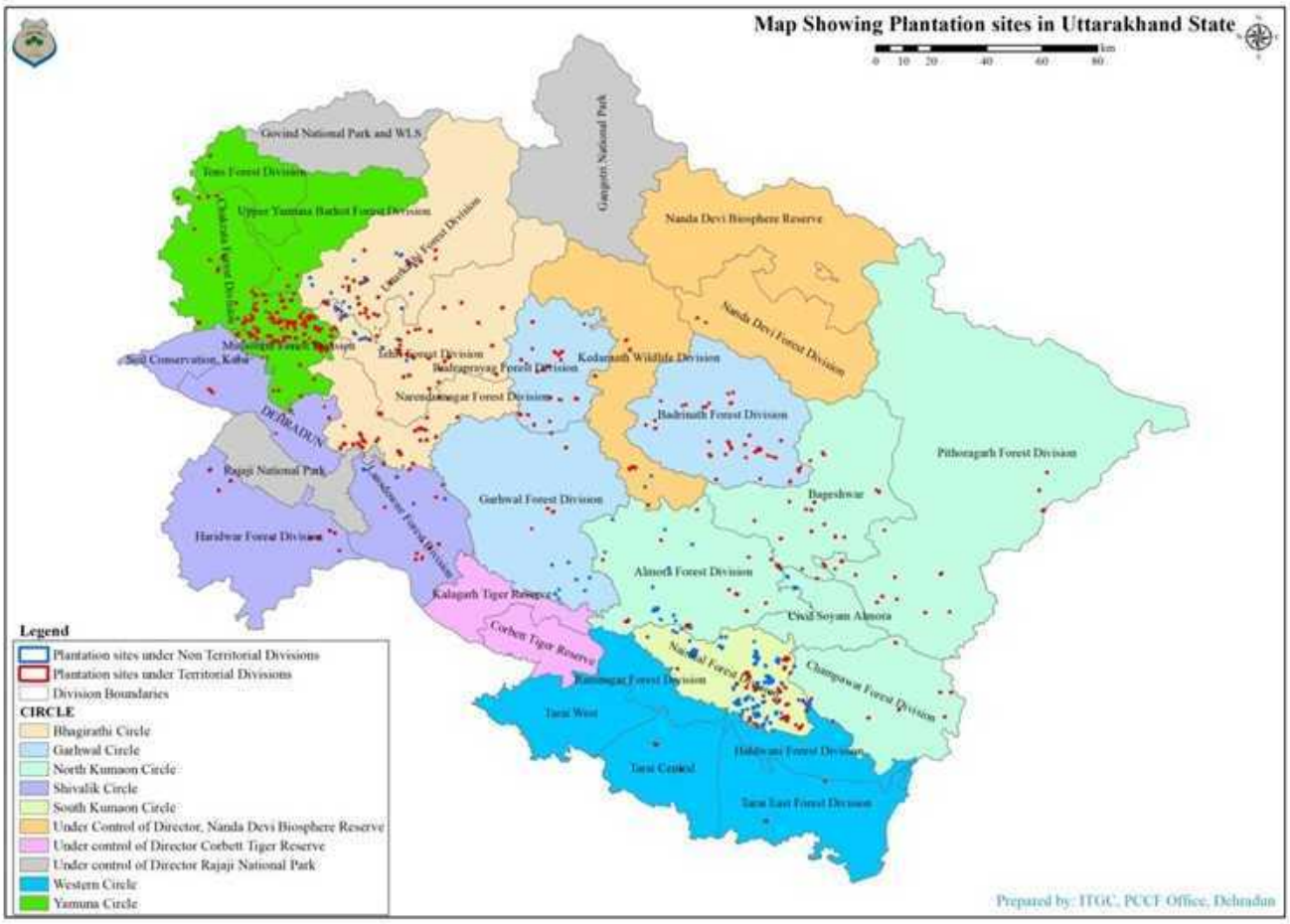


Figure 3.1(a): Circle map of Plantation Sites

3.2 Selected Plantation Area Evaluation:

From the total plantation of 5,121.22 hectares and 4,073,805 saplings, a focused evaluation was carried out on 1,350.35 hectares, constituting 26.37% of the total area. This selected area included 1,063,315 saplings.

Divisions such as Tehri Dam I and Tons showed a 100% selection rate, reflecting precise plantation efforts aligned with project goals. Other divisions like Nanda Devi (61.47%), Tanakpur Central (45.67%), and Haridwar (37.69%) also demonstrated high selection percentages.

Conversely, in some divisions, the selected area appears comparatively lower—for example, Civil & Soyam Almora (16.67%), Mussoorie (16.59%), and Additional Soil Conservation Ramnagar (17.55%). This variation is attributable to challenging and uniform topographical conditions that constrained the evaluation process within the given timeline. Despite such challenges, the teams successfully ensured spatially distributed coverage across representative sites.

In the upcoming sections, we will describe the field-level observations and sampling outcomes reported by each team in into thematic sections – **Plantation Activities, Nursery Details, Soil and Moisture Conservation (SMC), Other Activities, Safety Arrangements,**

and Species Diversity – to facilitate cross-comparison. Within each section, results are presented *team-wise* (Team 1 through Team 6) to maintain clarity and traceability to the original field investigations. All units, terminology, and formatting have been standardized for

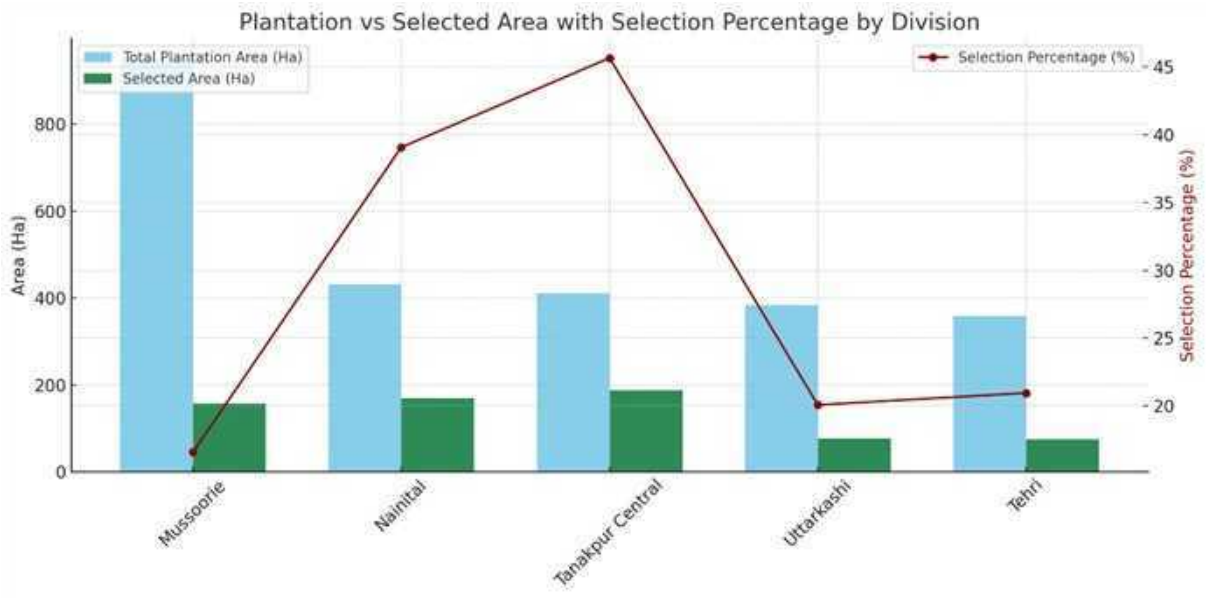


Figure 3.1 (b) Graph showing Plantation area vs selected area for sampling

consistency (e.g., areas in hectares (ha), lengths in kilometers (km) or meters (m), and survival rates in percentages). These observations include geo-tagged plantation plots, survival rates, species composition, and landscape conditions. The data presented will be later analyzed collectively to understand the broader effectiveness and ecological implications of the plantation drive.

Section 1: Consolidated Overview of Forestry Operations

The Annual Plan of Operations (APO) for 2024-25 represents a significant and multi-faceted investment in the ecological health and resilience of Uttarakhand's forest landscapes. The program's design extends beyond traditional afforestation to encompass a comprehensive suite of activities crucial for sustainable forest management. These include the scientific propagation of diverse plant species in departmental nurseries, extensive engineering and vegetative interventions for soil and moisture conservation (SMC), proactive measures for forest fire prevention, dedicated efforts for wildlife habitat improvement, and the essential maintenance of infrastructure to support all field operations. This integrated approach acknowledges that the creation of a thriving forest ecosystem is a complex endeavor, reliant on the synergistic interplay of multiple strategic components.

The scale of the APO 2024-25 is substantial, with activities spanning numerous administrative circles and divisions across the state. The aggregate figures from the consolidated field reports underscore the magnitude of the undertaking. In the realm of new afforestation, activities were carried out over approximately 770 hectares, involving the planting of nearly 680,000 saplings.[1] This effort was underpinned by a vast network of over 80 nurseries, which

collectively produced more than 5.5 million saplings, ensuring a robust supply for current and future plantation needs.[1] Concurrently, a massive campaign of soil and moisture conservation resulted in the construction of thousands of structures, from check dams and gully plugs to contour trenches and water harvesting ponds, fortifying the land against erosion and enhancing its hydrological balance.[1] The table below provides a master summary of these key performance indicators, offering a consolidated, division-wise snapshot of the program's primary outputs and serving as a quantitative foundation for the detailed analyses presented in the subsequent sections of this report.

Table 3.1: Master Summary of Key Performance Indicators (APO 2024-25)

Circle	Division	Total Plantation Area (ha)	Total Saplings Planted	Average Survival (%)	Total Nursery Sapling Production	Total SMC Structures
Bhagirathi	Soil Uttarkashi	36.0	37,000	89.83	206,792	258
Bhagirathi	Tehri	45.0	45,000	88.16	79,082	522
Bhagirathi	Tehri Dam 2	45.0	45,000	83.74	0	47
Bhagirathi	Uttarkashi	115.0	103,000	88.20	558,581	89
Bhagirathi	Narendra nagar	56.9	35,899	95.72	362,716	184
Garhwal	Garhwal	64.3	52,559	89.20	529,317	633
Nandadevi	Nandadevi	5.0	5,500	93.10	305,095	442
Sauth Kumao	South Kumaon	112.3	53,575	~89.00	344,698	>100
Shiwalik	Shiwalik	32.1	33,177	88.80	215,483	>149
Shiwalik	Dehradun	19.0	15,600	95.54	211,005	37

Shiwalik	Haridwar	42.0	47,200	94.55	181,258	3
Western	Western	92.1	115,290	~82.00	309,567	>42
Yamuna	Yamuna	59.6	33,177	88.80	794,663	78
Yamuna	Mussoorie	31.0	17,479	95.62	17,869	151
North Kumaon	Almora	36.5	36,641	92.02	164,369	0
North Kumaon	Bageshwar	20.8	22,913	90.55	199,906	57
North Kumaon	Champawat	21.0	14,250	90.72	196,335	0
North Kumaon	Pithoragadh	37.3	22,530	91.32	389,135	8
North Kumaon	Soil Ranikhet	10.0	10,000	90.95	0	0
Corbett Tiger Reserve	Corbett Tiger Reserve	0.0	0	N/A	0	62

Note: Data is consolidated from multiple team reports.[1] Survival rates and SMC structures for some divisions are aggregated or estimated based on available range-level data.

Section 2: In-Depth Analysis of Plantation Programs

The cornerstone of the APO 2024-25 is its ambitious plantation program, which aims to enhance forest cover, restore degraded ecosystems, and support local livelihoods. This section provides a multi-faceted analysis of the program's performance, examining not only the quantitative achievements of new plantations but also the underlying strategic decisions regarding planting density, long-term maintenance, species selection, and protective measures. The evaluation reveals a program that is highly successful in meeting its immediate targets but faces strategic questions regarding long-term viability and resource optimization.

2.1 New Plantation Achievements (2024-25): A Quantitative Assessment

The performance of new plantation activities under the APO 2024-25 has been exceptionally strong, with field data indicating high levels of success across nearly all operational areas. The quantitative achievements demonstrate a robust implementation capacity and effective site management practices. Divisions across multiple circles have successfully established new

plantations, contributing significantly to the state's green cover objectives. For instance, the Bhagirathi Circle was a major hub of activity, with its Uttarkashi Division leading in scale by planting 103,000 saplings over an extensive area of 115 hectares.[1] Similarly, the Western Circle demonstrated a significant commitment, with its divisions planting over 115,000 saplings across 92.1 hectares.[1]

A critical metric for evaluating plantation success is the sapling survival rate, and on this front, the APO 2024-25 has delivered outstanding results. The program operates under the benchmarks set by Government Order (GO) 98/14-P.B.V./94, which mandates a minimum survival rate of 70% for most areas and 80% for others.[1] The consolidated data reveals that virtually all divisions have not only met but substantially exceeded these standards. Narendranagar Division (Bhagirathi Circle) and Mussoorie Division (Yamuna Circle) stand out as top performers, achieving remarkable average survival rates of 95.72% and 95.62%, respectively.[1] Even divisions with the lowest reported survival rates, such as Pepalpadau in the Western Circle (72.39%) and Beronkhal in the Garhwal Circle (73.4%), remained compliant with the government mandate.[1] This widespread success points to the efficacy of the department's planting techniques, species selection, and initial post-plantation care. While celebrating this overall achievement, the sites at the lower end of the performance spectrum, though compliant, warrant closer investigation to identify and rectify any site-specific challenges, such as soil quality deficiencies, localized pest issues, or maintenance gaps, that may be suppressing their potential.

2.2 Plantation Density and Survival Dynamics

Beyond the headline success of high survival rates, the data allows for a more nuanced analysis of the relationship between planting strategy—specifically, the density of saplings planted per hectare—and the resulting survival outcomes. A consistent pattern emerging from the field reports suggests a potential inverse correlation between planting density and the percentage of saplings that survive. This observation challenges the intuitive assumption that planting more trees in a given area is always the optimal strategy and points toward a more complex ecological dynamic at play.

For example, detailed site-level data from the Bhagirathi Circle shows that a plantation in Badsi (comp. no 3b) with a relatively low density of 200 saplings per hectare achieved an exceptional survival rate of 97%.[1] In contrast, a site in Dharasu (comp.no.-1) with a much higher density of 1,000 saplings per hectare recorded a lower, albeit still commendable, survival rate of 85.36%.[1] This pattern is not isolated. Analysis from the Yamuna and Shivalik Circles reinforces this finding, noting that a low-density site in Mussoorie (200-500 saplings/ha) reported 97% survival, while a high-density site in Haridwar (1,100 saplings/ha) had a lower survival rate of 93.9%.[1]

This phenomenon can be understood through the lens of resource competition. In high-density plantations, a larger number of saplings compete for the same limited pool of essential resources, including water, soil nutrients, and sunlight. This heightened competition can induce stress on the young trees, potentially leading to higher mortality rates and thus a lower overall

survival *percentage*. While a high-density approach may still yield a greater absolute number of surviving trees per hectare in the short term, a strategy of lower-density planting could prove more resource-efficient and ecologically sound in certain environments. Saplings in less crowded conditions may develop more robust root systems and healthier canopies, making them more resilient to future stressors like drought or disease. This suggests that the department's standard planting protocols could be refined. Rather than a one-size-fits-all approach, a flexible strategy that adjusts planting density based on site-specific factors—such as soil quality, water availability, and the specific species being planted—could lead to higher per-sapling survival, reduced costs, and healthier, more resilient long-term forest stands.

2.3 Plantation Maintenance and Long-Term Viability

The ultimate success of an afforestation program is not measured by survival rates in the first year, but by the establishment of a self-sustaining forest over decades. Consequently, post-plantation maintenance is a critical activity that ensures the long-term viability of the initial investment. The data from APO 2024-25 indicates a significant commitment to this long-term care, with extensive maintenance activities being carried out on plantations established in previous years.[1] Across all circles, a consolidated area of over 1,200 hectares is currently under active maintenance, with some programs tending to plantations that are nearly a decade old, dating back to 2017-18.[1] Divisions such as Tehri, with over 609 hectares under maintenance, and Bageshwar, with 141 hectares, are clear leaders in this domain, demonstrating a strong institutional focus on safeguarding past investments.[1]

However, a detailed examination of the maintenance data reveals a critical and systemic gap in monitoring: the widespread absence of survival rate data for these older, maintained plantations. While initial survival is meticulously tracked for new plantations, the reporting for maintenance sites is largely incomplete, with multiple team reports explicitly noting this deficiency.[1] This lack of data constitutes a significant blind spot in the department's ability to evaluate the true, long-term return on its afforestation investments. The financial and human resources allocated to plantation maintenance are substantial, yet without tracking the corresponding survival rates over a 5, 10, or 15-year horizon, it is impossible to quantitatively assess the effectiveness of these expenditures.

This information gap prevents the department from answering fundamental questions about its long-term strategy. For instance, are the maintenance techniques being employed actually effective in sustaining forest cover, or are survival rates declining despite these efforts? Which maintenance strategies yield the best long-term survival for the lowest cost? Where should future maintenance funds be prioritized to save struggling plantations or support thriving ones? Without this crucial data, the department is effectively funding a multi-year, multi-crore project without measuring its final outcome. The establishment of a mandatory, long-term monitoring protocol for survival rates in all maintained plantations is therefore not merely a procedural improvement but a strategic necessity for ensuring accountability, optimizing resource allocation, and accurately assessing the ecological and financial ROI of the entire forestry program.

2.4 Species Selection and Ecological Strategy

The choice of species for plantation is a decision of profound strategic importance, influencing not only the immediate survival of saplings but also the long-term ecological function, biodiversity, and socio-economic value of the resulting forest. The consolidated data from the APO 2024-25 reveals a sophisticated and well-balanced approach to species selection, reflecting a multi-purpose strategy that aims to meet a variety of objectives simultaneously.[1] The comprehensive list of over 70 species planted demonstrates a clear effort to move beyond monocultures and create diverse, resilient forest ecosystems.

The species portfolio can be broadly categorized into several functional groups. Timber species, such as the frequently mentioned Baanj (Oak) and Devdar (Cedar), form the ecological backbone of many plantations, particularly in high-altitude regions, and are chosen for their value in ecosystem restoration and as a long-term timber resource.[1] These are complemented by a wide array of fruit-bearing species like Amla (Indian Gooseberry), Dadim (Pomegranate), and Amrud (Guava), which provide direct economic benefits to local communities and support wildlife populations. Furthermore, the inclusion of dedicated medicinal species, such as Tejpat (Indian Bay Leaf), Reetha (Soapnut), and a variety of herbs in specialized nurseries, alongside fodder species like Bheemal and Falyat, underscores a commitment to supporting local livelihoods and traditional economies.[1]

This strategic mix is not applied uniformly but is tailored to the specific ecological and social contexts of different regions. For example, the Nandadevi Circle, with its unique high-altitude ecosystem, places a strong emphasis on native conifers and specialized medicinal plants.[1] In contrast, the Western Circle's plantations show a greater proportion of commercially valuable timber species like Shesham and Kher, aligning with different regional priorities.[1] This context-aware approach to species selection is a significant strength of the program, enhancing the probability of plantation success and ensuring that the newly created forests are both ecologically appropriate and socially beneficial.

2.5 Protective Measures and Their Efficacy

The successful establishment of a new plantation, particularly in its vulnerable early years, is heavily dependent on effective protection from external threats, most notably grazing by domestic and wild animals. The data from APO 2024-25 indicates that the department has implemented a robust and consistent policy of protecting its newly planted sites. Across all circles and divisions, field reports consistently document the installation of protective measures, including chain-link fencing, stone walls (kuliwals), and other forms of boundary demarcation to secure the plantation perimeters.[1]

The efficacy of these measures is strongly correlated with the high survival rates observed across the program. The link is direct and causal: by preventing animal intrusion, these barriers protect young saplings from being eaten or trampled, which is a primary cause of mortality in unprotected areas. The field report from Team 2 provides a clear example of this correlation, noting that the Kotdwar range in the Shiwalik Circle, which reported an exceptional survival rate of 95.1%, had also installed 220 units of fencing to protect the site.[1] Similarly, the high

survival rates of 95.2% in Tusrad (South Kumaon) and 95.5% in South Jolasal (Western) are explicitly linked to the presence of safety walls and tar-bad fencing, respectively.

The consistent and successful implementation of these protective measures for plantations is a major operational strength. It demonstrates a clear understanding of the critical factors necessary for plantation success and a willingness to invest in the required infrastructure. This commitment to securing the final asset—the plantation—is commendable. However, as will be discussed in the following section, this laudable focus on protecting plantations stands in stark and troubling contrast to the apparent lack of similar protective measures for the department's nursery infrastructure, revealing a significant inconsistency in the program's overall risk management strategy.

Section 3: Analysis of Nursery Operations and Sapling Supply Chain

The foundation of any successful large-scale afforestation program lies in its ability to produce a consistent supply of healthy, high-quality saplings. The departmental nurseries are the engines of the APO, and their operational efficiency, strategic placement, and security are paramount to the entire program's success. This section analyzes the performance of the nursery network, revealing a system of immense productive capacity that is nonetheless hampered by significant logistical misalignments and a critical, systemic vulnerability in its security protocols.

3.1 Nursery Infrastructure and Production Capacity

The nursery infrastructure supporting the APO 2024-25 is extensive and highly productive, forming a robust backbone for the state's afforestation efforts. The consolidated data indicates the operation of at least 80 departmental nurseries spread across the various circles, covering a total area of approximately 119 hectares.[1] The collective output of this network is immense, with a total production of over 5.5 million saplings reported for the operational year.[1] This massive production capacity not only meets the immediate needs of the current plantation program but also creates a significant surplus, providing a strategic reserve for future expansion, casualty replacement, and distribution to other entities.

Certain divisions and individual nurseries stand out as major production hubs. The Yamuna Circle, for instance, reported the highest aggregate production, with its 14 nurseries yielding nearly 800,000 saplings.[1] At the individual level, nurseries like Odmatha in the Pithoragadh Division and the Tanda Hightech Nursery in the Western Circle are exceptionally high-performing, producing 275,055 and 207,465 saplings, respectively.[1] The existence of such high-yield facilities points to the successful implementation of advanced nursery techniques and efficient management practices. However, analysis of nursery efficiency, measured in saplings produced per hectare, shows considerable variation across the network. For example, the Abhiyaantrike nursery in Sauth Kumao demonstrates remarkable productivity with over 208,000 saplings per hectare, while others operate at a much lower intensity.[1] This variation suggests a significant opportunity for knowledge sharing and the standardization of best practices from high-performing nurseries to elevate the productivity of the entire network.

Table 3.2: Consolidated Nursery Operations Data by Division

Circle	Division	No. of Nurseries	Total Area (ha)	Total Saplings	Key Species Cultivated	Irrigation Systems	Safety Arrangements
Bhagirathi	Soil Uttarkashi	5	3.5	206,792	Baanj, Devdar, Amla, Tejpat, etc.	Tanks, pipelines	None reported
Bhagirathi	Tehri	4	2.73	79,082	Baanj, Anga, Padam, Buransh, etc.	Water tanks	None reported
Bhagirathi	Uttarkashi	7	7.45	558,581	Baanj, Deodar, Amla, Chullu, etc.	Pipes/showers	None reported
Bhagirathi	Gangotri NP	1	0.64	4,375	Medicinal herbs	Water tank, pipe	None reported
Bhagirathi	Narendranagar	4	4.2	362,716	Amla, Tejpat, Devdaar, Sheesham	Pipelines, Tanks	None reported
Shivalik	Dehradun	3	4.35	211,005	Sheesham, Jamun, Gulmohar	Pipelines, Tanks	None reported
Shivalik	Haridw	4	5.5	181,258	Sheesha	Pipeline	None

	ar				m, Kanju, Amla, Amrood	s	reported
Yamuna	Mussoorie	3	2.5	17,869	Baanj, Deodar, Dadim, Reetha	Tanks, Pipelines	None reported
Garhwal	Garhwal	15	17.16	529,317	Deodar, Baanj, Kachnar, Amla	Tanks, sprinklers	Not specified
Nandadevi	Nandadevi	8	5.55	305,095	Deodar, Baanj, medicinal herbs	Tanks, sprinklers	Not specified
Yamuna	Yamuna	14	14.94	794,663	Deodar, Baanj, Reetha, Amla	Tanks, sprinklers	Not specified
North Kumaon	Almora	5	3.05	164,369	Baanj, Devdar, Falyat, Uteesh	Not specified	None reported
North Kumaon	Bageshwar	6	6.58	199,906	Baanj, Falyat, Bheemal, Tejpat	Not specified	None reported
North Kumaon	Champawat	6	5.65	196,335	Baanj, Falyat, Devdar, Pangar	Not specified	None reported
North Kumaon	Pithoragadh	9	9.26	389,135	Baanj, Devdar, Tejpat, Ringal	Not specified	None reported

3.2 Sapling Supply and Demand Analysis: A Tale of Surpluses and Deficits

While the overall nursery production is more than sufficient to meet the program's needs, a closer look at the data reveals a significant logistical and strategic challenge: a pronounced misalignment between sapling production and plantation requirements at the divisional level. This imbalance has created a fragmented supply chain characterized by massive surpluses in some divisions and critical deficits in others, pointing to potential inefficiencies and strategic dependencies that warrant attention.

The data presents a tale of two extremes. On one hand, several divisions are producing saplings far in excess of their own plantation needs. The Uttarkashi Division, for example, produced a staggering 558,581 saplings while planting only 103,000, resulting in a surplus of over 450,000 saplings.[1] Similarly, the Narendranagar Division produced over 362,000 saplings against a requirement of just under 36,000, creating a tenfold surplus.[1] While this surplus capacity could be seen as a strategic asset, it also raises questions about planning and resource allocation. If these divisions are intended to be regional supply hubs, this strategy is not explicitly articulated in the operational plans.

On the other hand, some divisions are operating with a complete lack of local production capacity, making them entirely dependent on external sources. The Tehri Dam 2 Division, for instance, successfully planted 45,000 saplings but has zero reported nursery infrastructure of its own.[1] Similarly, the Corbett Tiger Reserve and the Soil Ranikhet Division also lack departmental nurseries and must source their saplings from elsewhere.[1] This creates a precarious situation where the success of one division's plantation program is entirely contingent on the surplus and logistical support of another. This dependency introduces several risks, including increased transportation costs, potential for sapling damage during transit over long distances, and the risk of supply disruptions. The existence of these parallel surpluses and deficits suggests a need for a more formalized, integrated, and efficient circle-wide or state-wide sapling supply chain strategy. Such a strategy would optimize production, minimize logistical costs, and reduce the strategic vulnerability of divisions that currently lack self-sufficiency.

3.3 Nursery Security: The Program's Achilles' Heel

Amid the many successes of the APO 2024-25, the analysis of nursery operations has uncovered a critical, pervasive, and alarming vulnerability that represents arguably the single greatest strategic risk to the entire afforestation program: the systemic lack of basic security for nursery infrastructure. The data is unequivocal and consistent across all six team reports. While new plantations are meticulously and universally protected with fencing and stone walls, the nurseries that produce the millions of saplings required for these plantations are, with almost no exceptions, left completely unsecured.[1] The "Safety Arrangements" column in the consolidated nursery data is a stark testament to this gap, reading "None reported" or "Not specified" for virtually every entry.[1]

This oversight represents a fundamental flaw in the program's risk management framework. Nurseries are, by their very nature, points of highly concentrated value. A single high-output facility, such as the Tanda Hightech Nursery holding over 200,000 saplings or the Odmatha nursery with over 275,000, represents a massive investment of time, labor, water, and materials.[1] These facilities are the critical enabling assets for the entire regional plantation plan. Leaving them exposed to common and predictable threats like grazing animals, theft, or localized disease outbreaks creates an unacceptable level of risk.

The potential chain of failure is simple and devastating. A single incident, such as a herd of cattle entering an unfenced nursery overnight, could wipe out the entire stock of saplings. Such an event would not be a minor setback; it would be a catastrophic failure for the regional APO. The division's ability to meet its annual plantation target would be completely nullified, wasting the entire year's budget and planning for that area. The current approach appears to focus all protective resources on the *final* asset (the individual sapling in the field) while completely neglecting the security of the *foundational* asset (the nursery stock). This is a strategic paradox akin to building a fortified vault to store cash but leaving the gold bullion required to mint the currency out on the street. The immediate and universal implementation of a security policy for all departmental nurseries, starting with the highest-value and highest-output facilities, is not merely a recommendation but an urgent operational necessity to mitigate this profound and entirely preventable risk.

Section 4: Assessment of Soil and Moisture Conservation (SMC) Initiatives

Soil and Moisture Conservation (SMC) activities are a vital, synergistic component of the APO 2024-25, serving as the foundational engineering and ecological work that underpins the success of afforestation, particularly in the state's fragile and erosion-prone hilly terrains. These interventions are designed to stabilize land, control soil loss, and enhance water retention, thereby creating a more hospitable micro-environment for sapling growth and ensuring the long-term sustainability of the plantations. This section analyzes the scale and strategic impact of the SMC initiatives, revealing an extensive program of work that is strongly correlated with positive plantation outcomes.

4.1 Quantitative Analysis of SMC Structures

The scale of SMC work undertaken during the APO 2024-25 is impressive, involving the construction of thousands of individual structures across a wide geographical area. The department has deployed a diverse array of techniques tailored to specific site conditions, ranging from vegetative measures to significant civil engineering works. The most common activities reported include the construction of Gully-Plugs to arrest erosion in water channels, the digging of Contour Trenches and Chaal-Khaal (small water harvesting pits) to capture runoff and increase infiltration, and the building of various types of Check Dams (R.R. Dry, Cratewire, Stone) to slow water flow and trap sediment.[1]

Certain divisions have emerged as leaders in the intensity and scale of their SMC operations. The Soil Uttarkashi Division, for example, reported the construction of 258 structures, with a heavy focus on Gully-Plugging (120 units) and R.R Dry Checkdams (55 units).[1] The Sauth

Kumao Circle also demonstrated a massive commitment, particularly to linear structures, with reports of over 7,800 meters of Contour Trenches being constructed.[1] Similarly, the Narendranagar Division executed a comprehensive SMC plan, completing 184 structures, including 46 R.R Dry Checkdams and 45 Gully-Plugs.[1] In the Nandadevi circle, an astonishing 10,614 contour trenches were reported, indicating a massive effort in land stabilization.[1] This extensive portfolio of work highlights a strong institutional understanding of the importance of preparing the land to receive and sustain new life.

Table 3.3: Consolidated SMC Structures by Type and Key Divisions

Structure Type	Total Quantity (Across all reports)	Key Divisions with High Activity
Gully-Plugging	> 740	Soil Uttarkashi (120), Nandadevi (258), Garhwal (154), Sauth Kumao (87)
Chaal-Khaal	> 480	Garhwal (189), Nandadevi (141), Soil Uttarkashi (44), Sauth Kumao (47)
R.R Dry Checkdam	> 570	Nandadevi (192), Garhwal (166), Soil Uttarkashi (55), Narendranagar (46)
Cratewire Checkdam	> 230	Garhwal (102), Nandadevi (51), Soil Uttarkashi (32), Narendranagar (27)
Contour Trench	> 19,000 (units/meters)	Nandadevi (10,614), Sauth Kumao (7800 m), Tehri (500)
Pond Construction	> 60	Garhwal (22), Tehri Dam 2 (12), Soil Uttarkashi (7), Narendranagar (5)
Sidewall	> 35	Narendranagar (21), Tehri Dam 2 (12)
Stone Checkdam	> 12	Uttarkashi (9), Bhagirathi (3)
Geo Jute/Copper Net	> 2,050 rm	Nandadevi (1,450 rm),

		Garhwal (600 rm), Bageshwar (4)

4.2 The Strategic Nexus: Correlating SMC with Plantation Success

The true value of the extensive SMC program becomes evident when its impact is analyzed in conjunction with plantation performance. The data reveals a strong and positive correlation between divisions that invest heavily in SMC work and those that achieve high and stable plantation survival rates. This relationship suggests that SMC is not merely an ancillary activity but a critical prerequisite for de-risking afforestation efforts and ensuring their long-term success, especially in challenging geographical contexts.

The evidence for this strategic nexus is compelling. The Narendranagar Division, which constructed 184 SMC structures, also boasts one of the highest average survival rates in the entire program at 95.72%.[1] Similarly, the Soil Uttarkashi Division, with its intensive program of 258 SMC structures, achieved a high survival rate of 89.83%.[1] The logic connecting these two outcomes is direct. SMC structures actively improve the foundational conditions for plant life. Check dams and gully plugs reduce the velocity of water runoff, preventing the erosion of topsoil that is vital for young saplings. Contour trenches and chaal-khaals capture precious rainwater, increasing soil moisture and making it available to the plants during dry spells. In essence, SMC creates a more stable, nutrient-rich, and water-secure environment, directly mitigating the primary causes of sapling mortality.

Conversely, divisions with less intensive SMC work, even if they have similar plantation targets, tend to show slightly lower, though still compliant, survival rates. The Tehri Dam 2 Division, for example, planted the same number of saplings (45,000) as the neighboring Tehri Division but implemented significantly fewer SMC structures (47 compared to Tehri's 522) and subsequently recorded the lowest survival rate in the Bhagirathi Circle at 83.74%.[1] This comparison strongly implies that the investment in SMC is a direct investment in the success and resilience of the plantation. It transforms the act of planting from a gamble against the elements into a calculated intervention with a higher probability of success. Therefore, the allocation of departmental budget and resources to foundational SMC work should be viewed as an integral and non-negotiable part of the plantation process itself, essential for maximizing the return on the overall afforestation investment.

Section 5: Evaluation of Ancillary Operations

While plantation and SMC form the core of the APO, a range of ancillary operations are essential for the program's holistic success, providing the necessary support, protection, and logistical backbone for all field activities. These operations, encompassing forest fire prevention, wildlife conservation, and infrastructure management, demonstrate the department's commitment to a comprehensive ecosystem management approach. This section consolidates and evaluates the performance of these critical support functions.

5.1 Forest Fire Prevention and Management

The threat of forest fires is a constant and significant risk to both new and established forest areas. The APO 2024-25 data indicates the implementation of a robust, multi-pronged strategy to mitigate this threat, combining proactive prevention, rapid response resource deployment, and community engagement.[1]

Proactive prevention is evident in the execution of controlled burning, a key technique for reducing fuel load in fire-prone areas. Significant controlled burns were carried out in the Tehri Division (124.20 ha) and the Haridwar Division (107 ha), demonstrating a large-scale effort to create fire-resistant landscapes.[1] This was complemented by the physical maintenance of over 170 km of fire lines in divisions like Pithoragadh and Yamuna.[1]

In terms of resource readiness, the department has made significant investments in its human and material capacity. Across various divisions, over 230 fire watchers were hired, insured, or paid, forming the first line of defense in detecting and reporting fire incidents.[1] This human capital was supported by the procurement and distribution of essential equipment, including 143 fire rakes and 35 fire kits, and the maintenance of 17 crew stations in Narendranagar.[1]

Crucially, the strategy also includes a strong focus on community engagement. Recognizing that local communities are vital partners in fire prevention, the department conducted 329 public awareness meetings in the Soil Kalsi division alone and organized numerous workshops in North Kumaon and Corbett, fostering a culture of shared responsibility for forest protection.

5.2 Wildlife Conservation and Habitat Improvement

The APO's mandate extends to the conservation of fauna, with numerous activities aimed at improving wildlife habitats and mitigating human-wildlife conflict. A primary focus has been on habitat restoration through the removal of invasive species. The Corbett Tiger Reserve led this effort, with over 100 hectares of Lantana eradication reported across its ranges, an activity critical for allowing native grasses and flora to regenerate and improve forage for herbivores.[1]

Enhancing water availability for wildlife is another key intervention. The construction and maintenance of numerous water holes in divisions like Corbett, Bageshwar, and Rajaji National Park ensure that animals have access to water during dry seasons, reducing their need to venture into human-dominated landscapes.[1]

To support anti-poaching and monitoring efforts, the department has invested in patrolling and modern technology. Extensive long-distance patrols were conducted, covering 128 km in Gangotri National Park and 79 km in the Garhwal and Nandadevi Circles.[1] These efforts are increasingly supported by technology, with the procurement of equipment like dragon apps for monitoring in the Yamuna Circle.[1] Infrastructure to manage wildlife movement, such as the repair of "hathilines" in Dehradun and the construction of 4 km of cement walls in Corbett, further contributes to mitigating conflict and protecting both wildlife and human communities.[1]

5.3 Infrastructure and Access Management

The successful execution of all field-based forestry operations is contingent upon a well-maintained logistical backbone of roads, walkways, and buildings. The APO 2024-25 included

a significant component of infrastructure maintenance to ensure operational readiness and accessibility.[1]

A major focus was on the repair and maintenance of forest motor roads, which are vital for transporting personnel, equipment, and saplings, as well as for enabling rapid response to fire incidents. The scale of this work was particularly large in the Corbett Tiger Reserve, where over 171 km of motor roads were repaired.[1] This ensures that the park's vast and remote areas remain accessible for patrolling and management.

In addition to motorable roads, the maintenance of pedestrian pathways, trek routes, and walkways is crucial, especially in mountainous terrain. Across all circles, a total of over 87 km of such pathways were repaired or maintained.[1] The Gangotri and Garhwal regions saw extensive walkway repairs, improving access for patrolling staff, pilgrims, and tourists, which in turn supports conservation efforts through better monitoring and regulated eco-tourism.[1] This investment in the fundamental infrastructure of the forest estate is a critical, though often overlooked, element that enables the success of the entire APO program.

Section 6: Consolidated Findings: A Division-Wise Performance Review

To translate the extensive data and analysis into a practical management tool, this section provides a consolidated, 360-degree performance review for each key administrative division. By synthesizing the findings from plantation, nursery, SMC, and ancillary operations, a distinct strategic profile emerges for each division, highlighting its strengths, operational focus, and potential areas for improvement. This comparative assessment allows for a nuanced understanding of how different operational models are performing across the state.

Table 3.4: Division-Wise Performance Scorecard

Division	Plantation Scale	Survival Rate (%)	Nursery Output	Nursery Self-Sufficiency	SMC Intensity	Key Strategic Focus
Soil Uttarkashi	Medium	89.83	High	Surplus	Very High	Integrated SMC & Plantation
Tehri	High	88.16	Medium	Surplus	High	Large-Scale Plantation
Tehri Dam 2	High	83.74	None	Deficit	Low	Plantation (Dependent)

Uttarkashi	Very High	88.20	Very High	Surplus	Medium	Nursery & Plantation Hub
Narendra nagar	High	95.72	Very High	Surplus	Very High	High-Survival Plantation
Garhwal	High	89.20	Very High	Surplus	Very High	All-Round Operations
Sauth Kumao	Very High	~89.00	High	Surplus	Very High	SMC & Diverse Plantation
Western	Very High	~82.00	High	Surplus	Medium	Commercial Timber Plantation
Corbett T.R.	None	N/A	None	Deficit	High	Habitat Management
Pithoragadh	High	91.32	Very High	Surplus	Low	Nursery & Diverse Plantation
Bageshwar	Medium	90.55	High	Surplus	High	Maintenance & SMC
Almora	High	92.02	High	Surplus	None	High-Survival Plantation

6.1 Division: Soil Uttarkashi (Bhagirathi Circle)

- **Performance Summary:** Soil Uttarkashi demonstrates a well-balanced and highly

effective operational model. It pairs a moderate scale of plantation (36 ha, 37,000 saplings) with one of the highest average survival rates in its immediate peer group (89.83%).[1]

- **Key Strengths:** The division's primary strength lies in its profound focus on Soil and Moisture Conservation. With 258 SMC structures created, it is a leader in this domain. This foundational work in land stabilization is directly correlated with its high and stable plantation success, showcasing a model of best practice.
- **Operational Focus:** The operational strategy is clearly centered on an "SMC-First" approach, where intensive land treatment precedes or accompanies afforestation to maximize the chances of long-term success in its challenging terrain.
- **Identified Gaps/Risks:** While its nursery production (206,792 saplings) far exceeds immediate plantation needs, creating a healthy surplus, the nurseries themselves lack reported security measures. This exposes a valuable asset to preventable risks.[1]
- **Comparative Assessment:** When compared to the Tehri Dam 2 division, which has a similar plantation area but has implemented far less SMC work and consequently has a lower survival rate, Soil Uttarkashi's integrated model appears demonstrably superior and more sustainable.

6.2 Division: Tehri Dam 2 (Bhagirathi Circle)

- **Performance Summary:** The Tehri Dam 2 division is a major contributor to the plantation targets, with 45,000 saplings planted over 45 hectares. However, its average survival rate of 83.74%, while compliant with GO standards, is the lowest within the Bhagirathi Circle.[1]
- **Key Strengths:** The division's strength is its focused execution of large-scale plantation activities.
- **Operational Focus:** The strategy appears to be heavily skewed towards meeting plantation targets, with comparatively less emphasis on supporting activities.
- **Identified Gaps/Risks:** The division's most significant gap is its complete lack of departmental nursery infrastructure, making it entirely dependent on external sources for its sapling supply. Furthermore, its investment in SMC (only 47 structures) is low relative to its plantation scale, which likely contributes to its lower survival rate compared to its peers.[1]
- **Comparative Assessment:** Tehri Dam 2 serves as a case study in a plantation-centric model with minimal in-house support. Its reliance on other divisions for saplings and its underinvestment in SMC create strategic dependencies and potentially limit the long-term resilience of its plantations.

6.3 Division: Uttarkashi (Bhagirathi Circle)

- **Performance Summary:** Uttarkashi is an operational powerhouse, leading the circle in both plantation scale (115 ha, 103,000 saplings) and nursery production (558,581 saplings). It maintains a strong survival rate of 88.20%.[1]
- **Key Strengths:** The division's core strength is its immense scale and capacity. Its nursery output is sufficient to support its own massive plantation program nearly five times over, establishing it as a major regional supply hub.
- **Operational Focus:** The division functions as a comprehensive forestry hub, with a dual

focus on large-scale afforestation and mass production of planting material. It also engages in a diverse range of ancillary activities, including fire prevention and walkway repairs.[1]

- **Identified Gaps/Risks:** Like other divisions, its primary risk lies in the unsecured status of its high-value, high-output nurseries. A failure at one of its major nurseries would have significant regional repercussions.[1]
- **Comparative Assessment:** Uttarkashi's model is one of scale and surplus. It acts as the primary engine for plantation and sapling supply in the region, contrasting with the more specialized or dependent models of other divisions.

6.4 Division: Narendranagar (Bhagirathi Circle)

- **Performance Summary:** Narendranagar is a top-performing division, achieving the highest average survival rate observed in the detailed data at an exceptional 95.72%. This is coupled with a significant plantation scale (56.9 ha, 35,899 saplings).[1]
- **Key Strengths:** The division excels at creating the optimal conditions for plantation success. Its high survival rate is underpinned by a very intensive SMC program (184 structures) and a highly productive nursery network (362,716 saplings).[1]
- **Operational Focus:** The strategy is clearly focused on achieving excellence in plantation survival through an integrated approach that combines high-quality sapling supply, robust land preparation via SMC, and effective site management.
- **Identified Gaps/Risks:** The division generates a massive sapling surplus (a tenfold surplus), which, if not managed through a clear regional supply strategy, could represent an inefficient allocation of resources. The risk of unsecured nurseries is also present.[1]
- **Comparative Assessment:** Narendranagar represents the gold standard for a successful, integrated afforestation model within the APO. Its performance provides a clear blueprint that could be replicated in other divisions aiming to maximize plantation survival.

6.5 Division: Corbett Tiger Reserve

- **Performance Summary:** The Corbett Tiger Reserve operates under a distinct mandate focused on conservation and habitat management, rather than new afforestation. As such, it reported no new plantation or nursery activities.[1]
- **Key Strengths:** The division's strength lies in its specialized expertise in wildlife habitat management. It led all divisions in large-scale invasive species removal (over 100 ha of Lantana eradication) and the maintenance of forest motor roads (171 km) to ensure access for anti-poaching and monitoring.[1]
- **Operational Focus:** The strategy is entirely geared towards improving the quality of the existing forest ecosystem for wildlife. This includes significant investment in SMC (62 structures) and water source development to support animal populations.[1]
- **Identified Gaps/Risks:** The division is dependent on external sources for any planting material it might require for specialized habitat restoration projects.
- **Comparative Assessment:** Corbett's operational profile is unique and serves as a benchmark for a habitat-centric conservation model, complementing the afforestation-focused models of other divisions.

6.6 North Kumaon Divisions (Almora, Bageshwar, Champawat, Pithoragadh)

- **Performance Summary:** The divisions of the North Kumaon Circle collectively represent a major theatre of operations, with a strong focus on both plantation and nursery activities. All divisions reported very high survival rates, ranging from 90.55% to 92.02%, well above the 80% GO standard for the region.[1]
- **Key Strengths:** The circle's strength is its consistency and diversity. Pithoragadh and Bageshwar are major nursery hubs, producing nearly 600,000 saplings combined.[1] The divisions also showcase high species diversity in their plantations. Bageshwar has the largest reported plantation maintenance area in the state (141 ha), indicating a strong commitment to long-term care.[1]
- **Operational Focus:** The circle has a balanced focus on establishing new, diverse plantations, producing a surplus of saplings, and maintaining older forest stands. Fire prevention is also a key activity across these divisions.[1]
- **Identified Gaps/Risks:** The most notable gap is the lack of reported SMC work in the Almora and Champawat divisions, despite their significant plantation activities. While their survival rates are currently high, this lack of foundational land treatment could pose a risk to the long-term health of these plantations.[1]
- **Comparative Assessment:** North Kumaon's divisions are high-performing and largely self-sufficient. The model in Bageshwar, which combines new plantations, nursery production, extensive maintenance, and SMC, is particularly well-rounded.

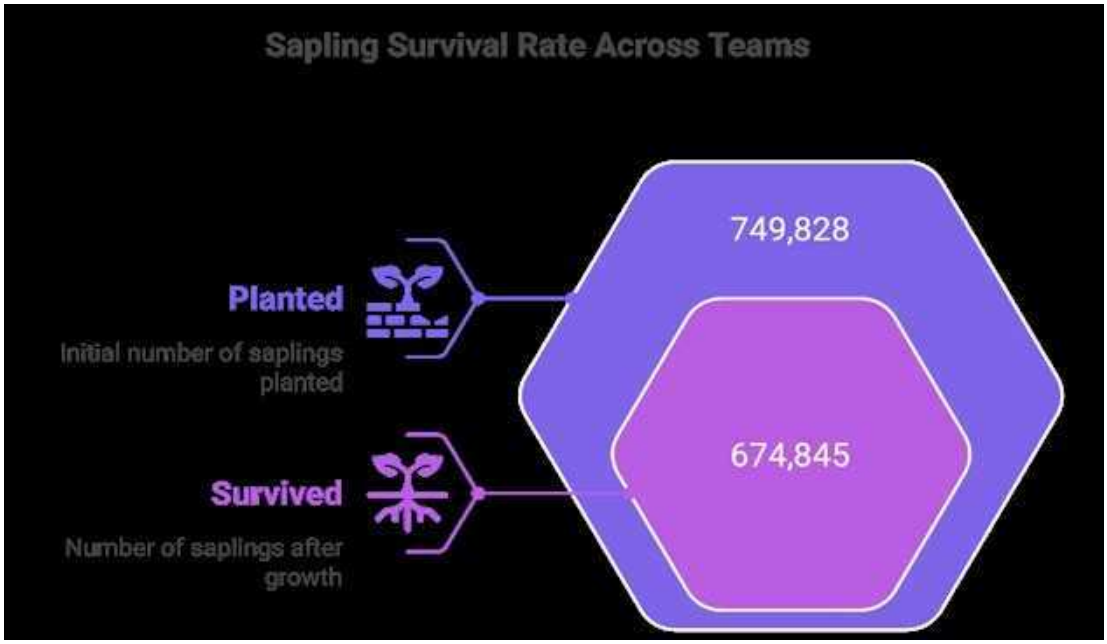
3.3 Consolidated Report on all the activities for all Divisions

3.3.1 Plantation Activities

In 2024-25, Uttarakhand's forestry teams planted 749,828 saplings across 914.03 hectares, achieving an average survival rate of approximately 90%, well above the GO standard.

Table 3.5: Summary of Plantation Activities by Team

Circle	Area (ha)	Saplings Planted	Average Survival Rate (%)
Bhagirathi	241.00	230,000	87.58
Shivalik	65.25	37,215	89.00
Corbett–South Kumaon	204.35	168,865	89.50
Rajaji	125.63	106,334	91.27
Yamuna	148.86	116,178	95.22
Garhwal	128.94	91,236	89.30
Total	**914.03**	**749,828**	**90.00**



Key Findings:

- **Bhagirathi Circle**: Planted 230,000 saplings over 241 hectares with an 87.58% survival rate. Low-density sites, like Badsi comp. no 3b (200 saplings/ha), achieved up to 97% survival.
- **Bhagirathi, Shivalik, Yamuna, Rajaji NP**: Recorded the highest survival rate at 95.22%, likely due to robust maintenance and favorable conditions.
- **Corbett, South Kumaon, Western:** Planted 168,865 saplings over 204.35 hectares, with a 89.5% survival rate, reflecting diverse ecological zones.

Insights:

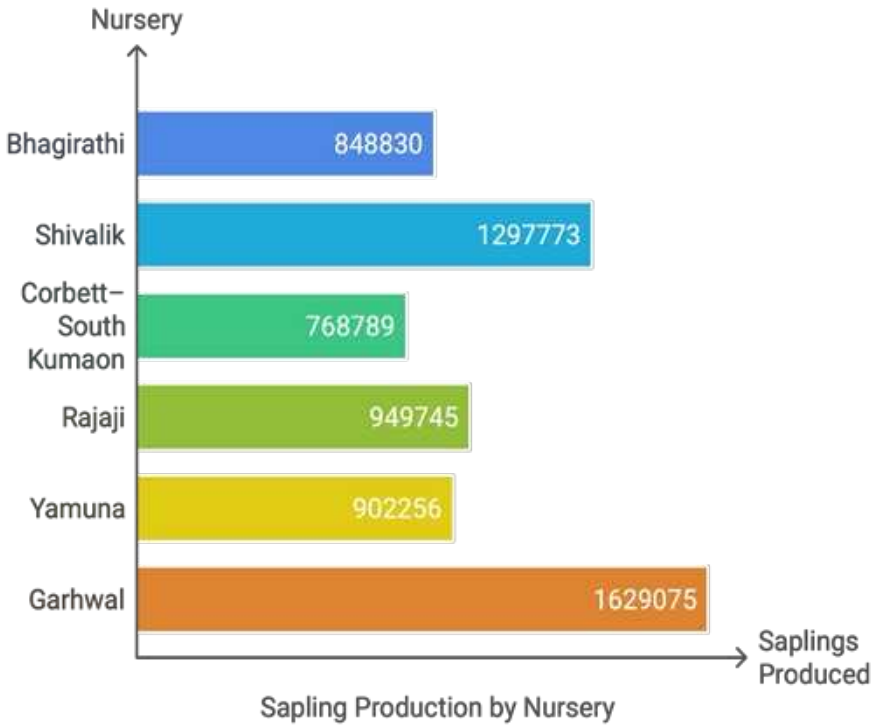
- Lower planting densities often correlates with higher survival rates, as seen in Team 1's data.
- Variations in survival rates suggest site-specific factors like soil quality and irrigation influence outcomes.
- All teams exceeded the 70% GO standard, indicating effective plantation strategies.

3.3.2 Nursery Management

Statewide, 142 nurseries operated across 140.82 hectares, producing 6,396,468 saplings to support current and future plantations.

Table 3.6: Summary of Nursery Activities by Team

Circle	Nurseries	Area (ha)	Saplings Produced
Bhagirathi	18	14.32	848,830
Shivalik	24	28.95	1,297,773
Corbett–South Kumaon	20	18.81	768,789
Rajaji	26	24.54	949,745
Yamuna	17	16.55	902,256
Garhwal	37	37.65	1,629,075
Total	**142**	**140.82**	**6,396,468**



Key Observations:

- **Garhwal Circle**: Operated 37 nurseries, producing 1,629,075 saplings — the highest output.
- **Shivalik Circle**: Produced 1,297,773 saplings from 24 nurseries, indicating high efficiency.
- **Irrigation**: Most nurseries used water tanks and pipelines.
- **Safety**: Some nurseries (e.g., Bhagirathi and Yamuna) lacked fencing, posing risks.

Insights:

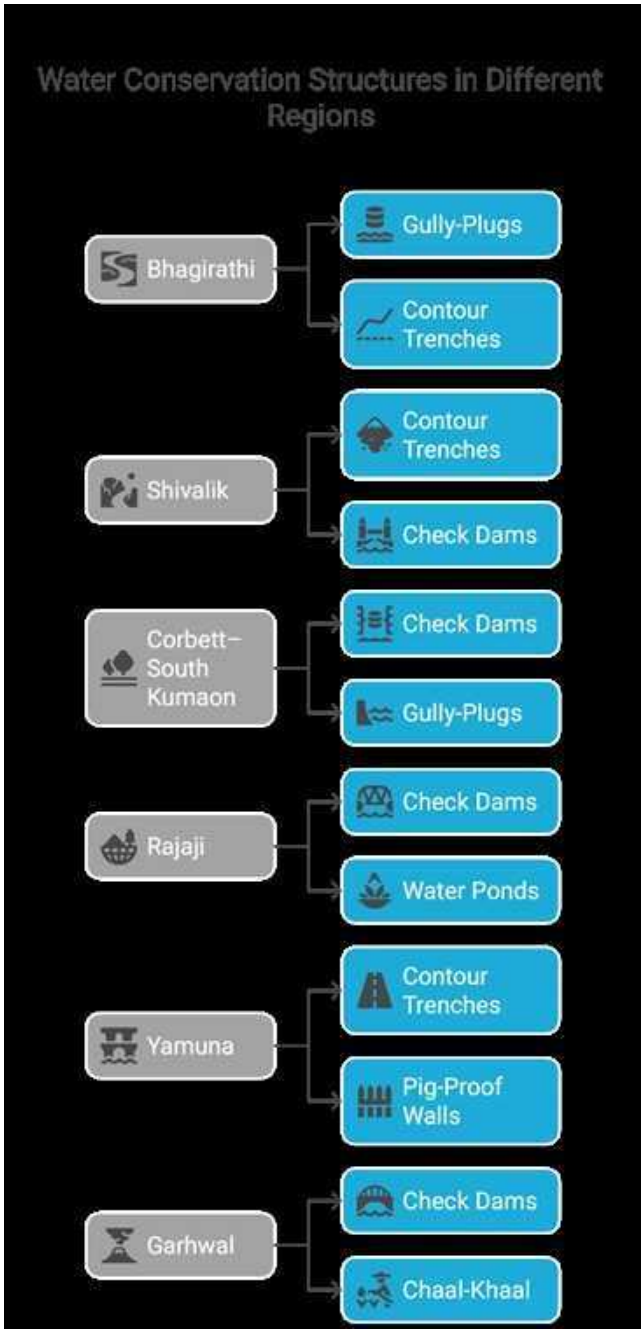
- Surplus sapling production (e.g., Team 6's 1.6 million vs. 91,236 planted) suggests potential for inter-regional supply or future plantations.
- Enhancing nursery security could reduce losses and improve supply reliability.

3.3.3 Soil and Moisture Conservation (SMC)

SMC efforts involved constructing thousands of structures, such as check dams, gully-plugs, contour trenches, and water harvesting pits, to combat erosion and conserve water. Due to varying reporting units (e.g., counts vs. meters), precise statewide totals are challenging.

Table 3.7: Partial Summary of SMC Structures by Team

Circle	Total Structures	Key Types (Examples)
Bhagirathi	1,039	Gully-Plugs (243), Contour Trenches (500)
Shivalik	>5,000	Contour Trenches (>3,150), Check Dams (>100)
Corbett–South Kumaon	Not specified	Check Dams, Gully-Plugs
Rajaji	Not specified	Check Dams, Water Ponds
Yamuna	Not specified	Contour Trenches, Pig-Proof Walls
Garhwal	Not specified	Check Dams, Chaal-Khaal



Key Activities:

- **Bhagirathi**: Focused on gully-plugging and contour trenches in Soil Uttarkashi to address severe erosion.
- **Multiple Circles:** Reported over 5,000 structures, with contour trenches dominating in Sauth Kumao.
- **Structure Types**:
    - **Contour Trenches**: Prevent runoff and retain water in hilly terrains.
    - **Check Dams**: Slow water flow to reduce erosion in streams.
    - **Gully-Plugs**: Stabilize gullies in erosion-prone areas.
    - **Water Ponds/Chaal-Khaal**: Harvest rainwater for irrigation.

Insights:

- SMC efforts are tailored to local topography, with intensive interventions in high-risk areas like Soil Uttarkashi.
- Inconsistent reporting units (e.g., meters for trenches) complicate aggregation, suggesting a need for standardized metrics.

3.3.4 Other Activities

Beyond plantation and SMC, teams engaged in activities to support conservation and infrastructure:

- **Wildlife Conservation**: Patrolling in protected areas like Gangotri and Corbett **Forest Fire Prevention**: Control burning and fire watcher employment.
- **Infrastructure Repairs**: Walkway repairs and road maintenance.
- **Training Programs**: Harela and staff training.

Table 3.8: Summary of Other Activities by Type and Team

Circle	Activity Type	Details
Bhagirathi	Wildlife, Fire Prevention	128 km patrolling, 21.2 km walkway repairs
Shivalik	Fire Prevention	Control burning in Bhatura Beat
Corbett–South Kumaon	Wildlife Conservation	Patrolling in Corbett
Rajaji	Training, Fire Prevention	Harela programs, fire safety works
Yamuna	Infrastructure	Road repairs, pig-proof walls
Garhwal	Fire Safety	Fire watcher support

Insights:

- These activities enhance ecosystem resilience and community engagement.
- Wildlife and fire prevention are critical in protected and fire-prone areas.

3.3.5 Geographical Distribution

Activities spanned multiple circles, reflecting Uttarakhand's diverse ecology:

- **Bhagirathi Circle**: Intensive plantation and SMC in Soil Uttarkashi and Narendranagar.
- **Garhwal Circle**: Significant nursery output and SMC.
- **Shivalik Circle**: Plantation and fire prevention focus.
- **Corbett Tiger Reserve** : Wildlife and habitat management.
- **Yamuna Circle**: Plantation and SMC efforts.

Insights:

- Resource allocation aligns with regional needs, with high-altitude areas prioritizing SMC and lowlands focusing on plantations.
- Overlaps (e.g., Bhagirathi by multiple teams) suggest coordinated efforts.

3.3.6 Safety Arrangements

Safety measures protected plantations and nurseries from animal damage and theft:

- **Plantations**: Most sites had boundary walls or fencing (e.g., Team 1: all 2024-25 sites fenced).
- **Nurseries**: Limited safety arrangements reported, with Teams 1 and 5 noting no fencing.

Table 3.9: Safety Arrangements by Team]

Team	Plantations	Nurseries
1	Fenced	None
2	Limited data	Limited
3	Not specified	Not specified
4	Fenced	Limited
5	Fenced	None
6	Not specified	Not specified

Insights:

- Plantation protection is robust, but nursery security needs enhancement to safeguard sapling stocks.

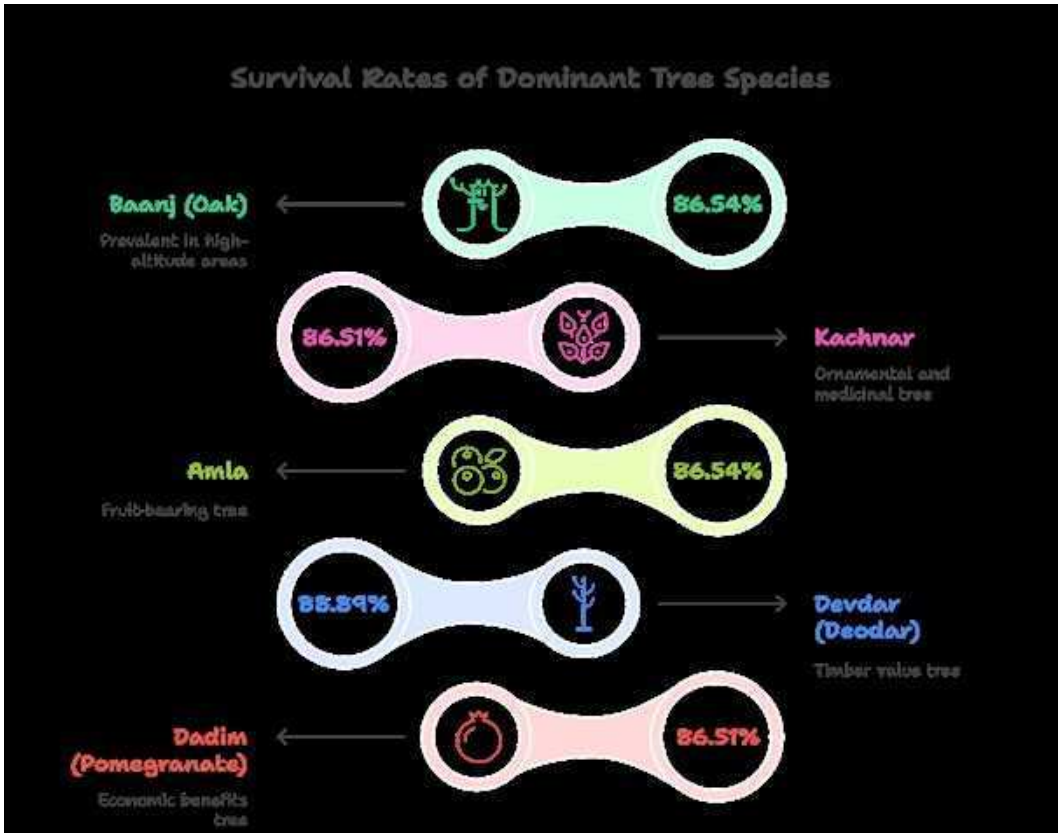
3.3.7 Species Diversity

Plantations featured diverse species tailored to local conditions, based on Proforma-2 data:

- **Dominant Species**
  - **Baanj (Oak)**: 83.74–89.34% survival, prevalent in high-altitude areas.
  - **Kachnar**: 83.74–89.28% survival, ornamental and medicinal.
  - **Amla**: 83.74–89.34% survival, fruit-bearing.
  - **Devdar (Deodar)**: 88.44–89.34% survival, timber value.
  - **Dadim (Pomegranate)**: 83.74–89.28% survival, economic benefits.

Table 3.10: Top Species by Frequency and Survival Rate]

Species	Frequency (Teams)	Avg. Survival Rate (%)
Baanj	1, 3, 4	~88
Kachnar	1, 3	~87
Amla	1, 4, 5	~88
Devdar	1, 6	~89
Dadim	1, 5	~87



Insights:

- Species selection balances ecological and economic goals.
- High survival rates indicate suitability of chosen species, though site-specific data is needed for optimization.

Comparative Insights

Cross-circle comparisons highlight key performance trends:

1. **Survival Rates**:
   Yamuna Circle's 95.22% survival vs. *Bhagirathi Circle's* 87.58% suggests that site conditions and post-plantation maintenance greatly influence success.
2. **Nursery Output**:
   Garhwal Circle produced 1.6 million saplings vs. *Corbett–South Kumaon Circle's* 768,789, reflecting scale differences and potential surplus generation.
3. **SMC Intensity**:
   Shivalik Circle reported over 5,000 structures compared to *Bhagirathi Circle's* 1,039, indicating priority areas for erosion control.

Insights

- Surplus nursery production (e.g., *Bhagirathi*: 848,830 produced vs. 230,000 planted) can support less-productive regions or future plantation drives.
- High Soil & Moisture Conservation (SMC) in erosion-prone regions correlates with better plantation outcomes.

Recommendations

To enhance the effectiveness of future forestry activities:

1. **Nursery Security**:
   Install fencing and boundary protection in vulnerable nurseries, especially in *Bhagirathi* and *Yamuna Circles*, to safeguard saplings.
2. **Planting Density Optimization**:
   Investigate the impact of low-density plantations (e.g., 97% survival in *Bhagirathi Circle's* Badsi comp. no. 3b) to determine optimal density.
3. **SMC Expansion**:
   Strengthen SMC infrastructure in erosion-prone zones such as *Tehri Dam 2* to enhance survival rates.
4. **Species Optimization**:
   Analyze survival and growth data of different species across sites to tailor plantation strategies.
5. **Standardized Reporting**:
   Use consistent units (e.g., number vs. meters) for all SMC data to improve clarity and state-level aggregation.
6. **Monitoring Systems**:
   Implement long-term digital monitoring of plantations and SMC interventions to enable adaptive management and data-driven decision-making.

Conclusion

Uttarakhand’s 2024-25 forestry activities under APO demonstrate significant progress, with a 90% sapling survival rate, robust nursery production, and extensive SMC efforts. By addressing gaps in nursery security, standardizing data, and optimizing species and SMC strategies, the state can further enhance its conservation outcomes, ensuring sustainable forest management.

04

CHAPTER

CONCLUSION, RECOMMENDATION & WAY FORWARDS

Chapter4:
Conclusion, Recommendations, and The Way Forward

The comprehensive Concurrent field evaluation of the Annual Plan of Operations (APO) for 2024-25 reveals a program of considerable operational success, marked by high plantation survival rates and extensive ancillary activities. However, it also brings to light significant strategic vulnerabilities and inefficiencies that, if addressed, could substantially elevate the program's long-term impact and sustainability. This concluding chapter synthesizes the key findings, translates them into a series of actionable recommendations, and outlines a strategic way forward to build a more resilient, efficient, and learning-oriented forestry management system for the future.

Conclusion: A Synthesis of Performance

The APO 2024-25 stands as a testament to the department's capacity to execute large-scale, complex forestry initiatives with a high degree of immediate success. The core mandate of afforestation is being met and exceeded, with sapling survival rates that are a credit to the field staff and operational planners. The program's holistic scope, encompassing soil conservation, habitat management, and fire prevention, reflects a mature and sophisticated understanding of ecosystem management.

Key Successes and Strengths:

- **Exceptional Plantation Survival:** Across nearly all operational areas, new plantation activities have achieved remarkably high sapling survival rates, consistently exceeding the standards stipulated by Government Order (GO) 98/14-P.B.V./94. Divisions such as Narendranagar (95.72%) and Mussoorie (95.62%) have set a benchmark for excellence.
- **Robust Foundational Works:** The strong positive correlation between intensive Soil and Moisture Conservation (SMC) work and high plantation survival is a standout finding. Divisions that invested heavily in land stabilization, such as Soil Uttarkashi and Narendranagar, reaped rewards in the form of healthier, more resilient plantations.
- **Effective Site Protection:** The consistent and widespread use of protective measures like fencing and stone walls for new plantations is directly linked to the high survival rates, demonstrating a clear understanding of the need to secure field assets from grazing and other threats.
- **Strategic Species Selection:** The program employed a sophisticated, multi-purpose species selection strategy, planting over 70 unique species. This approach balanced ecological restoration goals (using native species like Baanj and Deodar) with socio-economic benefits for local communities (through fruit, fodder, and medicinal species).

Critical Challenges and Strategic Gaps:

- **The Program's Achilles' Heel:** A critical and systemic vulnerability exists in the near-total lack of security for departmental nurseries. While plantations are meticulously protected, the nurseries—foundational assets housing millions of saplings—are left

exposed, creating single points of failure that could jeopardize regional plantation targets.

- **Logistical and Supply Chain Inefficiencies:** A pronounced misalignment exists between nursery production and plantation requirements at the divisional level. This has led to massive sapling surpluses in some divisions (e.g., Uttarkashi, Narendranagar) and complete deficits in others (e.g., Tehri Dam 2, Soil Ranikhet), indicating a need for a more integrated supply chain strategy.
- **Critical Data and Monitoring Gaps:** Pervasive inconsistencies in data reporting, including non-standardized units and, most importantly, the absence of long-term survival data for over 1,200 hectares of maintained plantations, represent a critical blind spot. This hinders a complete evaluation of the program's long-term impact and the true return on investment of maintenance expenditures.
- **Sub-Optimal Planting Strategies:** Field data suggests a potential inverse correlation between planting density and survival percentage. High-density planting does not always yield the best results, indicating an opportunity to refine planting protocols for greater resource efficiency and ecological health.

However, several some other areas of concern were also consistently highlighted:

- **Nursery Protection**: Nurseries statewide lacked adequate fencing and protective structures, leaving saplings vulnerable to animal damage and theft.
- **Uneven SMC Implementation**: Some divisions, notably Haridwar and Champawat, showed limited SMC works relative to plantation areas, raising concerns over long-term sustainability.
- **Fire Management**: Forest fire prevention measures were inconsistently applied, leaving certain areas more vulnerable.
- **Data Management**: There were notable inconsistencies and gaps in data reporting, impacting the accuracy and reliability of monitoring efforts.

Strategic Recommendations

To address these challenges and build upon the program's successes, the following tiered recommendations are proposed:

Foundational Recommendation:

- **Overhaul Data Integrity and Monitoring Protocols:** The effectiveness of any large-scale program depends on the quality of its data. It is imperative to implement a standardized, centralized, and mandatory digital reporting system for all field units to eliminate ambiguity and ensure consistency. Critically, this protocol must mandate the establishment of a multi-year monitoring schedule for tracking survival rates in all maintained plantation sites (e.g., at 3, 5, and 10-year intervals). This will provide the longitudinal data necessary for evidence-based decision-making and a true assessment of the program's ecological and financial ROI.

Critical Operational Recommendation:

- **Institute a Universal Nursery Security Policy:** The most acute strategic risk identified is the lack of security for departmental nurseries. A mandatory and universal security policy must be instituted, requiring the installation of appropriate protective

measures, such as chain-link fencing or stone boundary walls, for all nursery perimeters. Implementation should be prioritized based on risk and value, beginning immediately with the highest-output and highest-value nurseries, such as Tanda, Odmatha, and the major production hubs in the Yamuna, Uttarkashi, and Pithoragadh divisions. This action will close a critical loophole in the program's operational security and safeguard its most foundational assets.

Strategic Recommendations for Program Enhancement:

1. **Develop an Integrated Circle-Wide Sapling Supply Chain Strategy:** The current ad-hoc system of divisional surpluses and deficits is inefficient. The department should formalize a regional supply chain strategy that designates high-production divisions (e.g., Uttarkashi, Narendranagar) as official supply hubs. Concurrently, a plan should be developed to build nursery capacity in deficit divisions (e.g., Tehri Dam 2, Soil Ranikhet) to foster greater self-sufficiency and reduce logistical costs and risks.
2. **Replicate Successful Integrated Models:** The performance of divisions like Soil Uttarkashi and Narendranagar demonstrates a clear and successful model where intensive SMC work is a direct precursor to high plantation survival. This "SMC-First" approach should be replicated as a standard best practice, particularly in divisions with challenging terrain or those that currently show high plantation scale but low SMC investment (e.g., Almora, Champawat).
3. **Optimize Planting Density through Evidence-Based Guidelines:** To move beyond a one-size-fits-all approach, the department should initiate pilot projects across different agro-climatic zones to systematically study the long-term outcomes of variable planting densities. The results should be used to develop site-specific guidelines that optimize the balance between survival rates, resource utilization, and desired long-term forest structure.
4. **Standardize and Scale-Up Forest Fire Management:** While some divisions have excellent fire prevention programs, the approach is inconsistent. A minimum standard of fire preparedness—including regular maintenance of fire lines, planned controlled burns in safe seasons, and the establishment of community fire-watcher groups—should be institutionalized as a mandatory component of the APO for all fire-prone divisions.

Other Area of Recommendations

1. Enhance Nursery Security

- Install fencing or boundary walls at all major nurseries, prioritizing those producing substantial sapling outputs (e.g., Odmatha, Devprayag).
- Assign dedicated nursery guards in areas with high vulnerability to wildlife or livestock damage.

2. Optimize Species Selection and Plantation Density

- Encourage balanced species mixes tailored to site-specific ecological and economic goals, limiting extremely high diversity plantations unless specifically intended for experimental purposes.
- Standardize planting densities, favoring lower-density plantations (200-500 saplings/ha) that have consistently shown higher survival rates.

3. Strengthen and Expand SMC Measures

- Replicate successful models such as the comprehensive trenching and pond construction initiatives in Dhomakot (South Kumaon) and Narendranagar (Bhagirathi) to regions lacking adequate SMC interventions.
- Mandate SMC works proportional to plantation scale and topographical challenges, ensuring equitable distribution of these conservation structures.

4. Institutionalize Comprehensive Fire Management

- Establish consistent fireline maintenance, controlled burning programs, and community engagement strategies across all vulnerable divisions.
- Train local communities and establish dedicated firewatcher networks to proactively manage fire risks, utilizing the successful community-based approach demonstrated in Timli (Soil Kalsi).

5. Improve Data Quality and Reporting Standards

- Implement a centralized digital monitoring system, with field data entry applications equipped with validation checks to eliminate errors.
- Standardize reporting templates to include clear "targets versus achieved" metrics across all forestry activities, facilitating transparent and accurate performance evaluation.

The Way Forward: Building a Resilient and Learning-Oriented Future

Beyond immediate fixes, the long-term vision should be to foster a culture of continuous learning, adaptation, and resilience. The following steps outline a strategic path forward:

- **Institutionalize a Culture of Monitoring and Evaluation:** The concurrent monitoring process should be formally institutionalized as a permanent and integral part of departmental operations, not a one-off exercise. This involves creating a dedicated M&E unit with the necessary expertise (GIS, data analysis) and developing a state-level M&E manual to codify and standardize protocols for all forestry schemes.
- **Invest in Human Capital and Community Capacity:** The department must invest in training staff at all levels in modern monitoring tools, including GIS, remote sensing interpretation (e.g., NDVI analysis), and mobile data collection. Simultaneously, capacity building must extend to local communities. By sharing monitoring results and empowering Van Panchayats and other local bodies to participate in monitoring and corrective actions, the department can create a powerful grassroots stewardship layer, transforming communities from passive recipients to active partners in conservation.
- **Harness Technology for Enhanced Oversight:** The future of forest management lies in leveraging technology. The department should explore the integration of higher-resolution satellite data for more frequent monitoring, the use of drones for high-precision inspections in remote or inaccessible areas, and the application of simple AI tools to automatically flag anomalies in performance data, enabling a more proactive management response.

- **Expand the Framework for Holistic Management:** The success of the concurrent monitoring framework for the APO 2024-25 provides a proven model that should be sustained and expanded. Its application should be extended to monitor older CAMPA plantations and other critical forestry schemes, such as the Green India Mission and Namami Gange plantations. This will create a unified, state-wide M&E system, providing a comprehensive, real-time dashboard of the health of all of the state's green assets.
- **Short-term (Immediate next cycle)**:
    - Rapid installation of protective measures around critical nurseries.
    - Conduct site-specific evaluations for areas reporting lower survival rates to identify and address underlying causes.
    - Pilot digital data management systems within selected divisions to streamline data collection processes.
- **Medium-term (1-3 years)**:
    - Scale up successful SMC strategies across divisions identified as underperforming.
    - Establish dedicated training programs at model nurseries (e.g., Abhiyaantrike, Tanda) and model SMC sites to transfer knowledge and enhance field practices statewide.
    - Expand comprehensive fire management protocols to all forest ranges, including proactive community involvement and regular training.
- **Long-term (3-5 years)**:
    - Achieve statewide implementation of optimized species selection guidelines and standardized planting densities.
    - Fully institutionalize a robust, statewide monitoring and evaluation system equipped with digital data collection tools and rigorous validation protocols.
    - Develop an adaptive forestry management framework informed by continuous data feedback, ensuring long-term sustainability and resilience against climate and anthropogenic pressures.

By embracing a culture of data-driven evaluation, consistent risk management, and strategic optimization, the department has the opportunity to build upon its considerable achievements. Implementing these recommendations will transform a successful operational program into a truly resilient, efficient, and enduring investment in the ecological and economic future of the state, ensuring that the forests planted today thrive for generations to come and contribute meaningfully to state and national conservation goals.

GLIMPES OF CAMPA 2024-2025

Team Fifth, Mussoorie Wildlife Sanctuary, Activity: 7 kms Walkway Construction, Latitude: 30.46808056, Longitude: 78.17787222.

Team Fourth, Bageshwar Division, Bageshwar Range, Jaulkande site, Activity: Model Crew Station, Latitude: 29.82722222, Longitude: 79.75611111.

Team Fourth, Champawat Division, Bhingrada Range, Udarinala Uttis Khola Dhartola Sakdena VP site, Activity: DTR, Latitude: 29.55380556, Longitude: 79.93844444.

Team Fourth, Bageshwar Division, Bageshwar Range, Syuni VP site, Activity: Plantation, Latitude: 30.39997222, Longitude: 79.71369444.

Team Fifth, Soil Kalsi Division, Kalsi Second Range, Khadar Nursery site, Activity: Nursery, Latitude: 30.53802778, Longitude: 77.8315.

Team Fifth, Haridwar Division, Khanpur Range, Batiya site, Activity: Plantation, Latitude: 30.06722222, Longitude: 77.91888889.

Team Fourth, Bageshwar Division, Bageshwar Range, Activity: Plantation, Latitude: 0, Longitude: 0.

Team Fifth, Haridwar Division, Chidiyapur Range, Kotawali site, Activity: CA Plantation, Latitude: 29.816725, Longitude: 78.25873611.

Team Fourth, Bageshwar Division, Bageshwar Range, Activity: Plantation, Latitude: 0, Longitude: 0.

Team Fifth, Haridwar Division, Chidiyapur Range, Kotavali C.No. 9 site, Activity: Plantation Maintenance, Latitude: 29.77305556, Longitude: 78.29892222.

Team Fifth, Haridwar Division, Chidiyapur Range, Chidiyapur site, Activity: Rescue Centre, Latitude: 0, Longitude: 0.

Team Fourth, Almora Division, Almora Range, Bainagania VP site, Activity: Plantation, Latitude: 29.77666667, Longitude: 79.62222222.

Team Fourth, Almora Division, Almora Range, Bainagania VP site, Activity: Plantation, Latitude: 29.77666667, Longitude: 79.62222222.

TeTeam Fifth, Narendranagar Division, Shivpuri Range, Brahmpuri C.No.1 site, Activity: Plantation, Latitude: 30.14711111, Longitude: 78.35259444.

Team Fifth, Narendranagar Division, Shivpuri Range, Brahmpuri C.No.1 site, Activity: Plantation, Latitude: 30.13981944, Longitude: 78.30834444.

Team Fourth, Almora Division, Almora Range, Almora Van Chetra site, Activity: Leaf Blower Distribution, Latitude: 29.61555556, Longitude: 79.67194444.

Team Fifth, Dehradun Division, Rishikesh Range, Laalpani-2 site, Activity: Plantation Maintenance, Latitude: 30.09128056, Longitude: 78.26161667.

Team Third, Haldwani Division, Sharda Range, Chheeni Nursery site, Activity: Nursery, Latitude: 29.068, Longitude: 80.07791667.

Team First, Uttarkashi Division, Dunda Range, Dhanari C.No. 1 site, Activity: Plantation, Latitude: 30.66343056, Longitude: 78.36266389.

Team Fifth, Rajaji Tiger Reserve, Dhaulkhand Range, Activity: Water Pond, Latitude: 30.07953056, Longitude: 78.04388611.

Team Fifth, Rajaji Tiger Reserve, Beribada Range, Activity: Chowki Repairment, Latitude: 30.03583333, Longitude: 78.02027778.

Team First, Uttarkashi Division, Dunda Range, Dhanari C.No. 13 site, Activity: Gully Plugging, Latitude: 30.66297222, Longitude: 78.45898889.

Team First, Uttarkashi Division, Dunda Range, Dhanari C.No. 13 site, Activity: Gully Plugging, Latitude: 30.66297222, Longitude: 78.45898889.

Team Fifth, Narendranagar Division, Maniknath Range, Bemunda Nursery site, Activity: Nursery, Latitude: 30.26518056, Longitude: 78.36141111.

Team First, Uttarkashi Division, Dhanarigad Range, Chinyalisaur Nursery site, Activity: Nursery, Latitude: 30.581275, Longitude: 78.32877778.

Team First, Uttarkashi Division, Dharasu Range, Dharasu C.No. 1 site, Activity: Plantation, Latitude: 30.65247778, Longitude: 78.32701389.

Team First, Uttarkashi Division, Dunda Range, Bandarkot site, Activity: Fire Crew Station, Latitude: 30.74194444, Longitude: 78.36055556.

Team First, Uttarkashi Division, Nagungaad Range, Ghiyakoti site, Activity: Gully Plugging, Latitude: 30.54494722, Longitude: 78.29702778.

Team Fourth, Kalagarh Tiger Reserve, Mandal Range, West Dumunda Beat Block No. 2 site, Activity: Lantana Eradication, Latitude: 29.58305556, Longitude: 79.01055556.

Team First, Uttarkashi Division, Dunda Range, Bandarkot site, Activity: Fire Crew Station, Latitude: 30.74194444, Longitude: 78.36055556.

Team First, Tehri Dam 2 Division, Daskigaad Range, Kot ke Jaladi Soyam site, Activity: Plantation, Latitude: 30.57448333, Longitude: 78.29651667.

TeTeam Fifth, Narendranagar Division, Shivpuri Range, Brahmpuri C.No.1 site, Activity: Plantation, Latitude: 30.14711111, Longitude: 78.35259444.

Team First, Uttarkashi Division, Dharasu Range, Dichli C.No. 10 site, Activity: Plantation ANR, Latitude: 30.56628889, Longitude: 78.37747222.

Team First, Uttarkashi Division, Dharasu Range, Dichli C.No. 10 site, Activity: Plantation ANR, Latitude: 30.56628889, Longitude: 78.37747222.

Team Second, Tehri Dam 1 Division, Dharkot Range, Tipri Nursery site, Activity: Not specified, Latitude: 30.37784722, Longitude: 78.49548889.

Team First, Uttarkashi Division, Dhanarigaad Range, Kumrada Nala site, Activity: Cratewire Checkdam, Latitude: 30.56423889, Longitude: 78.36522778.

Team First, Tehri Dam 2 Division, Daskigaad Range, Kot ke Jaladi Soyam site, Activity: Plantation, Latitude: 30.57448333, Longitude: 78.29651667.

Team Fifth, Dehradun Division, Asarodi Range, Chandrabani 2 site, Activity: Plantation Maintenance, Latitude: 30.26966667, Longitude: 77.98143056.

Team First, Uttarkashi Division, Dharasu Range, Dichli C.No. 10 site, Activity: Plantation ANR, Latitude: 30.56628889, Longitude: 78.37747222.

Team First, Uttarkashi Division, Dharasu Range, Dichli C.No. 10 site, Activity: Plantation ANR, Latitude: 30.56628889, Longitude: 78.37747222.

Team First, Uttarkashi Division, Dhanarigad Range, Chinyalisaur Nursery site, Activity: Nursery, Latitude: 30.56811389, Longitude: 78.32861111.

Team First, Uttarkashi Division, Dhanarigad Range, Chinyalisaur Nursery site, Activity: Nursery, Latitude: 30.56811389, Longitude: 78.32861111.

Team First, Uttarkashi Division, Dhanarigad Range, Piplikoti site, Activity: Cratewire Checkdam, Latitude: 30.66735278, Longitude: 78.39920278.

Team Fifth, Narendranagar Division, Narendranagar Range, Chaldgaon Civil site, Activity: CA Plantation, Latitude: 30.2465, Longitude: 78.31972222.

Team First, Tehri Division, Tehri Range, Ranichauri site, Activity: Kendriye Nursery, Latitude: 30.31713611, Longitude: 78.4074.

Team Fifth, Dehradun Division, Thano Range, Song River site, Activity: Cratewire, Latitude: 30.28399722, Longitude: 78.21209167

Team Fourth, Champawat Division, Bhingrada Range, Udarinala Uttis Khola Dhartola Sakdena VP site, Activity: DTR, Latitude: 29.55380556, Longitude: 79.93844444.

Team First, Soil Uttarkashi Division, Jalkurgad Range, Lambgaon site, Activity: Forest Guard Chowki, Latitude: 30.51256111, Longitude: 78.49866111.

Team Fifth, Dehradun Division, Lachhiwala Range, Lachhiwala 6A site, Activity: Elephant Safety Ditch, Latitude: 30.19365833, Longitude: 78.12308056.

Team Fifth, Dehradun Division, Asarodi Range, Kadwapani site, Activity: Nursery, Latitude: 30.49440833, Longitude: 78.52275556.

Team Three, Nainital Division, South Gaula Range, Burtoli Nala Okhalkanda site, Activity: Not specified, Latitude: 29.31811111, Longitude: 79.79088889.

Team Second, Lansdowne Division, Lansdowne Range, Kendriye Nursery Farsula site, Activity: Nursery, Latitude: 29.81683139, Longitude: 78.65021167.

Team Second, Lansdowne Division, Lansdowne Range, Kendriye Nursery Farsula site, Activity: Nursery, Latitude: 29.81683139, Longitude: 78.65021167.

Team Fifth, Soil_Kalsi Division, Kalsi Timli Range, Darra Beat Timli site, Activity: Pond, Latitude: 30.34073333, Longitude: 77.79590278.

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