THIRD-PARTY EVALUATION OF WORKS DONE UNDER CAMPA IN THE STATE OF HARYANA
NORTH AND WEST CIRCLE
(2019-20 to 2021-22)








Submitted to

Principal Chief Conservator of Forests &
HoFF, Haryana State Forest Department,
Van Bhawan, Panchkula,
Haryana – 134109

August 2024

Submitted by

IORA Ecological Solutions Pvt. Ltd.
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Garden of Five Senses Road,
Saidulajab Village, Saket
New Delhi – 110030

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About Us

IORA Ecological Solutions Pvt. Ltd. (IORA) is an environmental advisory group committed towards promoting solutions for conservation and management of natural resources and climate change mitigation and adaptation. With our multi-disciplinary expertise in the domain of environmental finance, policy advisory and scientific research, along with a demonstrated experience in designing and implementation of projects across the world, we have successfully emerged as a notable platform delivering sustainable and scalable environment-related solutions.

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Publication Team

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Executive Summary

CAMPA is emerging as the largest sustainable source of funding for afforestation activities in the country. There is a growing importance of independent evaluations, to assess what is working and what is not, so as to be able to improve the program in the future. IORA Ecological Solutions entered into the agreement to take up the evaluation of the CAMPA activities in the State of Haryana. The objective of the evaluation was to assess the status of the CAMPA activities in Haryana, carried out in 2019-20, 2020-2021, and 2021-2022, and also to ascertain the reasons for its success or failure.

Monitoring and evaluation of the forestry interventions need to go beyond the single parameter of survival percentage and delve deeper by asking (1) whether the site selected was suitable for tree planting (2) Whether the species planted are native and suited to the ecosystem (3) Is the growth of the plants adequate? and finally, (4) will they survive beyond the project period and establish into forests? Only when a plantation performs well on all these parameters it can be termed as successful. The objective of this third-party evaluation study was to assess the performance of the CAMPA plantations and non-plantation activities and revolves around three key evaluation questions namely what is the status of survival and growth, what are the best practices and common pitfalls, and the lessons for the next phase. In terms of the evaluation framework, we used the three dimensions of relevance, effectiveness, and sustainability covering the five variables of site suitability, species suitability, growth, survival, and sustainability.

Following the Terms of References (ToR), we sampled 50%, 40%, and 30% area of the total CAMPA sites under each component in each forest division, carried out in 2019-20, 2020-21, and 2021-22 respectively. In each plantation site, 100% of the planted saplings were enumerated. The quantitative method includes the field assessment of height and growth and the actual extent of the plantation. The qualitative method includes the Key Informant Interview (KII) with the Range Officers, and Focus Group Discussion (FGD) with the local villagers whenever required. In the case of SMC and Fencing sites, the length, width, and depth of the structure and extent were physically measured. The expenditures of both structures could not be verified due to the lack of proper documentation.

The afforestation context in the state of Haryana is very different due to its dry climate, topography, unavailability of forestlands, grazing pressure, severe anthropogenic disturbances, and other biotic threats. In almost every division in Haryana, the afforestation sites are mostly disputed lands, previously encroached on by the local people. Due to the huge livestock population, the grazing pressure is immensely high in most of the sites. Frost and fire also affected the plantation sites in many areas. Hence, due to this diversity of afforestation contexts, it may not be wise to compare the plantation performance across divisions.

- In North Circle, a total of 439 sites have been evaluated. For plantation activities (Compensatory Afforestation and Net Present Value) 145 sites have been covered and for non-plantation activities (Fencing, Building and Soil and Moisture Conservation) 294 sites have been covered.
- The Circle has six plantation models such as CA Tall Plants, CA Small Plants, NPV Tall Plants, NPV Native, NPV Eco-restoration, and NPV Ridge. The overall survival percentage of plants in this Circle is 60.27%.
- In North Circle, a total of 179 sites have been evaluated. For plantation activities (Compensatory Afforestation and Net Present Value) 154 sites have been covered and for non-plantation activities (Fencing, Building and Soil and Moisture Conservation) 25 sites have been covered.
- The Circle has four plantation models such as CA Tall Plants, NPV Tall Plants, NPV Eco-restoration, and NPV Ridge. The overall survival percentage of plants in this Circle is 69.89%.

We came across several good practices and plantation outcomes in all the divisions. In all the divisions, fast-growing native species like Sheesham and Arjun were prioritized for the plantation. These plants also have immense medicinal properties and can withstand moderate forest fire, frost, and waterlogging. Robust growth of Sheesham was observed in most of the sites from 2019-20. Papdi species were also found to be very successful in most of the sites since cattle animals do not prefer this plant for grazing. In almost all the divisions, the species selection was good. In Morni-Pinjore and Kaithal division, fast-growing tall species such as Kadam, Sheesham were planted in roadside plantation which showed excellent growth. But in some cases in Bhiwani, Yamuna Nagar, and Chakhri Dadri, the site selection was not been done adequately, resulting in severe loss of planted saplings. In all the divisions, the efforts of forest guards and watchers to protect and sustain the plantation sites were commendable.

Both the plantations in the natural landscape and the roadside in some locations needed significant improvements. The common pitfalls identified were lack of any protection measures, selection of unsuitable sites, damage to plants by cattle and wildlife, weed infestation, lack of community participation, and weak record keeping. Selecting sites with high vulnerabilities such as cattle grazing, browsing by wild herbivores, weed infestation, etc. without adequate mitigation and adaptation measures was observed in all the divisions. In most of the divisions, the record-keeping was found to be inadequate. Documents related to the plantation sites such as plantation journals, estimates, and measurement books were unavailable. Also, in plantation sites, no demarcation (boards) were found, creating difficulties in identifying the sites from the APO.

We suggest that the threats posed by the drivers of degradation such as grazing, fire, weeds, etc. need to be factored into the plantation plan before afforestation is initiated. The whole range of ecological afforestation approaches needs to be made permissible based on the status of the ecosystem, i.e., whether it is degraded, damaged, or destroyed. In every plantation site, adequate protection measures should be adopted. Instead of the uniform artificial regeneration approach, adapting the plantation models to site-specific locality factors should be encouraged. Exotic plants should be avoided and native species preferred. Non-forest ecosystems such as grasslands that have intrinsic ecosystem values need to be excluded from tree plantations. To prevent fire, grazing, and other anthropogenic disturbances, community involvement before the initiation of the afforestation program is an utmost necessity. Also, record keeping must be strengthened in range level.

Overall the evaluation study found that the CAMPA plantations are performing satisfactorily. By avoiding the pitfalls, adopting adequate protection measures, scaling up the good practices, and adopting policy changes in the design as discussed above, the next phase of the program can show even better results.

1. Chapter One: Introduction

There is a global drive to restore degraded ecosystems so that they can again harbour biodiversity, sequester carbon and provide the full range of ecosystem services (IPBES, 2018). One of the approaches in this direction is the forest landscape restoration (FLR) which aims to bring back functionality and productivity to deforested lands while contributing to social and economic wellbeing (McLain et al., 2021). In 2011, as a part of the Global Restoration Initiative (Bonn Challenge), 47 governments committed to bringing 150 million hectares of deforested and degraded land into restoration using the FLR approach by 2020 and 350 million hectares by 2030. The government of India made a Bonn Challenge pledge to bring under restoration 13 million hectares of degraded land by 2020 and an additional 8 million hectares by 2030. Reportedly, it has made a steady progress towards this pledge and by 2018 had already brought an area of 9.8 million hectares under restoration since 2011 (Borah et al., 2018). Primary approach to FLR in India has been afforestation which is funded through several flagship programmes such as the National Afforestation Programme (NAP), National Mission for a Green India (GIM), National Green Highways Mission, National Mission for Clean Ganga (NMCG), Compensatory Afforestation (CAMPA), Nagar Van Yojana and others. The focus of this report is the plantation and non-plantation activities under Compensatory Afforestation fund Management and Planning Authority (CAMPA) in the state of Haryana from 2019-20 to 2021-22.

1.1. About the State of Haryana

Haryana is situated in the northern part of India and has a geographical area of 44,212 sq km which constitutes 1.34% of the geographical area of the country. The State lies between latitude 27°39'N to 30°55'N and longitude 74°27'E to 77°36'E. Physiographically Haryana falls in the Indo Gangetic plain although some of the areas fall in Shiwalik hills as well. Climate of the State varies from moist sub- tropical in north bordering Himachal Pradesh to arid in southern part bordering Rajasthan. The State is bordered by Himachal Pradesh and Punjab in the North, Uttarakhand, Uttar Pradesh and Delhi on the East and Rajasthan on the West & South. The average annual rainfall varies from about 200 mm to 1,400 mm and the average annual temperature ranges between 1°C to 45°C. The Yamuna and the Ghaggar are the important rivers of the state.

Haryana is primarily an agricultural State of India and 80% of the total geographical area is under agriculture. As per the Champion & Seth Classification of Forest Types (1968), the forests in Haryana belong to three Forest Type Groups i.e. Tropical Dry Deciduous Forest, Tropical Thorn Forest and Subtropical Pine Forests which are divided into 10 Forest Types. Over 500 bird species have been recorded in the State which is almost 40% of total bird species in the country. Although, the maximum portion of the geographical area consists of agricultural fields, over a time, the State has achieved a unique status in the field of agroforestry which has enabled the forest deficient State to support a large number of wood-based industries based on farm-grown timber. Poplar and Eucalyptus trees are the major agroforestry species which have become the main resource for improvement of livelihood of farmers in northern and central parts of the State.

Recorded Forest Area (RFA) in the State is 1,559 sq km of which 249 sq km is Reserved Forests, 1,158 sq km is Protected Forests and 152 sq km is Unclassed Forests.

In Haryana, during the period 1st January 2015 to 5th February 2019, a total of 1,529 hectares of forest land was diverted for non-forestry purposes under the Forest Conservation Act, 1980 (MoEF & CC, 2019). Two National Parks, eight Wildlife Sanctuaries and two Conservation Reserves constitute the Protected Area network of the State covering 0.75% of its geographical area.

1.2. Afforestation context in the State of Haryana

Active afforestation in the forest and private lands can positively impact the biodiversity and ecological balance, climate regulation and watershed management of the area. The land-use adjacent to the forestlands is mostly big and smallholder farming and is human dominated which creates severe anthropogenic disturbances. The lack of availability of public and forest lands on-scale in the divisions of Haryana is one of the biggest constraints in the afforestation program. The afforestation context across various divisions is very difficult due to variation in land-uses, topography, severe anthropogenic pressure, lack of forest staffs and, unavailability of funds on time. The Aravalli region in Nuh-Mewat and Mahedragarh Division have dry and rocky soil bed which is not suitable for afforestation initiatives. In Gurugram and Faridabad most of the afforested lands were previously encroached by the local zamindaars. There is a lack of natural forest area to take up plantations and hence most of the activities were carried out as road side plantation. Due to the high livestock population, the grazing pressure in every division is immense. Hence, it may not be wise to compare the activities across divisions and with other states as the restoration context is very different.

1.3. About CAMPA

With a cover of 23% of Geographical area of the country, forest in India comprise of a number of diverse forest types and reserved areas designated as National Parks and Wildlife Sanctuaries. In India, forest meet the livelihood needs of people living in and adjoining the forests in about 1,73,000 villages. Forests also act as carbon sinks and regulators of water regime.

Many development and industrial projects such as erection of dams, mining, and construction of industries or roads require diversion of forest land. Any project proponent, government or private must apply for forest clearance from Ministry of Environment and Forests (MoEF), before the conversion of land take place. This proposal is to be submitted through the concerned forest department of the state government. If clearance is given, then compensation for the lost forest land is also to be decided by the ministry and the regulators.

Due to certain discrepancies in the implementation of compensatory afforestation, some NGOs had approached The Hon'ble Supreme Court for relief. The Hon'ble Supreme Court on 10th July, 2009 issued orders that there will be a Compensatory Afforestation Fund Management and Planning Authority (CAMPA) as National Advisory Council under the chairmanship of the Union Minister of Environment & Forests for monitoring, technical assistance and evaluation of compensatory afforestation activities.

1.4. Objectives of CAMPA

Compensatory Afforestation Fund Management and Planning Authority (CAMPA) are meant to promote afforestation and regeneration activities as a way of compensating for forest land diverted to non-forest uses. National CAMPA Advisory Council has been established as per orders of The Hon'ble Supreme Court with the following mandate:

- Lay down broad guidelines for State CAMPA.
- Facilitate scientific, technological and other assistance that may be required by State CAMPA.
- Make recommendations to State CAMPA based on a review of their plans and programmes.
- Provide a mechanism to State CAMPA to resolve issues of an inter-state or Centre-State character.

1.5 Organization of the report

The report is the final part of the evaluation and monitoring of CAMPA activities in Haryana carried out in the year 2019-20, 2020-21 and 2021-22. This final report is the compiled version of the activities carried out in the forest divisions of North and West Circles.

In the report, the primary findings of the evaluation work are focused into three parameters:

a) Relevance (Species and site suitability)
b) Effectiveness (Survival, growth and extent)
c) Sustainability (Monitoring, protection and maintenance)

For each circles, division-wise good practices and pitfalls along with geo-tagged photos will be provided. For each pitfall, recommendations are provided.

2. Chapter Two: Objectives

Evaluation is a rigorous and independent assessment of project activities to determine the extent to which they are achieving stated objectives. The key distinction between evaluation and monitoring is that evaluations are done independently and are also more rigorous in their procedures, design and methodology, and generally involve more extensive analysis. Evaluation of plantations need to cover aspects of site suitability, species selection, survival, growth and future sustainability.

The objective of an evaluation is to provide information that can help inform decisions, improve performance and achieve planned results. The objective of the present evaluation study is to address the following key points namely:

1. Current status, survival and growth of the activities
2. Extent of the activities
3. Best practices and common pitfalls
4. Provide viable recommendations

We assessed not only the outputs and outcomes of the initiative but also critically analyzed the program design, decision making and implementation process. So, for plantations that are excellent, the evaluation probed the reasons for the success, and for plantations that performed poorly, the reasons for the failure were noted. So that in the phase, corrective action can be taken to upscale the success stories and prevent the failures from repeating.

3. Chapter 3: Program Components and Their Description

3.1 Plantation Activity

3.1.1 Compensatory Afforestation (CA)

Compensatory afforestation (CA) is one of the most important requirements/condition for prior approval of the Central Government for the diversion of forest land for non-forest purposes and the purpose of compensatory afforestation (CA) is to compensate the loss of 'land by land' and loss of 'trees by trees' (Forest (Conservation) Act, 1980).

Any proposal submitted by the State/UT Government seeking prior approval of the Central Government under the FCA shall have a comprehensive scheme for compensatory afforestation, duly approved by the competent authority of the concerned State/UT administration.

Land for CA:

(i) Normally, CA is to be raised on suitable non-forest land, equivalent to the area proposed for diversion, at the cost to be paid by the User Agency.

(ii) As far as possible, the non-forest land for CA is to be identified as contiguous to or in the proximity of a Reserve/Protected Forest to enable the Forest Department to effectively manage the newly planted area.

(iii) Where non-forest land is available but lesser in the extent to the forest area being diverted, CA could be carried out over degraded forest twice in the extent of the area being diverted or the difference between the forest land being diverted and the available non-forest land, as the case may be. The non-availability of suitable non-forest land for CA in the State / Union Territory would be accepted by the Central Government only on the basis of a Certificate of the Chief Secretary of the State/Union Territory Government to that effect in respect of States/UTs having forest area more than 33% of the geographical area in the prescribed format.

(iv) In case, non-forest land for CA is not available in the same district, it should be identified anywhere else in the concerned/State/Union Territory near to the site of diversion as far as possible, so as to minimize adverse impact on the micro-ecology of the area.

(v) In exceptional cases where non-forest land for CA is not available in the same State/UT in which the diversion of forest land is proposed, land for CA can be identified in any other State/UTs, preferably in neighboring State/UTs. The corresponding amount for carrying out CA shall be deposited in the CAMPA account of the State/UT in which CA is proposed.

The types of CA plantation activities undertaken by the state is mentioned below

1. CA Tall Plant (CA TP)
   Plantation of tall plants (6-8 ft.) with a plantation density of 1000 saplings per hectare.
2. CA Small Plant (CA SP)
   Plantation of small plants (1-2 ft.), with a plantation density of 1000 saplings per hectare.
3. CA Trench cum Pit Method
   Plantation of tall plants (6-7 ft.) with a plantation density of 1000 saplings per hectare. Trenches are dug next to the planted saplings.

3.1.2 Net Present Value (NPV)

It is a mandatory one-time payment that a user has to make for diverting forestland for non-forest use, under the Forest (Conservation) Act, 1980. As per the CAF Act 2016, the money

received towards net present value and penal net present value shall be used for artificial regeneration (plantation), assisted natural regeneration, forest management, forest protection, forest and wildlife related infrastructure development, wildlife protection and management, supply of wood and other forest produce saving devices and other allied activities in the manner as may be prescribed.

The types of NPV activities undertaken by the state are:

1. NPV Tall Plant

This plantation model consists of tall plants (6-8 ft.) and a density of 250 saplings per RKM (Running Kilometers).

2. NPV Ridge

In this plantation model tall plants (6-8 ft.) were planted on ridges of 8-10 m to reclaim waterlogged areas or retain the moisture in dry areas. Usually 500 saplings per RKM are planted in this model.

3. NPV Native

It is a plantation model with tall plants (5-8 ft.) where 500 saplings are planted per RKM. In this model, only native species of the area are chosen.

4. NPV Eco-restoration

It is a plantation model where small plants (1-2 ft.) with a sapling density of 200 per RKM. In this case, plantations are usually protected by stone wall.

5. NPV Alkali

In this plantation model, saplings were planted on alkaline soil in order to reclaim and restore the land. Tall plants (5-6 ft.) and small plants (1-2 ft.) are planted at a density of 1000 saplings per hectare.

3.2 Non-plantation Activity

3.2.1 Fencing

Fencing is the principal protection measure for a plantation. Two kinds of fencing are used in the forest sector, i.e. Barbed wire Fencing and Chain Link Fencing.

3.2.2 Soil and Moisture Conservation (SMC) Works

SMC works are usually done to capture and retain the moisture in the soil in places with water scarcity. There are various kinds of effective SMC works, e.g. Soak pits, Check Dams, ponds, crate wire structures, Contour trenches, percolation ponds, reinforced cement concrete structures, stone studs etc.

3.2.3 Buildings

These activities include constructing residential and official buildings for forest range officers, frontline staff, etc. deployed for forest and wildlife protection.

3.3 Development and Wildlife Wing

3.3.1 Wildlife Wing

Wildlife Wing undertakes activities like wildlife management and conservation, establishment, expansion and up-gradation of wildlife facilities, purchase of wildlife and rescue equipment, construction of boundary walls, extension of protection center, construction of office, residences for staff, shelter homes, habitat improvement, etc.

3.3.2 Development Wing

Activities like maintenance of research plots, creation of germplasm, construction of underground water storage, construction of RO, mist chamber, etc. were undertaken by the state's Research, Seed and Training Divisions.

Publicity and Training Circle carries out activities like training camps for stakeholders, capacity-building workshops, development of publicity material, excursions for the researchers, exposure and education visits for school children, video documentation etc.

4. Chapter 4: Program Implementing Agencies and Their Hierarchy

4.1. State CAMPA

The Hon'ble Supreme Court also approved the guidelines prepared by the MoEF for utilizing CAMPA funds by an agency to be constituted in the states and to be known as The State CAMPA.

Some of the key points in the guidelines are:

- The State CAMPA would presently receive funds collected from user agencies towards compensatory afforestation, additional compensatory afforestation, penal compensatory afforestation, Net Present Value (NPV) and all other amounts recovered from such agencies under the Forest (Conservation) Act, 1980 and presently lying with the Adhoc CAMPA.
- The State CAMPA would administer the amount received from the Adhoc CAMPA and utilize the funds collected for undertaking compensatory afforestation, assisted natural regeneration, conservation and protection of forests, infrastructure development, wildlife conservation and protection and other related activities and for matters connected therewith or incidental thereto.
- State CAMPA would provide an integrated framework for utilizing multiple sources of funding and activities relating to protection and management of forests and wildlife. Its prime task would be regenerating natural forests and building up the institution engaged in this work in the State Forest Department including training of the forest officials of various levels with an emphasis on training of the staff at cutting edge level (forest range level). In short, the department would be modernized to protect and regenerate the forests and wildlife habitat.

The guidelines also talk about establishment of an independent system for concurrent monitoring and evaluation of the works implemented in the States utilizing the funds available.

In sum, the prime task of State CAMPA would be regenerating natural forests and building up the institution engaged in this task in the State Forest Department.

4.2. CAMPA in Haryana

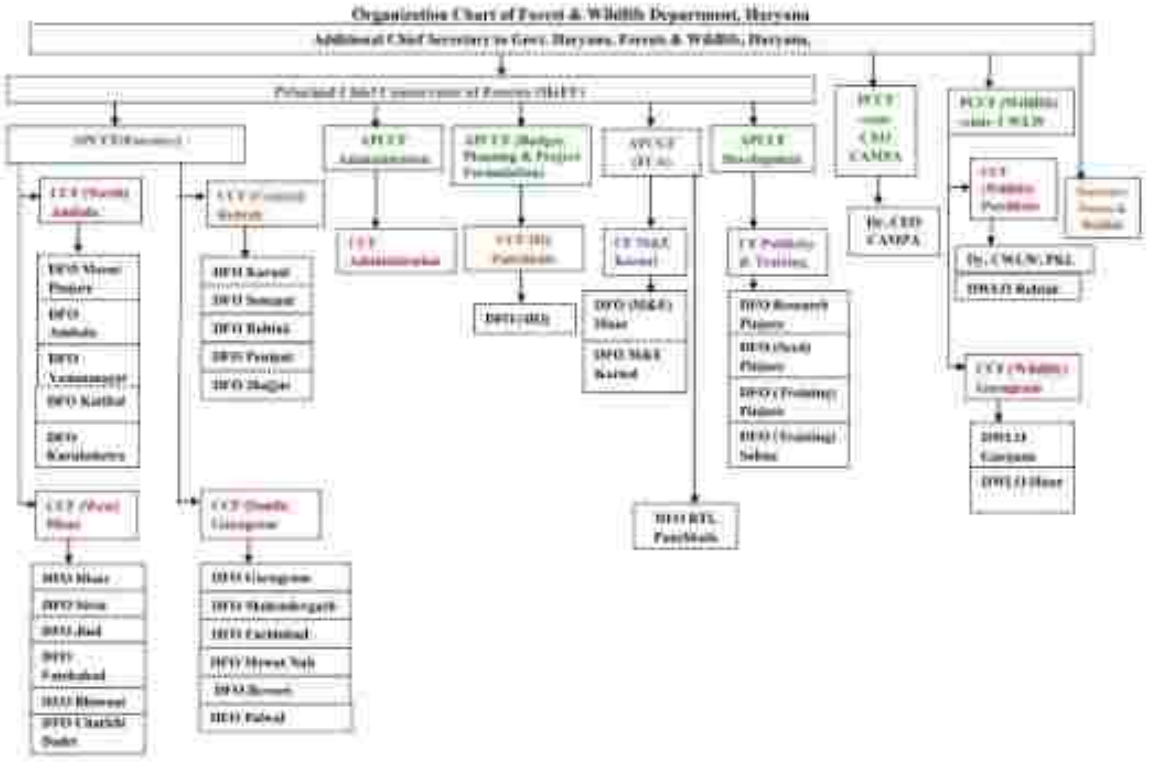
Prior to the enactment of Compensatory Afforestation Fund Act, 2016, in compliance of the directions of the Supreme Court and guidelines issued by the MoEF & CC, New Delhi on 2nd July 2009, Haryana Government had constituted the State CAMPA vide notification no. 5330-Ft-4-09/511 dated 08.01.2010. The State Authority, CAMPA was comprised of

- The Governing Body chaired by Hon'ble Chief Minister, Haryana,
- The Steering Committee chaired by the Chief Secretary to Government of Haryana, and
- The Executive Committee chaired by Principal Chief Conservator of Forests (HoFF).

With the enactment of Compensatory Afforestation Fund Act, 2016 and notification of Compensatory Afforestation Fund Rules, 2018, the "Haryana State Compensatory Afforestation Fund Management and Planning Authority (State Authority) has been reconstituted in accordance with the provision of Section-10 of Compensatory Afforestation Fund Act, 2016 vide notification dated 22.11.2018. The reconstituted State Authority has a Governing Body headed by Hon'ble Chief Minister, Haryana, a Steering Committee headed by the Chief Secretary to Government of Haryana and an Executive Committee headed by Principal Chief Conservator of Forests, (Head of the Forest Force).

4.3. Haryana State Forest Department

The Forest Department of Haryana is the implementing agency for the CAMPA scheme. The forest depart of Haryana is consist of 22 forest divisions, falling under 4 territorial circle, Wildlife Wing, Research and Development Division, and Publicity and Training Circle.



5. Chapter 5: Methodology

5.1. Evaluation framework

The IFAD evaluation framework elucidates five dimensions that need to be covered namely relevance, effectiveness, impact, efficiency and sustainability (IFAD evaluation manual 2009).

- Relevance concerns the extent to which a development initiative and its intended outputs or outcomes are consistent with the needs of the environment and the intended beneficiaries. Relevance also considers the extent to which the plantation activity is suited to the environment and the intended beneficiaries. In applying the criterion of relevance, the evaluation explored the extent to which the planning, design and implementation took into account the local context in terms of needs of the local community and the environment. Two variables namely site suitability and species selection were measured.
- Effectiveness is a measure of the extent to which the initiative's intended results have been achieved. Evaluating effectiveness involves an assessment of cause and effect that is, attributing observed changes to project activities and outputs. While assessing the effectiveness of plantations, the two variables – growth and survival were measured.
- Impact measures changes in human development and people's well-being that are brought about by development initiatives, directly or indirectly. At times, evaluating impact faces challenges. Confirming whether benefits to beneficiaries can be directly attributed to the intervention can be difficult, especially since there are several ongoing interventions often with overlapping objectives. As the plantations are only a few years old, it is too early to measure their impact either on local livelihoods or the environment. Efficiency includes a measure of how economically inputs (funds, expertise, time, etc.) are converted into results. An analysis of budget use and compliance is also important in order to assess the efficiency dimension. Measuring efficiency will need assessment of financial aspects and would take the form of financial audit and hence was not attempted.
- Sustainability is the likely continuation of net benefits from an intervention beyond the phase of funding support. It includes an assessment of the likelihood that the results will be resilient to risks beyond the project's life. While assessing sustainability the prospects of future survival of the plants was assessed based on risks like droughts, grazing, fire etc.

Hence, of these five evaluation criteria, the present evaluation covered the three dimensions of relevance, effectiveness and sustainability by measuring the five variables namely site suitability, species selection, growth, survival and sustainability.

5.2. Approach

IORA Ecological Solutions entered into agreement with the Haryana State Forest Department to execute the Third Party Evaluation and monitoring of CAMPA activities carried out in the year of 2019-20, 2020-21 and 2021-22 on 28th November, 2022.

The framework for this evaluation focused on three key parameters namely - relevance (site and species suitability), effectiveness (survival, growth and area coverage) and sustainability (maintenance, protection and monitoring. Extensive fieldworks have been carried out for primary data collection using both quantitative and qualitative tools.

Quantitative tools were used to assess the survival and health of the plantation, geographical features, and actual area extent. Qualitative tools were used to understand the hurdles faced by the forest department in various phases of the plantation, disturbance regime, pitfalls, good practices etc. Two PRA tool, e.g. Key Informant Interview (KII) and Focus Group Discussion (FGD) were used to get the perception of both the stakeholders and the implementing

authority. Departmental APO, plantation journal, measurement book, were used as secondary information to validate the primary data. Photographic evidence, GPS tracks along the plantation boundaries, waypoints have been generated through the field visits.

5.3. Sampling strategy

The consolidated list of work carried out under CAMPA scheme on 2019-20, 2020-21 and 2021-22 were collected from the Haryana CAMPA head office, Chandigarh.

As required in the Terms of References, the sampling intensity was 50%, 40% and 30% of the total area of plantations under each component in each division for 2019-20, 2020-21 and 2021-22, respectively. In case of the non-plantation activities, the same sampling strategy was adopted.

Within a plantation site, 100% enumeration of the planted saplings was carried out to ensure the proper output of the evaluation.

Table 5.1: Methodology adopted for data collection

Method	Description	Usage
Primary Data		
Field Enumeration	Field observation in the sites by using GPS. Within a site, 100% enumeration of the planted saplings were done.	Assess the effectiveness of the plantation by measuring the height, survival and the area extent
Key Informant Interview	Qualitative in-depth interviews with those who have first- hand knowledge of the initiative operations and context.	Identify the difficulties faced in planning, implementation and monitoring phases to figure out how the effectiveness of the plantation can be enhanced.
Focus Group Discussions	A small group (5-10 people) discussion on a limited set of topics to explore in-depth stakeholder opinions and perceptions of the initiative and its impact. Semi-structured questionnaires were used to ensure a standardized approach to obtain information from the group concerning the inputs, outputs and contextual factors of the initiative.	Assess the extent of active community participation in these type of projects and the impacts of the communities from different socio-economic background on various CAMPA initiatives.
Photos with good resolution	Good resolution, geotagged photos were taken to identify the good practices and pitfalls of the plantation. Google Earth historical imagery system was used	The photos will reflect the current situation of the plantation.
Data collection	The data entry was done by using the Kobo toolbox system, which is much more convenient.	Kobo app was used in the field for faster data entry by using mobile.

Secondary Data		
State Level	Details of CAMPA projects including financial (allocations, sanctions, expenditure), physical (planning process, approved projects, various government directives etc.) and monitoring (internal monitoring reports, government directives etc.)	To assess the physical and financial allocations, targets and expenditure of the total initiative.
Circle/Division Level	Project proposal, estimate, sanction order, work commencement order, plantation journal, compartment history, working plan prescriptions for the compartment, muster rolls, expenditure vouchers, completion reports, process photographs, monitoring reports, GPS points	To assess the physical and financial targets of the projects, planning and implementation of the individual projects, inputs, process and outputs of these projects

5.4. Quantitative data collection

5.4.1. Assessing the extent of the plantation

Within a site, the extent/ boundary of the plantation was measured by using GPS (Locus Map). Tracks was made using GPS in each plantation site for further verification. The track was then saved and extracted as KML file. Measuring the area coverage of plantation projects in forest areas can prove to be difficult using conventional tools especially for large plantations. In these cases, GPS receivers were used and way points were obtained by traversing the perimeter of the plantation. These points were projected on Google Earth Pro which supports measuring area and perimeter with polygon tool which helped to assess the accuracy of the plantation area.

5.4.2. Enumeration of the planted materials

All the pits were counted in a plantation to assess the survival rate of the plantation. Species wise height and collar girth/ GBH were recorded as the key growth parameters. The health of the saplings (wilting/ browsed/ wounded/ stressed/ pathogen attack etc.) was also recorded by ocular observation.

Geo-tagged photos were taken at every plantation and non-plantation sites.

5.4.3. Physical verification of non-plantation sites

In case of a non-plantation site, the width, depth and length of the structure were physically measured and then matched with the APO data. Financial verification was also done by matching the amount of actual expenditure with the state APO. Geotagged photos were taken from every angle to depict the exact condition of the structure.

The data (both plantation and non-plantation) were collected by using Kobo collect app. It is an open data collection toolbox, which was customized by IORA specially to ease the data collection in the field. The datasheets were then extracted from Kobo as excel files.

Figure 5.1: Field enumeration in a plantation site, Rewari Division

Figure 5.2: Physical verification of a SMC structure (non-plantation) in Palwal Division

5.5. Qualitative data collection

The objective of the qualitative data collection is to analyze the effectiveness of the four stages of the plantation activity i.e. planning, implementation, maintenance and protection by obtaining feedback from the local community and the technical staff. PRA tools were used to interview the local community and the technical staff. A semi-structured questionnaire was designed to conduct a Focus Group Discussion (FGD) with the local community and a Key Informant Interview (KII) of the technical staff, preferably the Range Officer. These PRA tools

had both open ended and closed questions and provided valuable insights on the present status of the plantation, and also how to improve the effectiveness of future plantations.

Figure 5.3: Focus Group Discussion with the local people at Golwa site, Mahendragarh Division

Figure 5.4: Key Informant Interview with the Range Officer at Fandabad Division

5.6. Criteria for grading the plantation sites

It is useful to have ranking/scales to evaluate the plantation projects. However, this is not easy since the site parameters, species and inputs provided will vary from plantation to plantation and it may not be appropriate to rank such heterogeneous plantation projects using a common scale.

The common grading criteria for a plantation site are:

- Survival rate
- Species composition as per the APO
- Growth of the planted species
- Extent of the plantation
- Site suitability
- Species suitability
- Protection measure
- Monitoring/ Watch and ward
- Plantation journal/ measurement book
- Plantation map and KML files
- Presence of major invasive species
- Weeding in site
- Hoeing in sites

5.7. Criteria for grading non-plantation sites

5.7.1. Fencing:

- Fencing type
- Working status
- Activity status
- Serving the purpose intended
- Expenditure as per the APO
- Site suitability
- Measurement book

5.7.2. Soil and Moisture Conservation (SMC)

- SMC type
- Working status
- Site suitability
- Measurement as per the APO
- Measurement book
- Fulfilling design specifications

4.7.3. Buildings

- Location
- Building status
- Serving intended purpose
- Expenditure as per the APO
- Measurement book
- Dampness and leaks on the walls
- Structural quality and cracks
- Site on e-greenwatch

5.8 Data Analysis

The data (both plantation and non-plantation) were collected by using the Kobo collect app. It is an open data collection toolbox, which was customized by IORA specially to ease the data collection in the field. The datasheets were then extracted from Kobo as Excel files.

Good practices and pitfalls in each site were obtained by using PRA tools and ocular observation and mentioned in the report. On the basis of the pitfalls in each plantation site, viable recommendations were made.

Good plantation sites were highlighted as success stories, where the uniqueness of the sites was reported and the changes in the landscape over the years due to the plantation were observed by using Google Earth Historical Imagery.

5.9. Limitations

5.9.1. Capturing variability across sites

Haryana is a state with a wide variety of ecological parameters. The geology, rainfall, soil, topography, vegetation types, and many other parameters change significantly across the length and breadth of the state. The key drivers of degradations were also found to be different in each division. It was very challenging to capture the variability across various sites in different divisions.

5.9.2. Accessibility in the sites

In most areas of the South Circle, the abundance of *Prosopis juliflora* makes the site almost inaccessible. Due to this invasive species, most planted individuals were stunted, thus very hard to identify and measure. The same situation was faced in Central Circle, where the sites were almost inaccessible due to the presence of *Sachharum spontaneum*. In the Mahendragarh and Nuh-Mewat divisions, some sites were inaccessible due to presence of illegal mining and hostile local communities.

Nevertheless, every site was enumerated properly despite the presence of these problems.

5.9.3. Enumeration in larger sites

As required in the Terms of Reference (ToR), we conducted 100% enumeration in all the sites. Some of the sites were spread across vast areas (30-50 ha/ 30-60 RKM). In those sites, plantation enumeration was extremely tedious and challenging, due to the large area and huge number of planted species.

6. Chapter 6: North Circle

The North Circle consists of five divisions, Ambala, Kaithal, Kurukshetra, Morni-Pinjore and Yamuna Nagar. Each and every division is unique in terms of the terrain, local vegetation, drivers of degradation, and results produced. The findings are categorized into three dimensions: Relevance, Effectiveness and Sustainability by measuring five principal variables namely site suitability, species selection, growth, survival and sustainability.

Table 6.1: Plantation Target and achievement for 2019-20

Divisions	CATP			NPVTP		
	Target (Ha)	Achieved (Ha)	Plants	Target (RKM)	Achieved (RKM)	Plants
Morni-Pinjore	17.676	17.676	17676	60	60	15000
Ambala	4.64	4.64	4636	60	60	15000
Yamuna Nagar	16.913	16.913	16913	60	60	15000
Kurukshetra	19.1633	34.497	38686	210	210	52500
Kaithal	6.66	19.961	19961	90	90	22500

Plantation Target and achievement for 2020-21

Table 6.2: Plantation Target and achievement for 2019-20

Divisions	CATP			CASP		
	Target (Ha)	Achieved (Ha)	Plants	Target (Ha)	Achieved (Ha)	Plants
Morni-Pinjore	45	45	45000	228.84	228.84	228890
Ambala	148.964	148.964	148966	23	23	23000
Yamuna Nagar	9.344	9.344	9344	0	0	0
Kurukshetra	21.5	6.503	6503	3.297	2.637	2637
Kaithal	8.2963	18.7094	18709.4	5.5025	40.172	20000

Divisions	NPVTP (RKM)			NPV RIDGE		
	Target (RKM)	Achieved (RKM)	Plants	Target (RKM)	Achieved (RKM)	Plants
Morni-Pinjore	100	100	25000	0	0	0
Ambala	100	100	25000	0	0	0
Yamuna Nagar	100	100	23500	0	0	0
Kurukshetra	260	260	65000	0	0	0
Kaithal	120	120	30000	40	40	20000

Divisions	NPV ECORESTORATION		
	Target (RKM)	Achieved (RKM)	Plants
Morni-Pinjore	10	10	5000
Ambala	0	0	0
Yamuna Nagar	0	0	0
Kurukshetra	0	0	0
Kaithal	0	0	0

Table 6.3: Plantation Target and achievement for 2021-22

Divisions	CATP			NPVTP		
	Target (Ha)	Achieved (Ha)	Plants	Target (RKM)	Achieved (RKM)	Plants
Morni-Pinjore	177.3225	426.721	135963	100	100	25000
Ambala	89.87	89.87	89426	150	150	37500
Yamuna Nagar	134.811	134.811	134811	423	423	105750
Kurukshetra	8.9955	8.9955	19940	250	250	62500
Kaithal	77.846	77.22	772200	360	360	90000

Divisions	NPV RIDGE		
	Target (RKM)	Achieved (RKM)	Plants
Morni-Pinjore	0	0	0
Ambala	100	100	50000
Yamuna Nagar	0	0	0
Kurukshetra	0	0	0
Kaithal	0	0	0

6.1 KAITHAL DIVISION

Table 6.4: Plantation sites (NPV) evaluated in Kaithal division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS of activity taken	Physical Target (No. of plants)	No. of Plants planted	No. of Plants counted	Survival (%)	Average Height (Ft.)	Date of visit
2019-20												
2019-20	Kaithal	Devban	NPV TP	Harsola to Majra Road KM 0-8 L&R	6 RKM	5.8 RKM	1500	1500	1213	80.9	12.7	20-06-23
2019-20	Kaithal	Kaithal	NPV TP	Kaithal Dhand Road KM 13-22 L&R	5 RKM	5.1 RKM	1250	1250	935	74.8	9.4	22-06-23
2019-20	Pundri	Kaul	NPV TP	Sirsa Branch RD 118-140 L&R	5 RKM	4.8 RKM	1250	1250	1142	91.4	11.8	29-06-23
2019-20	Saraswati	Kharkan	NPV TP	Bhuna Sultania Road	9 RKM	9 RKM	2250	2250	2128	94.6	11.3	24-06-23
2019-20	Saraswati	Banpura	NPV TP	R.F. Bichhian	10 RKM	10 RKM	2500	2500	1525	61.0	7.0	25-06-23
2019-20	Saraswati	Thehmajbulla	NPV TP	R.F. Rewar	10 RKM	9.5 RKM	2500	2500	1142	45.7	12.4	25-06-23
2019-20	Saraswati	Kharkan	NPV TP	Urlana Minor RD 77-94 (L), 94-101 (L&R)	11 RKM	11 RKM	2750	2750	2310	84.0	8.8	24-06-23
2020-21												
2020-21	Kaithal	Kalayat	NPV TP	Badsikri to Balu-Songri Road KM	9 RKM	9.3 RKM	2250	2250	1702	75.64	13.7	20-06-23
2020-21	Pundri	Rajound	NPV TP	Serdha Mandwal Road K.m	2.4 RKM	2.4 RKM	600	600	457	76.17	7.8	29-06-23

2020-21	Pundri	Kaul	NPV TP	Kaul Faral Road K.M. 0-7 L&R	7.5 RKM	7.5 RKM	1875	1875	1556	82.99	10.8	28-06-23
2020-21	Saraswati	Kharkan	NPV TP	Uriana Minor RD 24-40 L&R	10 RKM	10.46 RKM	2500	2500	2273	90.92	9.9	24-06-23
2020-21	Saraswati	Cheeka	NPV TP	Markanda Distt. RD 110-137 L/Side	12 RKM	7 RKM	3000	3000	1905	63.50	10.7	23-06-23
2020-21	Saraswati	Cheeka	NPV TP	Hansi Butana RD 35-37 L&R	10 RKM	10 RKM	2500	2500	2291	91.64	16.3	23-06-23
2020-21	Saraswati	Cheeka	NPV TP	Hansi Butana RD 50-104 L&R	12 RKM	12.75 RKM	3000	3000	2416	80.53	13.2	23-06-23
2021-22												
2021-22	Kaithal	Siwan	NPV TP	Kaithal to Khanori Road 4-17 L&R	6 RKM	6 RKM	1500	1500	870	58.00	7.3	21-06-23
2021-22	Kaithal	Devban	NPV TP	NH-152 87-110 L&R	14 RKM	14 RKM	3500	3500	2607	74.49	6.6	20-06-23
2021-22	Kaithal	Kaithal	NPV TP	Hansi Butana Link Chenel 130-158 L&R	10 RKM	10 RKM	2500	2500	1894	75.76	9.5	22-06-23
2021-22	Pundri	Kaul	NPV TP	Dhand Pehowa 0-4	6 RKM	6 RKM	1500	1500	1308	87.20	8.9	28-06-23
2021-22	Pundri	Rajound	NPV TP	Rajound Kithana 0-10	10 RKM	10 RKM	2500	2500	1695	67.80	7.5	29-06-23
2021-22	Pundri	Pundri	NPV TP	Rajound Distry. 0-26	10 RKM	10 RKM	2500	2500	2030	81.20	10.9	29-06-23

2021-22	Saraswati	Kharkan	NPV TP	Urlana Minor RD 77-94 L/Side RD 94-101 L&R	8 RKM	4.2 RKM	2000	2000	1440	72.00	9.1	24-06-23
2021-22	Saraswati	Cheeka	NPV TP	Hansi Butana Canal RD 6-45 R/Side, RD 12-16 L/Side	10 RKM	10 RKM	2500	3000	2416	80.53	13.2	23-06-23
2021-22	Saraswati	Cheeka	NPV TP	Hansi Butana Canal RD 50-104 L&R	12 RKM	12.75 RKM	3000	2500	2020	80.80	10.9	23-06-23
2021-22	Saraswati	Cheeka	NPV TP	Tatiana Minor RD 5-38 L&R	10 RKM	10 RKM	2500	2500	1634	65.36	9.5	23-06-23
2021-22	Saraswati	Cheeka	NPV TP	Bhatia Minor RD 0-Tail L&R	10 RKM	8 RKM	2500	2500	1845	73.80	8.2	23-06-23
2021-22	Saraswati	Kharkan	NPV TP	Bhuna Minor RD 14-26 L&R	4 RKM	4 RKM	1000	1000	887	88.70	6.7	24-06-23
2021-22	Saraswati	Kharkan	NPV TP	Gogh Thehkhark Kharkan Road Km 0-5.5 L&R	6 RKM	5.5 RKM	1500	1500	1375	91.67	6.8	24-06-23
2021-22	Saraswati	Kharkan	NPV TP	Urlana Minor RD 77-94 L/Side RD 94-101 L&R	11 RKM	7.2 RKM	2750	2750	2310	84.00	8.8	24-06-23
2021-22	Saraswati	Kharkan	NPV TP	Urlana Minor RD 52-62 L&R	5 RKM	3.04 RKM	1250	1250	953	76.24	10.7	24-06-23
2021-22	Saraswati	Kharkan	NPV TP	Saraswati Canal RD 75.5-95 L&R	7 RKM	5.3 RKM	1750	1750	1284	73.37	7.7	24-06-23

Table 6.5: Plantation sites (CA) evaluated in Kaithal division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS of activity taken	Physical Target (No. of plants)	No. of Plants planted	No. of Plants counted	Survival (%)	Average Height (ft.)	Date of visit
2019-20												
2019-20	Kaithal	Kalayat	CA TP	Dhundwa to Ujjana Road KM 0-6 L&R	7 RKM	8 RKM	1715	1715	1496	87.2	16.1	20-06-23
2019-20	Kaithal	Kalayat	CA TP	Balu to Badsikri Road KM 0-6 L&R	7 RKM	8.2 RKM	1750	1750	1478	84.5	14.7	20-06-23
2019-20	Kaithal	Kalayat	CA TP	Badsikri to Julani Khera Road KM 0-4 L&R	4 RKM	3.3 RKM	1250	1250	1087	87.0	15.9	20-06-23
2019-20	Kaithal	Kalayat	CA TP	Batta Minor RD 12-42 L&R	9.9 RKM	10 RKM	1770	1770	1380	78.0	15.2	20-06-23
2019-20	Kaithal	Kaithal	CA TP	Kaithal New By Pass KM	6 RKM	6 RKM	1500	1500	1200	80.0	9.6	22-06-23
2019-20	Kaithal	Devban	CA TP	Jakholi to Kotra Road KM 0-3 L&R	4 RKM	3.5 RKM	1125	1125	953	84.7	16.0	20-06-23
2019-20	Kaithal	Devban	CA TP	Jakholi to Nandkaran Majra Road KM 0-4 L&R	4 RKM	2.9 RKM	1125	1125	821	73.0	15.4	20-06-23
2019-20	Kaithal	Devban	CA TP	Kelram Minor RD 0-20 L&R	20 RKM	20 RKM	2250	2250	1900	84.4	18.3	20-06-23

2019-20	Kaithal	Devban	CA TP	Songal to Sismor Road KM 0-3 L&R	4 RKM	3.3 RKM	1125	1125	1105	98.2	16.8	20-06-23
2019-20	Kaithal	Siwan	CA TP	Nagal to Gohra Road to Lender Majla Road KM 0-4 L&R	4 RKM	4 RKM	1250	1250	1075	86.0	14.2	21-06-23
2019-20	Kaithal	Siwan	CA TP	Sangatpura Barsahib to Lender Budha Khera Road KM 0-6 L&R	4 RKM	4 RKM	1625	1625	1381	85.0	16.3	21-06-23
2020-21												
2020-21	Kaithal	Siwan	CA TP	R F Siwan	12.69 Ha	12.74 Ha	12692	12692	9524	75.04	4.3	21-06-23
2020-21	Saraswati	Banpura	CA Native	R.F Nauch Rect.No 36,37,	10 Ha	1.9 RKM	5000	5000	2180	43.60	8.4	25-06-23
2020-21	Saraswati		CA Native	R.F Papsar Rect No 12,13,21,22,	10 Ha	1.3 RKM	5000	5000	1628	32.56	7.2	25-06-23
2021-22												
2021-22	Kaithal	Kaithal	CA TP	N.K. Railway Line KM 49-58 L&R	9 RKM	9 RKM	3234	3234	2670	82.56	9.0	22-06-23
2021-22	Kaithal	Devban	CA TP	Sirsa Branch RD 190-237 L&R	3.276 Ha	3.25 Ha	4110	3276	3030	92.49	10.6	20-06-23
2021-22	Pundri	Kaul	CA TP	N.K. Railway Line KM 61-68 L&R	13.42 Ha	13.4 Ha	13420	13420	10816	80.60	7.9	28-06-23
2021-22	Pundri	Kaul	CA TP	Kaithal Distry. RD 0-29 L&R	3.5 RKM	3.5 RKM	3500	3500	2639	75.40	9.4	26-06-23

6.1.1. Relevance

6.1.1.1. Site Suitability

- Roadside plantations have shown excellent growth and survival

Most of the roadside plantations were situated adjacent to agricultural fields (Figure 6.1). Fertilizers and manures applied to the agricultural crop also benefitted the planted saplings. Planted saplings also have a steady supply of water from the irrigated agricultural field. Some of the roadside plantations have barbed wire fencing as a protection measure which prevented grazing and other anthropogenic activities.

Figure 6.1: Plants in roadside plantations showing excellent growth

- Impact of grazing pressure

Both domestic and feral cattle posed a serious threat to the plantations of the Kaithal division. Most of the plantations do not have any kind of protection measures, which exposes them to severe grazing. In many sites, cattle were found roaming inside the plantation area (Figure 6.2).

Figure 6.2: Herds of livestock observed on plantation sites

- Impact of fire

Effects of fire were observed in most of the plantation sites. In the plantation in RF Rewar, more than 1200 planted trees were destroyed due to devastating forest fire leaving only some patches of Siris (Figure 6.3). Severe effects of fire due to stubble burning were observed in

the NK Railway line (RD 49-58) plantation site (Figure 6.4). Proper consultation needs to be done with the local landowners before plantation to prevent the loss of saplings due to stubble burning.

Figure 6.3: Plantation sites severely affected due to forest fire

Figure 6.4: Saplings severely affected by stubble burning

- Abundance of invasive species

In Kaithal division, the presence of invasive species like Vilayti Babool (*Prosopis juliflora*, Figure 6.5) and Congress grass (*Parthenium hysterophorus*, Figure 6.6) was observed in most of the plantation sites. The presence of these species poses a serious threat to the native herbs as well as planted saplings by releasing allelopathic chemicals into the soil and creating

impenetrable low canopy cover. Proper weed removal is needed at regular intervals to ensure the survival and growth of the planted species.

Figure 6.5. Abundance of Parthenium at plantation site

Figure 6.6. Abundance of Prosopis juliflora at plantation site

6.1.1.2. Species Suitability

Out of the 22 planted species (Table 6.6), Arjun and Sheesham were found to be dominant. Most of the species showed good growth and survival across the division.

In most of the sites, fast-growing native species like Sheesham, Arjun, Jamun, Kadam etc. were planted, which attained very good growth, especially in roadside plantations.

In the waterlogging sites, resistant species like Arjun, Jamun and Sheesham were planted, which produced good results.

In some plantation sites, planted species were found to be damaged by frost.

Exotic species such as Bottle Brush and Jakranda were planted in some plantation sites. Although these species produced good growth and survival, it is strongly suggested that exotic species should be excluded from the plantation species mix.

Table 6.6: List of planted species in Kaithal division

Sr. No	Local Name	Botanical Name
1	Arjun	*Terminalia arjuna*
2	Sheesham	*Dalbergia sissoo*
3	Jamoa	*Eugenia cuspidata*
4	Kachnar	*Bauhinia variegata*
5	Neem	*Azadirachta indica*
6	Balamkheera	*Kigelia pinnata*
7	Shahtoot	*Moras alba*
8	Pilkhan	*Ficus virens*
9	Amaltas	*Cassia fistula*
10	Jamun	*Syzygium cumini*
11	Siris	*Albizia lebbeck*
12	Amla	*Phyllanthus emblica*
13	Gular	*Ficus recemosa*
14	Kadam	*Neolamarckia cadamba*
15	Papdi	*Holoptelea integrifolia*
16	Lagerstroemia	*Lagerstroemia speciosa*
17	Jackranda	*Jacaranda mimosifolia*
18	Chukrasia	*Chukrasia tabularis*
19	Bottlebrush	*Callistemon lanceolata*
20	Jungle Jalebi	*Pithecellobium dulce*
21	Lasoda	*Cordia myxa*
22	Palas	*Butea monosperma*

6.1.2. Effectiveness

6.1.2.1 Survival of the Plantation

The overall survival rate of plantations in the Kaithal division was found to be good at 76.83 %. Among the three plantation years, the highest survival rate was observed in the plantations carried out during 2019-20, with a rate of 81.1%. Conversely, the lowest survival rate was recorded for the plantations from 2020-21, with an average survival rate of 71.3% (Table 6.7).

Table 6.7: Year wise average survival and height of the plantations

Plantation year	Average survival (%)	Average height (ft.)
2019-20	81.1	13.5
2020-21	71.3	10.2
2021-22	78.1	9
Average	**76.83**	**10.9**

6.1.2.2 Growth of the plantation

Among the 22 planted species, Siris, Kadam and Arjun have attained the most height in the plantations of 2019-20, 2020-21 and 2021-22 respectively (Table 6.8). Other than these, Sheesham, Kachnar, Balamkheera and Pilkhan also showed excellent growth.

Table 6.8: Average height (ft.) of the species planted in three plantation years

Sr. No	Species Planted		Plantation Year		
	Local Name	Botanical Name	2019-20	2020-21	2021-22
1	Arjun	*Terminalia arjuna*	14.0	11.2	10.7
2	Sheesham	*Dalbergia sissoo*	15.9	13.1	10.6
3	Jamoa	*Eugenia cuspidata*	8.5	8.2	6.8
4	Kachnar	*Bauhinia variegata*	9.05	-	8.6
5	Neem	*Azadirachta indica*	8.9	7.3	8.6
6	Balamkheera	*Kigelia pinnata*	11.2	9.8	6.8
7	Shahtoot	*Moras alba*	9.1	6.1	-
8	Pilkhan	*Ficus virens*	9.9	13.2	10.1
9	Amaltas	*Cassia fistula*	5.6	-	-
10	Jamun	*Syzygium cumini*	6.5	6.7	6.9
11	Siris	*Albizia lebback*	20.3	-	-
12	Amla	*Phyllanthus emblica*	8	11.6	8.6
13	Gular	*Ficus recemosa*	5.3	6.1	6.5

14	Kadam	*Neolamarckia cadamba*	-	16.7	-
15	Papdi	*Holoptelea integrifolia*	-	8.6	-
16	Lagerstroemia	*Lagerstroemia speciosa*	-	15.6	8.5
17	Jackranda	*Jacaranda mimosifolia*	-	14.4	-
18	Chukrasia	*Chukrasia tabularis*	-	12.2	-
19	Bottlebrush	*Callistemon lanceolata*	-	-	4.6
20	Jungle Jalebi	*Pithecellobium dulce*	-	-	5.1
21	Lasoda	*Cordia myxa*	-	-	10.4
22	Palas	*Butea monosperma*	-	-	6

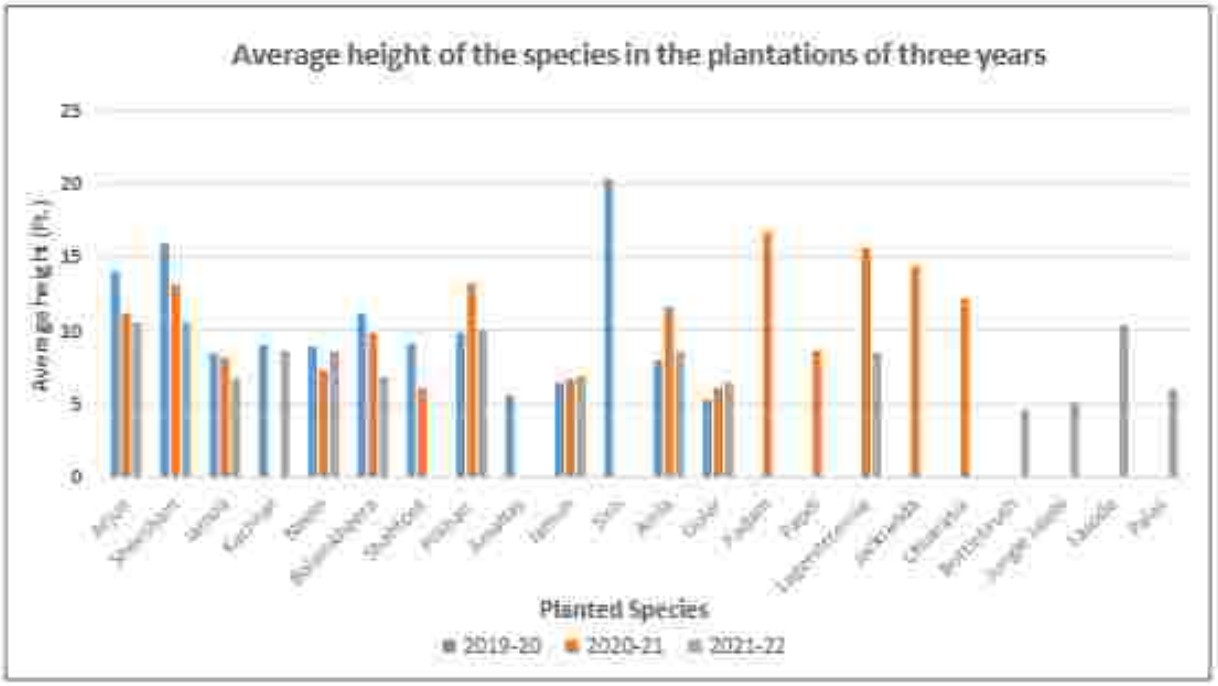


Figure 6.7. Average height of the planted species in three years of plantations

6.1.3. Sustainability

6.1.3.1 Protection

Almost all the plantations were carried out without any kind of protection measures e.g. Barbed Wire Fencing, Cattle Proof Trench tree guards, etc. Only in 7 plantations, complete or partial peripheral fencing was observed. Adequate protection measures should be taken before initiating the plantation activities to avoid damages by grazing animals, trespassers, and illegal cutting.

6.1.3.2 Maintenance

Despite severe grazing pressure, most of the plantations produced good growth and survival and were maintained properly. This is the result of the hard work done by forest guards and

chowkidaar/watchers. The KII revealed that most of the officers and forest guards are very dedicated and passionate about the afforestation initiative and look after the sites regularly.

6.1.3.3. Monitoring

Despite of severe grazing pressure, most of the plantations produced good growth and survival and maintained properly. This is the result of the hard work done by forest guards and chowkidaar/watcher. The KII revealed that most of the officers and forest guards are very dedicated and passionate about the afforestation initiative and looks after the sites regularly.

Figure 6.8. Kaithal New Bypass plantation (2019-20) with complete fencing

Figure 6.9. Partial perimeter fencing at NH 152 (RD 87-110) plantation site

6.1.4. Scoring of the plantations

The plantations of the Kaithal division scored a total of 198.2 out of 250 (table 6.9), which can be considered as very good. Almost all the plantation sites have performed very well, despite the effects of fire, severe grazing pressure, waterlogging, and other unfavorable factors. This happened due to the collective efforts and dedication of the forest officials.

Table 6.9: Scores assigned to the plantations of Kaithal Division

S.No	Component	Range	Year	Name of site	Survival % (100)	Growth (20)	Species Suitability (10)	Site Suitability (10)	Protection (20)	Extent (20)	Journal (20)	Map (10)	Invasive (10)	Species composition (10)	Weeding and Hoeing (10)	Watch and (10)
1	CA TP	Kaithal	2019-20	Dhundwa to Ujjana Road KM 0-6 L&R	87.2	20	10	10	0	20	20	10	10	10	10	10
2	CA TP	Kaithal	2019-20	Balu to Badsikri Road KM 0-6 L&R	84.5	20	10	10	0	20	20	10	10	10	10	10
3	CA TP	Kaithal	2019-20	Badsikri to Julani Khera Road KM 0-4 L&R	87.0	20	10	10	0	20	20	10	10	10	10	10
4	CA TP	Kaithal	2019-20	Batta Minor RD 12-42 L&R	78.0	20	10	10	0	20	20	0	5	10	5	10
5	CA TP	Kaithal	2019-20	Kaithal New By Pass KM	80.0	18	10	10	15	20	20	0	10	8	8	10
6	CA TP	Kaithal	2019-20	Jakholi to Kotra Road	84.7	20	10	10	0	20	20	10	10	10	10	10

				KM 0-3 L&R												
7	CA TP	Kaithal	2019-20	Jakholi to Nandkaran Majra Road KM 0-4 L&R	73.0	20	10	10	0	20	20	10	10	10	10	10
8	CA TP	Kaithal	2019-20	Kelram Minor RD 0-20 L&R	84.4	20	10	10	0	20	20	0	10	10	10	10
9	CA TP	Kaithal	2019-20	Songal to Sismor Road KM 0-3 L&R	98.2	20	10	10		20	20	10	10	10	10	10
10	CA TP	Kaithal	2019-20	Nagal to Gohra Road to Lender Majla Road KM 0-4 L&R	86.0	20	10	10	0	20	20	10	10	10	10	10
11	CA TP	Kaithal	2019-20	Sangatpura Barsahib to Lender Budha Khera Road KM 0-6 L&R	85.0	20	10	10	0	20	20	10	10	8	10	10
12	NPV TP	Kaithal	2019-20	Harsola to Majra Road KM 0-8 L&R	80.9	20	10	10		20	20	10	10	10	10	10

13	NPV TP	Kaithal	2019-20	Kaithal Dhand Road KM 13-22 L&R	74.8	15	10	10	10	20	20	0	8	10	8	10
14	NPV TP	Pundri	2019-20	Sirsa Branch RD 118-140 L&R	91.4	18	10	10	0	20	20	10	0	10	0	10
15	NPV TP	Saraswati	2019-20	Bhuna Sultania Road	94.6	20	10	10	0	20	20	10	10	10	10	10
16	NPV TP	Saraswati	2019-20	R.F. Bichhian	61.0	15	10	10	12	20	20	10	8	6	9	10
17	NPV TP	Saraswati	2019-20	R.F. Rewar	45.7	10	10	10	4	20	20	10	0	8	0	0
18	NPV TP	Saraswati	2019-20	Uriana Minor RD 77-94 (L) 94-101 (L&R)	84.0	20	10	10	0	20	20	10	7	9	8	10
19	CA TP	Kaithal	2020-21	R F Siwan	75.0	12	10	10	10	20	20	0	5	10	0	10
20	CA TP	Kaithal	2020-21	Badsikri to Balu-Songri Road KM	75.6	20	10	10	0	20	20	10	10	10	10	10
21	NPV TP	Pundri	2020-21	Serdha Mandwal Road K.m	76.2	16	10	10	0	20	20	10	8	10	8	10

22	NPV TP	Pundri	2020-21	Kaul Faral Road K.M. 0-7 L&R	83.0	20	10	10	0	20	20	10	10	10	10	10
23	NPV TP	Saraswati	2020-21	Urlana Minor RD 24-40 L&R	90.9	20	10	10	0	20	20	10	8	10	8	10
24	NPV TP	Saraswati	2020-21	Markanda Distt. RD 110-137 L/Side	63.5	16	10	10	0	20	20	10	6	10	0	10
25	NPV TP	Saraswati	2020-21	Hansi Butana RD 35-37 L&R	91.6	20	10	10	20	20	20	10	10	10	10	10
26	NPV TP	Saraswati	2020-21	Hansi Butana RD 50-104 L&R	80.5	16	10	10	0	20	20	10	8	10	8	10
27	CA Native Sp	Saraswati	2020-21	R.F.Nauch Rect.No 36,37,	43.6	15	10	10	20	20	20	10	0	6	0	0
28	CA Native Sp	Saraswati	2020-21	R.F. Papsar Rect. No. 12,13,21,22,	32.6	15	10	10	20	20	20	10	0	6	0	0
29	NPV TP	Kaithal	2021-22	Kaithal to Khanori Road 4-17 L&R	58.0	15	10	10	0	20	20	0	5	10	5	10

30	NPV TP	Kaithal	2021-22	NH-152 87-110 L&R	74.5	20	10	10	10	20	20	10	8	10	8	10
31	NPV TP	Kaithal	2021-22	Hansi Butana Link Chenel 130-158 L&R	75.8	20	10	10	0	20	20	0	10	10	10	10
32	NPV TP	Pundri	2021-22	Dhand Pehowa 0-4	87.2	20	10	10	0	20	20	10	6	10	6	10
33	NPV TP	Pundri	2021-22	Rajound Kithana 0-10	67.8	15	10	10	0	20	20	10	0	10	10	10
34	NPV TP	Pundri	2021-22	Rajound Distry. 0-26	81.2	17	10	10	0	20	20	10	0	10	0	10
35	NPV TP	Saraswati	2021-22	Urlana Minor RD 77-94 L/Side RD 94-101 L&R	72.0	18	10	10	0	20	20	10	5	8	5	10
36	NPV TP	Saraswati	2021-22	Hansi Butana Canal RD 6-45 R/Side, RD 12-16 L/Side	80.5	20	10	10	0	20	20	10	8	10	8	10

37	NPV TP	Saraswati	2021-22	Hansi Bufana Canal RD 50-104 L&R	80.8	16	10	10	0	20	20	10	6	10	8	10
38	NPV TP	Saraswati	2021-22	Tatiana Minor RD 5-38 L&R	65.4	15	10	10	0	20	20	10	10	10	10	10
39	NPV TP	Saraswati	2021-22	Bhatia Minor RD 0-Tail L&R	73.8	15	10	10	0	20	20	10	8	10	0	10
40	NPV TP	Saraswati	2021-22	Bhuna Minor RD 14-26 L&R	88.7	20	10	10	0	20	20	10	5	6	6	10
41	NPV TP	Saraswati	2021-22	Gogh Thehkhark Kharkan Road Km 0-5.5 L&R	91.7	20	10	10	0	20	20	10	10	10	10	10
42	NPV TP	Saraswati	2021-22	Urlana Minor RD 77-94 L/Side RD 94-101 L&R	84.0	20	10	10	0	20	20	10	7	9	8	10
43	NPV TP	Saraswati	2021-22	Urlana Minor RD 52-62 L&R	76.2	20	10	10	0	20	20	10	7	10	7	10
44	NPV TP	Saraswati	2021-22	Saraswati Canal RD 75.5-95 L&R	73.4	18	10	10	0	20	20	10	0	10	0	10

45	CA TP	Saraswati	2021-22	N.K. Railway Line KM 49-58 L&R	82.6	15	10	10	8	20	20	10	0	6	0	10
46	CA TP	Saraswati	2021-22	Sirsa Branch RD 190-237 L&R	92.5	18	10	10	0	20	20	0	0	10	8	10
47	CA TP	Saraswati	2021-22	N.K. Railway Line KM 61-68 L&R	80.6	17	10	10	0	20	20	10	0	8	0	10
48	CA TP	Saraswati	2021-22	Kaithal Distry. RD 0-20 L&R	75.4	15	10	10	0	20	20	10	0	5	0	10
		Average			77.8	17.9	10.0	10.0	2.8	20.0	20.0	8.3	6.4	9.2	6.5	9.4

Success Story: The Avenue Plantations of Kaithal Division

The Avenue plantations in Kaithal were stood out due to their excellent survival, growth and species composition. Unlike other divisions, the avenue plantations consist of the highest number of species. Tall, fast-growing native saplings of Sheesham (*Dalbergia sisoo*), Arjun (*Terminalia arjuna*), Bakain (*Melia azadarach*), Neem (*Azadirachta indica*), Pilkhan (*Ficus recemosa*) along with *Lagerstroemia speciosa*, Kadam (*Neolamarckia cadamba*), *Alianthus excelsa*, were planted. In the plantations carried out in 2019-20, some species even observed in their flowering/ fruiting stage.

6.1.5. Non-plantation activities

6.1.5.1 Fencing

Only one fencing site was evaluated in the Kaithal Division. The fencing work was found to be intact and working effectively.

Table 6.10: Details of evaluated fencing sites of the Kaithal division

Site	Length in Measurement Book	Actual length	% Variation	Status	Effectiveness	Budget allotted	Expenditure
R.F.Siwan C-1 to C-17 (29.876398,76.321442)	25 RKM	25 RKM	0	Intact	Very effective	5000000	4788550

Figure 6.10: Fencing work in RF Siwan

6.1.5.2. Soil and Moisture Conservation (SMC) Works

A total of four sites (1 trench and 3 concrete SMC structures) were evaluated in Kaithal Division. All the SMC works are found to be intact and working effectively.

Table 6.11: Details of evaluated SMC sites of Kaithal division

Sl No	Range	Site Name	Name of Watershed	Name of SMC work	Expenditure	Lat	Log	Size (Measurement book)	Actual Size	Variation
1	Pundri	Fatehpur Escape	C-1	Water Body -1	103863	29.777859	76.542388	1.5 X 1 X 10 m	1.5 X 1 X 10.5	5%
2	Pundri	Fatehpur Escape	C-2	Water Body- 2	103863	29.777805	76.542018	1.5 X 1 X 10 m	1.5 X 1 X 10.6	5%
3	Pundri	Fatehpur Escape	C-2	Water Body- 3	103863	29.779410	76.538993	1.5 X 1 X 10 m	1.5 X 1 X 10.7	2%
11	Pundri	Fatehpur Escape	C-4	Digging of Trench	127407	29.783488	76.543224	1.5 X 1 X 660 m	1.5 X 1 X 650	-1.51%

Figure 6.11: SMC (Digging of Trench) work in C4, Fatehpur Escape

Figure 6.12: SMC Structures in C2 and C1, Fatehpur Escape

6.1.5.3. Scoring of the Non-Plantation Activities

Table 6.12: Score obtained by the fencing sites in Kaithal divisions

Sl. No	Scoring components	Full score	Obtained score
1	Working Status	20	20
2	Serving the purpose intended	20	20
3	Actual extent	20	20
4	Site suitability	10	10
5	Measurement book	10	10
6	Expenditure as per the APO	20	20
	Total	**100**	**100**

Table 6.13: Score obtained by the SMC sites in Kaithal division

Sl. No	Scoring components	Full score	Obtained score
1	Working status	20	20
2	Site suitability	20	20
3	Measurement as per the APO	20	20
4	Fulfilling design specification	20	20
5	Measurement book	20	20
	TOTAL	**100**	**100**

6.2 AMBALA DIVISION

Table 6.14: Plantation activities (CA) evaluated in Ambala division

Year of Activity	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20												
2019-20	Naraingh ar	Narain ghar	CA TP	barri Rasour PF	4.616 Ha	4.616 Ha	4616	4616	3000	65	8.5	20.6.23
2020-21												
2020-21	Naraingh ar	Kurali	CA	Jharshella PF	4 Ha	4 Ha	4000	4000	3821	95.5	15.5	22.6.23
2020-21	Naraingh ar	Narain ghar	CA TP	Kathe Majra Sec 4&5	25 Ha	25 Ha	25500	25500	24583	96.4	8.7	16.6.23
2020-21	Naraingh ar	Rao Majra	CA TP	Rao majra RF	15 Ha	15 Ha	15000	15000	10403	69.4	4.4	17.6.23
2020-21	Naraingh ar	Narain ghar	CA TP	Kathe Majra	4.5 Ha	4.5 Ha	4500	4500	1064	23.6	23.5	21.6.23
2020-21	Naraingh ar	Narain ghar	CA SP	Laha sec 4&5	3 Ha	3 Ha	3000	3000	1096	36.5	12	20.6.23
2021-22												
2020-21	Naraingh ar	Shahz adpur	CA TP	chajju majra sec 4&5	20 Ha	20 Ha	20000	UNDER COURT CASE				22.6.23

2021-22	Narainghar	Shahzadpur	CA TP	Bharog Sec 4&5	23 Ha	23 Ha	23000	23000	19476	84.7	3.8	22.6.23
2021-22	Narainghar	Shahzadpur	CA TP	Barri khori	10 Ha	10 Ha	10000	10000	4578	45.8	4.8	20.6.23

Table 6.15: Plantation activities (NPV) evaluated in Ambala division

Year of Activity	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
						2019-20						
2019-20	Narainghar	Shahzadpur	NPV TP	NH-73 (314), Shahzadpur byepass to Pathrehri	10 RKM	10 RKM	2500	2500	1900	76	16.2	21.6.23
2019-20	Narainghar	Narainghar	NPV	Manakpur PF	10 RKM	10 RKM	2500	2500	1156	46.2	14	20.6.23
2019-20	Ambala	Ambala west	NPV TP	NH-65, 11.1 to 12.2 km	5 RKM	5 RKM	1250	1250	946	75.7	8.8	24.6.23
2019-20	Saha	Mulana	NPV TP	jagadhri-Ambala road	5 RKM	5 RKM	1250	1250	1114	89.1	7	25.6.23
2019-20	Saha	Barada	NPV TP	Mojghar-Gherii road	20 RKM	20 RKM	5000	5000	964	19.3	4.5	25.6.23

2020-21												
2020-2021	Naraingh ar	Shahzadpur	NPV TP	kakar Majra, NH 344	5 Ha	5 Ha	1250	1250	1098	87.8	6	21.6.23
2020-21	Naraingh ar	Shahzadpur	NPV TP	pathrehri, NH 344	10 Ha	10 Ha	2500	2500	1784	71.4	13.5	21.6.23
2020-21	Ambala	Ambala	NPV TP	manakpur, NH 65 0-8km	10 RKM	10 RKM	2500	2500	2394	95.8	6.7	24.6.23
2020-21	Ambala	jansui	NPV TP	jansui-niharsi road 0-7km(I&R)	10 RKM	10 RKM	2500	2500	2058	82.3	4.3	24.6.23
2020-21	Ambala	Ambala west	NPV TP	Ghel kalan NH 65, 5.3-8.4 km	15 RKM	15 RKM	3750	3750	2908	77.5	10.7	24.6.23
2021-22												
2021-22	Naraingh ar	Narainghar	NPV	Ratour sce 4&5	82 RKM	82 RKM	41,000	41,000	29673	72.4	9.3	19.6.23
2021-22	Naraingh ar	Narainghar	NPV TP	sangrani sec 4&5	15 RKM	15 RKM	3750	3750	2376	63.4	4.2	21.6.23

6.2.1. Relevance

6.2.1.1. Site suitability

- Abundance of Invasive species

The abundance of invasive species such as *Parthenium hysterophorus* and *Lantana camara* was observed in most of the plantation sites in Ambala (Figures 6.13 & 6.14). In some cases, the planted saplings are not visible due to the excessive growth of weeds such as *Cannabis* sp and *Parthenium*. The presence of these species poses a serious threat to the native herbs as well as planted saplings by creating impenetrable low canopy cover and in some cases, releasing allelopathic chemicals into the soil. Proper weed removal is needed at regular intervals to ensure the survival and growth of the planted species.

Figure 6.13: Dense canopy of Lantana camara at site Rao Majra

Figure 6.14: Abundance of Parthenium in the plantation site of Bharog Sec 4 & 5

- Impact of grazing

Most of the plantation sites were impacted by severe grazing pressure. Domestic and feral cattle were found to be roaming inside the plantation sites (Figure 6.15). Most plantation sites have no protection measures, which exposes the planted saplings to severe grazing. Stunted and leafless saplings were found in many sites as a result of grazing. Adequate protection measures need to be taken to ensure the survival and growth of the plantations.

Figure 6.15: Herd of cattle roaming inside the plantation site Bani Khori

6.2.1.2 Species suitability

- Native fast-growing species such as Sheesham, Arjun, Kadam, and Siris were planted in most of the plantations which resulted in impressive survival and growth.
- In some of the plantations, exotic species such as Bottlebrush (*Callistemon lanceolatus*), Silver Oak (*Grevillea robusta*) and Safeda (*Eucalyptus babylonica*) were planted. Although, the growth of these species were excellent, it is highly suggested that these species should be excluded from the species mix and native fast growing species should be chosen instead to achieve the basic goal of an afforestation initiative- restoring the local biodiversity.

Table 6.16 Planted species observed in the Ambala Division.

Sr. No.	Species Planted	
	Local Name	**Botanical Name**
1	Sheesham	*Dalbergia sissoo*
2	Papdi	*Holoptelea integrifolia*
3	Arjun	*Terminalia arjuna*
4	Bottlebrush	*Callistemon lanceolatus*
5	Kanakchampa	*Pterspermun acerifolium*
6	Siris	*Albizia lebback*
7	Kadam	*Neolamarckia cadamba*
8	Jamun	*Syzygium cumini*
9	Silver Oak	*Grevillea robusta*
10	Amaltas	*Cassia fistula*
11	Kachnar	*Bauhinia variegata*
12	Balamkheera	*Kigelia pinnata*
13	Safeda	*Eucalyptus babylonica*
14	Amla	*Phyllanthus emblica*
15	Peepal	*Ficus religiosa*
16	Neem	*Azadirachta indica*
17	Sagon	*Tectona grandis*
18	Gular	*Ficus recemosa*
19	Khair	*Acacia catechu*

6.2.2. Effectiveness

6.2.2.1 Survival of the plantations

The overall survival rate of plantations in the Ambala division was found to be very satisfactory at 67.4%. Among the three plantation years, the highest survival rate was observed in the plantations carried out during 2020-21, with a rate of 73.6%. Conversely, the lowest survival rate was recorded for the plantations from 2019-20, which had a survival rate of 61.9% (Table 6.17).

Table 6.17: Year-wise survival rate and average height of the plantation sites

Year	Average Survival (%)	Average height (Ft)
2019-20	61.9	9.8
2020-21	73.6	10.5
2021-22	66.5	5.5

6.2.2.2 Growth of the plantation

Kanakchampa (*Pterospermum acerifolium*) for the year 2019-20 and Safeda (*Eucalyptus babylonica*) for 2020-21 and 2021-22 were found to be attained the most height respectively (Table. 6.18).

Table 6.18: Average height of different plant species across three plantation years

Sr. No.	Species Planted		Plantation year		
	Local Name	Botanical Name	2019-20	2020-21	2021-22
1	Sheesham	*Dalbergia sissoo*	11.2	8.5	3.8
2	Papdi	*Holoptelea integrifolia*	11	5.5	4
3	Arjun	*Terminalia arjuna*	8.2	4.8	6.3
4	Bottlebrush	*Callistemon lanceolatus*	13.5	8.8	-
5	Kanakchampa	*Pterspermun acerifolium*	17	-	-
6	Siris	*Albizia lebbeck*	15	6.5	-
7	Kadam	*Neolamarckia cadamba*	15	11	-
8	Jamun	*Syzygium cumini*	7	6.3	-
9	Silver Oak	*Grevillea robusta*	13	9.3	-
10	Amaltas	*Cassia fistula*	5	-	-

11	Kachnar	*Bauhinia variegata*	4	-	-
12	Balamkheera	*Kigelia pinnata*	-	4.3	3.8
13	Safeda	*Eucalyptus babylonica*	-	17	13
14	Amla	*Phyllanthus emblica*	-	10	-
15	Peepal	*Ficus religiosa*	-	10.5	-
16	Neem	*Azadirachta indica*	-	6	-
17	Sagon	*Tectona grandis*	-	2.5	7.3
18	Gular	*Ficus recemosa*	-	8	-
19	Khair	*Acacia catechu*	-	-	5.5

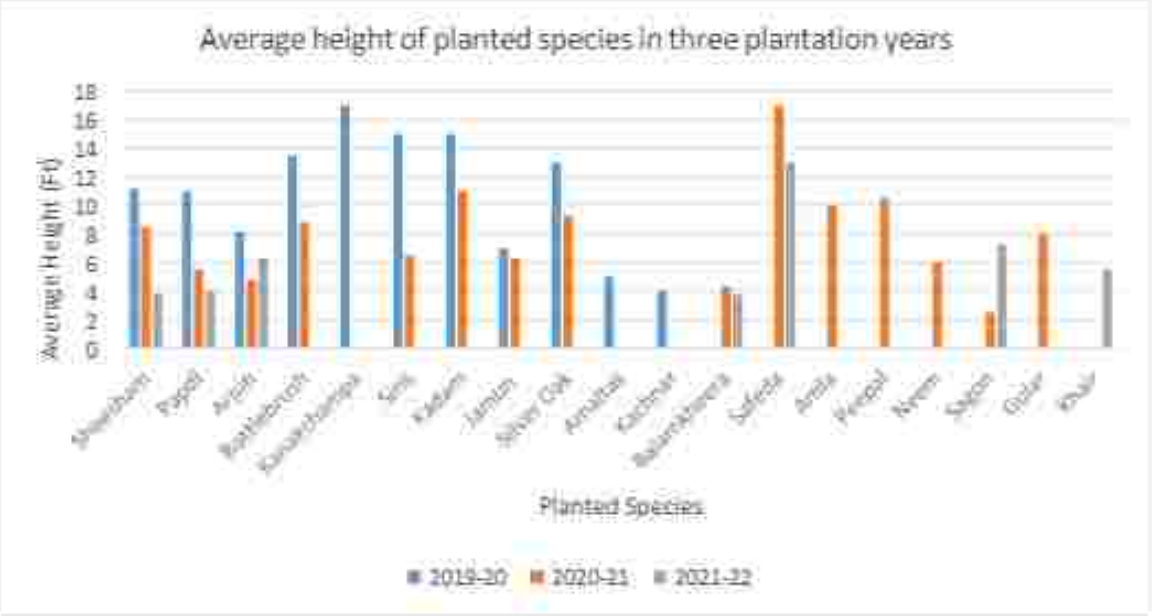


Figure 6.16: Average height of different plant species across three evaluation years

6.2.3. Sustainability

6.2.3.1. Protection

Most of the plantation sites were carried out without any protection measures. However, in some plantation sites, barbed wire fencing or cattle-proof trenches (CPT) were found. In the plantation of Kathe Majra Sec 4 & 5, Naraingarh range, both CPT and barbed wire fencing were observed (Figure 6.17). Adequate protection measures should be taken before conducting plantation activities to avoid damage to the plantation by grazing animals, trespassers, and unauthorised harvesting.

Figure 6.17: CPT and barbed wire fencing in Kathe Majra Sec 4 & 5 (2020-21) plantation site

6.2.3.2 Monitoring

Regular monitoring of the plantation is reported in all the plantation sites of the division. Chowkidaar/Watchers have been appointed in all the forest ranges to take care of plantation sites.

6.2.3.3 Maintenance

The written information/evidence/records for plant maintenance/replacement, such as plantation journals, APOs, plantation maps, etc., have been properly maintained in all forest ranges.

6.2.4. Plantation Scoring

The plantations carried out under the CAMPA scheme in the year 2019-20, 2020-21 and 2021-22 scored an average of 186, out of 250 (Table 6.19). Overall, the score was very satisfactory, considering the immense grazing pressure and other anthropogenic disturbances observed in most plantation sites.

Table 6.19: Score obtained by the plantations in Ambala division

Year	Components	Name of Reach/ Site	Survival	Growth	Species suitability	Site suitability	Protection	Extent	Journal	Map	Invasive	Species composition	Weeding and hoeing	Watch and ward
2019-20	CA TP	bami Rasour PF	65	8.5	10	10	0	20	20	10	10	10	10	10
2019-20	NPV TP	NH- 73 (314), Shahzadpur byepass to Pathrehri	76	16.2	10	10	0	20	20	10	10	10	10	10
2019-20	NPV	Manakpur PF	46.24	14	10	10	20	20	20	10	0	10	0	10
2019-20	NPV TP	NH-65, 11.1 to 12.2 km	75.68	8.8	10	10	0	20	20	10	10	10	10	10
2019-20	NPV TP	jagadhri-Ambala road	89.12	7	10	10	0	20	20	10	10	10	10	10
2019-20	NPV TP	Mojghar-Gherli road	19.28	4.5	10	10	0	20	20	10	10	10	10	10
2020-	NPV TP	kakar Majra, NH 344	87.84	6.0	10	10	0	20	20	10	10	10	10	10

2021														
2020-21	CA	Jharshella PF	95.53	15.5	10	10	20	20	20	10	0	10	0	10
2020-21	CA TP	Kathe Majra Sec 4&5	96.40	8.7	10	10	20	20	20	10	10	10	10	10
2020-21	CA TP	Rao majra RF	69.35	4.4	10	10	20	20	20	10	0	10	0	10
2020-21	NPV TP	pathrehri, NH 344	71.36	13.5	10	10	0	20	20	10	0	10	0	10
2020-21	CA	Kathe Majra	23.64	23.5	10	10	0	20	20	10	10	10	10	10
2020-21	CA SP	Laha sec 4&5	36.53	12	10	10	0	20	20	10	10	10	10	10
2020-21	CA	chaju majra sec 4&5												
2020-21	NPV TP	manakpur, NH 65 0-8km	95.76	6.7	10	10	0	20	20	10	10	10	10	10
2020-21	NPV TP	jansui-niharsi road 0-7km(I&R)	82.32	4.3	10	10	0	20	20	10	10	10	10	10

2020-21	NPV TP	Ghel kalan NH 65, 5.3-8.4 km	77.55	10.7	10	10	0	20	20	10	10	10	10	10
2021-22	NPV	Ratour sce 4&5	72.37	9.3	10	10	20	20	20	10	0	10	0	10
2021-22	NPV TP	Sangrani sec 4&5	63.36	4.2	10	10	0	20	20	10	0	10	0	10
2021-22	CA	Bharog Sec 4&5	84.68	3.8	10	10	20	20	20	10	0	10	0	10
2021-22	CA	Barri khori	45.78	4.8	10	10	0	20	20	10	0	10	0	10
			68.69	9.31	10	10	6	20	20	10	6	10	6	10

Success Story: Kathe Majra Sec 4 & 5 (2020-21), Naraingarh Range

A 25 Ha CA plantation was carried out in Kathe Majra Sec 4&5 of Naraingarh Range in 2020-21, which has a potential to turn into a biodiversity haven. Mostly Sheesham and Arjun were planted, which showed extraordinary growth and survival. Other species includes Kachnar, Kadam, Jamun, Amla and Peepal all of which produced very good result. The plantation was protected by partial perimeter fencing (Barbed wire) and Cattle Proof Trench (CPT). Movement of spotted deer (identified by scats), various reptiles and avifauna were observed inside the plantation. The current status of the plantation clearly showed regular monitoring and weeding of the invasive species.

6.3 KURUKSHETRA DIVISION

Table 6.20: NPV (Net Present Value) plantation sites evaluated in Kurukshetra division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20												
2019-20	Thanesar	Ladwa	NPV	WJC RD 148-152 L & R	16 RKM	11.24 RKM	4000	4000	3630	90.75	23.5	12-09-2023
2019-20	Thanesar	Ladwa	NPV	SK Road Km 62-74 L & R	10RKM	23.8 RKM	2500	2500	2010	80.4	27.1	12-09-2023
2019-20	Thanesar	Shahabad	NPV	GT Road Km 171-181 L & R	15 RKM	17.8 RKM	3750	3750	3004	80.1	9.1	13-09-2023
2019-20	Thanesar	Thol	NPV	Shahabad Thol Road km 8-14.5 L & R & Jhansa Bhatha	10 RKM	12 RKM	2500	2500	2005	80.2	7.1	13-09-2023
2019-20	Thanesar	Jyotisar	NPV	Pabnawa Minor, Rd 35-47, L/Side	6 RKM	4.184 RKM	1500	1500	1065	71	10.2	13-09-2023
2019-20	Pehowa	Bhaurakh	NPV	A/H Road Km 35-45 L & R	15 RKM	23.6 RKM	3750	3750	3153	84.08	17	14-09-2023
2019-20	Pehowa	Ramgarh	NPV	RF Ramgarh Rect No. 38	10 RKM	788 RKM	2500	2500	Affected by Fire	0	0	15-09-2023

2019-20	Pehowa	Pehowa	NPV	RF Seonsa Rect No. 72	25 RKM	1.33 RKM	6250	6250	Affected by Fire	0	0	15-09-2023
2019-20	Pehowa	Ramgarh	NPV	RF Ramgarh Rect. No. 21	10 RKM	650 RKM	2500	2500	Affected by Fire	0	0	15-09-2023
2019-20	Pehowa	Ramgarh	NPV	RF Ramgarh Rect. No. 47	10 RKM	77.4 RKM	2500	2500	Affected by Fire	0	0	15-09-2023
2020-21												
2020-21	Thanesar	Ladwa	NPV	Fire Line RF Sonti	14 RKM	11.2 RKM	3500	3500	3150	90	4	12-09-2023
2020-21	Thanesar	Shahabad	NPV	DUK Railway Line 164-168 L & R side	15 RKM	8 RKM	3000	3000	2180	72.66	8.1	13-09-2023
2020-21	Thanesar	Shahabad	NPV	GT Road Km 181-190 L & R	20 RKM	25.8 RKM	5000	5000	4255	85.1	14	13-09-2023
2020-21	Thanesar	Ladwa	NPV	WJC RD 152-159 R/Side, Old Service Road + WJC RD 145-155 L/Side	16 RKM	16 RKM	4000	4000	No Plantation	No Plantation	No Plantation	13-09-2023
2020-21	Pehowa	Bhaurakh	NPV	Tyukar Minor RD 5-30 L & R	13 RKM	13.2 RKM	3250	3250	2577	79.3	16	2023
2020-21	Pehowa	Pehowa	NPV	Gumthala Minor RD 0 to Tail L+R	15 RKM	15.4 RKM	3750	3750	3012	80.32	8	14-09-2023

2021-22												
2021-22	Thanesar	Thol	NPV	Kheri Majri Gorkha Road Km 0-9 L & R	8 RKM	15.6 RKM	2000	2000	1800	90	10.9	13-09-2023
2021-22	Thanesar	Jyotisar	NPV	Thanesar Dhand Road Km 0-5 L&R	2 RKM	7 RKM	500	500	300	60	8.2	13-09-2023
2021-22	Thanesar	Jyotisar	NPV	NK Railway Line Km 76-81 L&R	10 RKM	10.5 RKM	2500	2500	2250	90	10	13-09-2023
2021-22	Thanesar	Jyotisar	NPV	Bhari to Bhagthala Road + Bhagthala Surmi Road Km 0-17 L&R	10 RKM	20.6 RKM	2500	2500	2185	87.4	9.6	13-09-2023
2021-22	Thanesar	Thol	NPV	Kheri Shaida toBabukpur Road Km 0-2 L & R	2.50 RKM	2.8 RKM	625	625	563	90.08	13	13-09-2023
2021-22	Thanesar	Shahabad	NPV	Surakhpur Badam Road Km 0-11 L & R	11 RKM	22.6 RKM	2750	2750	2475	90	11	14-09-2023
2021-22	Pehowa	Pehowa	NPV	Bateri-Rua-Sarsa Road Km. 0-7 L+R	8 RKM	8.04 RKM	2000	2000	1940	97	10.6	14-09-2023
2021-22	Pehowa	Pehowa	NPV	Saraswati Canal R.D. 25-77.2 L+R	25 RKM	29.6 RKM	6250	6250	3038	48.6	6	14-09-2023

Table 6.21: CA (Compensatory Afforestation) plantation sites evaluated in Kurukshetra division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20	Thanesar	Jyotisar	CA	SYL KM 22.9-24.0 L&R	1.34 Ha	1.3 Ha	1345	1345	900	66.9	5.9	13-09-2023
2019-20	Thanesar	Ladwa	CA	WJC RD 148-152 L/side of Left Side	Missing in APO	Plantation not done	840	840	Plantation not done	Plantation not done	Plantation not done	13-09-2023
2019-20	Thanesar	Thol	CA	Shahabad Thol Road Km 8-14.5 L&R	1.8 Ha	Plantation not done	1795	1795	Plantation not done	Plantation not done	Plantation not done	13-09-2023
2019-20	Pehowa	Ramgarh	CA	Conservation Reserve Forest Ramgarh, Rect. No. 21, 22, 38 & 47	9.34 Ha	Affected by Fire	8500	8500	Affected by Fire	Affected by Fire	Affected by Fire	15-09-2023
2020-21	Thanesar	Jyotisar	CA	SYL KM 21.5-29 L/side (3140+18940 Plants)	4 Ha	Plantation not done	4000	4000	Plantation not done	Plantation not done	Plantation not done	13-09-2023
2020-21	Thanesar	Jyotisar	CA	SYL KM 21.5-29 L/side (3140+18940 Plants)	2.423 ha	Plantation not done	2423	2423	Plantation not done	Plantation not done	Plantation not done	13-09-2023
2021-22	Pehowa	Pehowa	CA	Saraswati Drain RD 84-132 L & R	3.7594 Ha	3.7 Ha	2270	2270	650	28.63	3.3	15-09-2023

6.3.1. Relevance

6.3.1.1 Site suitability

- Roadside plantations have performed well

Most of the roadside plantations were situated adjacent to agricultural fields (Figure 6.18). Fertilizers and manures applied to the agricultural crop also benefitted the planted saplings. Planted saplings also have a steady supply of water from the irrigated agricultural field. Some of the roadside plantations have barbed wire fencing as a protection measure which prevents grazing and other anthropogenic activities.

Figure 6.18: Roadside plantations with tall plants

- Plantations along the canals/distributary performed well

Plantations carried out along a canal or drain have performed very good growth (Figure 6.19). Due to the presence of the canal, moisture is retained in the soil and the saplings have enough water. Most of these plantations were inaccessible by vehicle, so the grazing or any other anthropogenic pressure is almost absent. Arjun, Jamun, Sheesham, etc. which can grow in waterlogged conditions were planted to ensure the survival of the plantation. Planting trees on the sides of drains and canals brings about ecological benefits such as soil stabilization, improved water quality, and enhanced biodiversity. However, this initiative also faces some challenges in terms of selecting suitable tree species and ensuring proper maintenance.

Figure 6.19 Canalside plantations with well-grown Arjun plants

- Impact of fire

The detrimental effects of fires were observed in almost every plantation site. In the sites of Ramgarh RF, almost all the plants were completely eradicated by the recent fire. The burnt saplings were replaced by Sheesham saplings, but due to the alkaline soil, the species did not show the expected survival and growth.

- Impact of Grazing

Both domestic and feral cattle posed a serious threat to the plantations of the Sirsa division. Most of the plantations do not have any kind of protection measures, which exposes them to severe grazing. In many sites, cattle (sheep and goats) were found roaming adjacent and even inside the plantation area (Figure 6.20).

Figure 6.20: Cattle roaming inside the plantation

6.3.1.2 Species suitability

1. Overall, the species selection in the Kurukshetra division was found to be satisfactory.
2. A total of 22 planted species were noted in the sample sites during the evaluation.
3. Out of the 22 species, Sheesham (*Dalbergia sissoo*), Jamun (*Syzygium cumini*), and Arjun (*Terminalia arjuna*) were found to be the dominant species.
4. In roadside plantations, fast growing species such as Kanakchampa (*Pterospermum acerifolium*), Peepal (*Ficus religiosa*), Kadam (*Neolamarckia cadamba*), Chakrasia (*Chukrasia tubularis*) were planted, which attained great height within 3-4 years of plantation.
5. In Ramgarh RF plantation, almost all the plants were completely eradicated by the recent fire. The burnt saplings were replaced by Sheesham saplings, but due to the alkaline soil, the species did not show the expected survival and growth.

Table 6.22: List of planted species found in the plantations of Kurukshetra Division

	Local Name	Botanical Name
1	Sheeshsam	*Dalbergia sissoo*
2	Jamun	*Syzygium cumini*
3	Haldu	*Haldina cordifolia*
4	Arjun	*Terminalia arjuna*
5	Sagon	*Tectona grandis*
6	Kanakchampa	*Pterospermum acerifolium*

7	Neem	*Azadirachta indica*
8	Pilkhan	*Ficus virens*
9	Peepal	*Ficus religiosa*
10	Lasoda	*Cordia myxa*
11	Molshri	*Mimusops elengi*
12	Silver Oak	*Grevillea robusta*
13	Gular	*Ficus recemosa*
14	Lagerstroemia	*Lagerstroemia speciosa*
15	Jamoa	*Eugenia cuspidata*
16	Kadam	*Neolamarckia cadamba*
17	Chukrasia	*Chukrasia tabularis*
18	Amla	*Phyllanthus emblica*
19	Bel	*Aegle mermalos*
20	Kachnar	*Bauhinia variegata*
21	Banyan	*Ficus benghalensis*
22	Cut Sagon	*Heterophragma adenophyllum*

6.3.2. Effectiveness

6.3.2.1 Survival of the plantations

The overall survival rate of plantations in the Kurukshetra division was found to be satisfactory at 78.8%. Among the three plantation years, the highest survival rate was observed in the plantations carried out during 2020-21, 81.5%. Conversely, the lowest survival rate was recorded for the plantations from 2021-22, which had a survival rate of 75.7% (Table 6.23).

Table 6.23: Year-wise survival rate and average height of the plantation sites

Plantation Year	Av. Survival %	Av Height (Ft)
2019-20	79.1	14.3
2020-21	81.5	10.0
2021-22	75.7	9.2
Average	**78.8**	**11.2**

6.3.2.2 Growth of the plantations

Among 22 planted species Kadam (*Neolamarckia cadamba*), Kachnar (*Bauhinia variegata*), and Sheesham (*Dalbergia sissoo*) were the highest growing species for the year 2019-20, 2020-21 and 2021-22 respectively (Table 6.24).

Table 6.24: Average height of different plant species across three plantation years

	Species planted		Plantation Year		
	Local Name	**Botanical Name**	**2019-20**	**2020-21**	**2021-22**
1	Sheeshsam	*Dalbergia sissoo*	15.9	14.48	9.26
2	Jamun	*Syzygium cumini*	12.7	9.9	-
3	Haldu	*Haldina cordifolia*	7	-	-
4	Arjun	*Terminalia arjuna*	14.5	8.6	4.3
5	Sagon	*Tectona grandis*	30	-	-
6	Kanakchampa	*Pterospermum acerifolium*	20.25	12.65	-
7	Neem	*Azadirachta indica*	8.5	13.6	-
8	Pilkhan	*Ficus virens*	6.6	6.05	-
9	Peepal	*Ficus religiosa*	14.8	21	-
10	Lasoda	*Cordia myxa*	6.6	-	-
11	Molshri	*Mimusops elengi*	8.2	5.5	-
12	Silver Oak	*Grevillea robusta*	8.2	-	-
13	Gular	*Ficus recemosa*	6.6	-	-
14	Lagerstroemia	*Lagerstroemia speciosa*	6.6	6.6	-
15	Jamoa	*Eugenia cuspidata*	6.6	9.25	-
16	Kadam	*Neolamarckia cadamba*	24.4	21	-

17	Chukrasia	*Chukrasia tabularis*	15.1	16.2	-
18	Amla	*Phyllanthus emblica*	16	-	-
19	Bel	*Aegle mermalos*	-	4.1	-
20	Kachnar	*Bauhinia variegata*	-	24.4	-
21	Banyan	*Ficus benghalensis*	-	6.6	-
22	Cut Sagon	*Heterophragma adenophyllum*	-	27	-

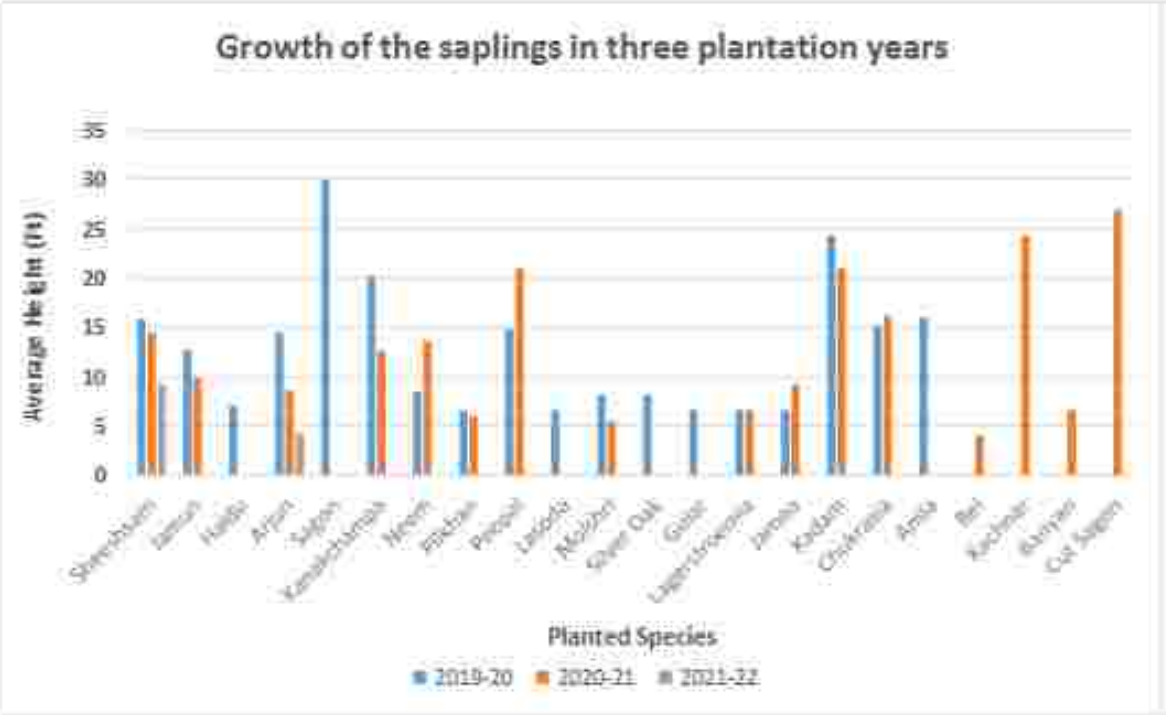


Figure 6.21: Growth of the saplings in three plantation years

6.3.3. Sustainability

6.3.3.1 Protection

Most of the plantation sites are found without any proper protection measures such as fencing, tree guards, cattle-proof trenches etc., making these plantation sites prone to the damage inflicted by grazing and browsing animals. Adequate protection measures should be taken before conducting plantation activities to avoid damage to the plantation by grazing animals, trespassers, and unauthorized harvesting.

6.3.3.2 Monitoring

Regular monitoring of the plantation is reported in all the plantation sites of the division. Chowkidaar/Watchers have been appointed in all the forest ranges to take care of plantation sites.

6.3.3.3 Maintenance

The written information/evidence/records for maintenance/replacement of plants such as plantation journals, APOs, plantation maps etc., have not been maintained in any forest range. This is one of the major shortcomings seen across the ranges of Kurukshetra division.

6.3.4. Scoring of the plantation works

The plantations carried out under the CAMPA scheme in the Kurukshetra division in the year of 2019-20, 2020-21 and 2021-22 scored an average of 133.8, out of 250 (Table 6.25). Overall, the score obtained was satisfactory, considering the immense grazing pressure and other anthropogenic disturbances observed in most of the plantation sites.

Table 6.25: Score obtained by the plantations in Kurukshetra division

	Year	Name of the Site	Survival	Growth	Species suitability	Site suitability	Protection	Extent	Journal	Map	Invasive	Species composition	Weeding and hoeing	Watch and ward
1	2019-20	WJC RD 148-152 L & R	90.75	20	20	20	0	20	0	0	0	10	0	10
2	2019-20	SK Road Km 62-74 L & R	80.4	20	20	20	0	20	0	0	10	10	10	10
3	2019-20	GT Road Km 171-181 L & R	80.1	17	20	20	0	20	0	0	10	10	10	10
4	2019-20	Shahabad Thol Road km 8-14.5 & Jhansa Bhatha	80.2	15	20	20	0	20	0	0	10	10	10	10
5	2019-20	Pabnawa Minor, Rd.35-47, L/Side	71	18	20	20	0	20	0	0	10	10	10	10
6	2019-20	SYL KM 22.9-24.0 L&R	66.9	15	20	20	0	20	0	0	10	10	10	10
7	2019-20	WJC RD 148-152	0	0	0	0	0	0	0	0	0	0	0	0

		L/side of Left Side													
8	2019-20	Shahabad Thol Road Km 8-14.5 L&R	0	0	0	0	0	0	0	0	0	0	0	0	0
9	2019-20	A/H Road Km 35-45 L & R	84.08	17	20	20	0	20	0	0	10	10	10	10	
10	2019-20	RF Ramgarh Rect No. 38	0		0	0	0	0	0	0	0	0	0	0	0
11	2019-20	RF Seonsa Rect No. 72	0		0	0	0	0	0	0	0	0	0	0	0
12	2019-20	RF Ramgarh Rect. No. 21	0		0	0	0	0	0	0	0	0	0	0	0
13	2019-20	RF Ramgarh Rect. No. 47	0		0	0	0	0	0	0	0	0	0	0	0
14	2019-20	Conservation Reserve Forest Ramgarh, Rect. No. 21, 22, 38 & 47	0		0	0	0	0	0	0	0	0	0	0	0
15	2020-21	Fire Line RF Sonti	80	15	20	20	0	20	0	0	10	10	10	10	
16	2020-21	DUK Railway Line 164-168 L & R side	72.66	16	20	20	0	20	0	0		0		10	
17	2020-21	GT Road Km 181-190 L & R	85.1	20	20	20	0	20	0	0		10		10	

18	2020-21	SYL KM 21.5-29 Lside (3140+18940 Plants)	0	0	0	0	0	0	0	0	0	0	0	0	0
19	2020-21	WJC RD 152-159 R/Side, Old Service Road + WJC RD 145-155 L/Side	0	0	0	0	0	0	0	0	0	0	0	0	0
20	2020-21	SYL KM 21.5-29 Lside (3140+18940 Plants)	0	0	0	0	0	0	0	0	0	0	0	0	0
21	2020-21	Tyukar Minor RD 5-30 L & R	79.3	20	20	20	0	20	0	0	10	10	10	10	10
22	2020-21	Gumthala Minor RD 0 to Tail L+R	80.32	16	20	20	0	20	0	0	10	10	10	10	10
23	2021-22	Khera Majri Gorkha Road Km 0-9 L & R	90	20	20	20	0	20	0	0	10	10	10	10	10
24	2021-22	Thanesar Dhand Road Km 0-5 L&R	60	18	20	20	0	20	0	0	10	10	10	10	10
25	2021-22	NK Railway Line Km 76-81 L&R	90	20	20	20	0	20	0	0	10	10	10	10	10
26	2021-22	Bhari to Bhagthala	87.4	20	20	20	0	20	0	0	10	10	10	10	10

		Road + Bhagthala Surmi Road Km 0-17 L&R												
27	2021-22	Kheri Shalda toBabukpur Road Km 0-2 L & R	90.06	20	20	20	0	20	0	0	10	10	10	10
28	2021-22	Surakhpur Badam Road Km 0-11 L & R	90	20	20	20	0	20	0	0	10	10	10	10
29	2021-22	Bateri-Rua-Sarsa Road Km. 0-7 L+R	97	20	20	20	0	20	0	0	10	10	10	10
30	2021-22	Saraswati Canal R.D. 25-77.2 L+R	49.6	16	20	20	0	20	0	0	10	10	10	10
31	2021-22	Saraswati Drain RD 84-132 L & R	28.63	15	20	20	0	20	0	0	10	10	10	10
			52.98	**14.54**	**13.55**	**13.55**	**0**	**13.55**	**0**	**0**	**6.21**	**6.45**	**6.21**	**6.77**

6.3.5. Non-plantation works

6.3.5.1 Fencing

Fencing was evaluated in only one site (Table 6.26), which was found with completely damaged, worn-out barbed wire fences. After conducting the audit of the fencing work, it is evident that the fences are not intact and are not effectively serving their purpose. This is a matter of concern as it compromises the security and protection of the plantations. Immediate action is required to address these issues and ensure that the fences are repaired or replaced to ensure their effectiveness.

Table 6.26: Details of evaluated fencing sites of Kurukshetra division

Sl. No	Year	Range	Barbed wire Fence Id/NO/Name	Length in measurement Book	Actual Length in field	% Variation (+/-)	Present status	Effectiveness
1	2020-21	Thanesar	Shahabad Barar Road Km 0-2 L/side	8 RKM	1.1 RKM	86.25	worn out	non-effective

Figure 6.22: Worn out fencing site in Thanesar Range

6.3.5.2. Scoring of the Non-plantation works:

Table 6.27: Score obtained by the fencing site in Kurukshetra division

	Year	Name of the Site	Survival	Growth	Species suitability	Site suitability	Protection	Encroachment	Cattle menace	Invasive	Species composition	Weeding and hoeing	Watch and ward
1	2019-20	WJC RD 148-152 L & R	99.75	20	20	20	0	20	0	0	0	10	0	10
2	2019-20	SK Road Km 62-74 L & R	80.4	20	20	20	0	20	0	0	10	10	10	10
3	2019-20	GT Road Km 171-181 L & R	80.1	17	20	20	0	20	0	0	10	10	10	10
4	2019-20	Shahabad Thol Road km 8-14.5 & Jhansa Bhatha	80.2	15	20	20	0	20	0	0	10	10	10	10
5	2019-20	Pabnawa Minor, Rd.35-47, L/Side	71	16	20	20	0	20	0	0	10	10	10	10
6	2019-20	SYL KM 22.9-24.0 L&R	66.9	15	20	20	0	20	0	0	10	10	10	10
7	2019-20	WJC RD 148-152 Uside of Left Side	0	0	0	0	0	0	0	0	0	0	0	0
8	2019-20	Shahabad Thol Road Km 8-14.5 L&R	0	0	0	0	0	0	0	0	0	0	0	0
9	2019-20	A/H Road Km 35-45 L & R	84.08	17	20	20	0	20	0	0	10	10	10	10

10	2019-20	RF Ramgarh Rect No. 38	0		0	0	0	0	0	0	0	0	0	0	0
11	2019-20	RF Seonsa Rect No. 72	0		0	0	0	0	0	0	0	0	0	0	0
12	2019-20	RF Ramgarh Rect. No. 21	0		0	0	0	0	0	0	0	0	0	0	0
13	2019-20	RF Ramgarh Rect. No. 47	0		0	0	0	0	0	0	0	0	0	0	0
14	2019-20	Conservation Reserve Forest Ramgarh, Rect. No. 21, 22, 38 & 47	0		0	0	0	0	0	0	0	0	0	0	0
15	2020-21	Fire Line RF Sonti	90	15	20	20	0	20	0	0	10	10	10	10	10
16	2020-21	DUK Railway Line: 164-168 L & R side	72.66	16	20	20	0	20	0	0		0		10	10
17	2020-21	GT Road Km 181-190 L & R	65.1	20	20	20	0	20	0	0		10		10	10
18	2020-21	SYL KM 21.5-29 Lside (3140+1894 0 Plants)	0	0	0	0	0	0	0	0	0	0	0	0	0
19	2020-21	WJC RD 152-159 R/Side, Old Service Road +	0	0	0	0	0	0	0	0	0	0	0	0	0

		WUC RD 145-155 L/Side													
20	2020-21	SYL KM 21.5-29 Lside (3140+1894 0 Plants)	0	0	0	0	0	0	0	0	0	0	0	0	0
21	2020-21	Tyukar Minor RD 5-30 L & R	78.3	20	20	20	0	20	0	0	10	10	10	10	10
22	2020-21	Gumthala Minor RD 0 to Tail L+R	80.32	16	20	20	0	20	0	0	10	10	10	10	10
23	2021-22	Kheri Majri Gorkha Road Km 0-9 L & R	90	20	20	20	0	20	0	0	10	10	10	10	10
24	2021-22	Thanesar Dhand Road Km 0-5 L&R	60	18	20	20	0	20	0	0	10	10	10	10	10
25	2021-22	NK Railway Line Km 76-81 L&R	90	20	20	20	0	20	0	0	10	10	10	10	10
26	2021-22	Bhan to Bhagthala Road + Bhagthala Surmi Road Km 0 L&R	87.4	20	20	20	0	20	0	0	10	10	10	10	10
27	2021-22	Kheri Shaida toBabukpur Road Km 0-2 L & R	90.08	20	20	20	0	20	0	0	10	10	10	10	10
28	2021-22	Surakhpur Badam	90	20	20	20	0	20	0	0	10	10	10	10	10

		Road Km 0-11 L & R											
29	2021-22	Bateri-Rua-Sarsa Road Km 0-7 L+R	97	20	20	20	0	20	0	0	10	10	10	10
30	2021-22	Saraswati Canal R.D. 26-77.2 L+R	48.6	16	20	20	0	20	0	0	10	10	10	10
31	2021-22	Saraswati Drain RD 84-132 L & R	26.83	15	20	20	0	20	0	0	10	10	10	10
			52.98	**14.54**	**13.55**	**13.55**	**0**	**13.55**	**0**	**0**	**6.21**	**6.45**	**6.21**	**6.77**

6.4 MORNI-PINJORE DIVISION

Table 6.28: CA (Compensatory Afforestation) plantation sites evaluated in Momi-Pinjore Division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20												
2019-20	Pinjore	Pinjore	CA SP	R-62, C-2	15.05 Ha	15 Ha	15052	15052	10837	72	8.9	07-07-2023
2020-21												
2020-21	Panchkula	Khetpurali	CA TP	Ketpurali-C-81	10 Ha	10 Ha	10000	10000	7200	82.1	6.7	5-07-23
2020-21	Raipur Rani	Mirpur	CA TP	C-50	2 Ha	2 Ha	2000	2000	1440	84	5	1-07-23
2020-21	Raipur Rani	Mirpur	CA TP	C-34	2 Ha	2 Ha	2000	2000	1440	79.2	5.2	1-07-23
2020-21	Raipur Rani	Trilokpur	CA TP	C-80	2 Ha	2 Ha	2000	2000	1440	70.2	7.5	4-07-23
2020-21	Raipur Rani	Bhood	CA TP	C-5	2 Ha	2 Ha	2000	2000	1440	72.1	5.6	8-07-23
2020-21	Raipur Rani	Bhood	CA TP	C-19	2 Ha	2 Ha	2000	2000	1380	69	5.5	8-07-23
2020-21	Kalka	Nanakpur	CA SP	R-71 C-7	1.34 Ha	1.34 Ha	1390	1390	1001	85.6	4.1	7-03-23
2020-21	Raipur Rani	Trilokpur	CA SP	C-80	20 Ha	20 Ha	20000	20000	14400	71	2.2	4-07-23

2020-21	Raipur Rani	Mirpur	CA SP	C-50	5 Ha	5 Ha	5000	5000	3600	68.4	2.4	1-07-23
2020-21	Raipur Rani	Mirpur	CA SP	C-34	10 Ha	10 Ha	10000	10000	7200	82.7	1.9	1-07-23
2020-21	Raipur Rani	Trilokpur	CA SP	C-72	20 Ha	20 Ha	20000	20000	14400	71.6	6	5-07-23
2020-21	Raipur Rani	Bhood	CA SP	C-5	20 Ha	20 Ha	20000	20000	14400	73	5.8	8-07-23
2020-21	Panchkula	Khetpurali	CA SP	Ketpurali-C-81	20 Ha	20 Ha	20000	20000	14400	81.2	1.8	5-07-23
						2021-22						
2021-22	Morni	Morni	CA TP	C-129	6.45 Ha	6.45 Ha	6450	6450	4644	82	6.4	8-07-23
2021-22	Morni	Bhuri	CA TP	C-122	10 Ha	10 Ha	10000	10000	7200	81.2	8.1	8-07-23
2021-22	Morni	Thandog	CA TP	C-185	5 Ha	5 Ha	5000	5000	3600	83.6	7.4	8-08-23
2021-22	Morni	Bhuri	CA TP	C-218	5 Ha	5 Ha	5000	5000	3600	86	0.1	8-11-23
2021-22	Raipur Rani	Trilokpur	CA TP+SP	C-73	20 Ha	20 Ha	20000	20000	14400	78.3	8.4	4-07-23
2021-22	Raipur Rani	Bhood	CA TP+SP	C-73	5 Ha	5 Ha	5000	5000	3600	67.2	6	8-07-23
2021-22	Raipur Rani	Bhood	CA TP+SP	C-19	8.172 Ha	8.172 Ha	8172	8172	5884	81.2	5.5	8-07-23

2021-22	Panchkula	Burjkotian	CA SP	R-70, C-5	10 Ha	10 Ha	10000	10000	7200	84.2	1.7	3-07-23
2021-22	Panchkula	Ramgarh	CA TP	DP-247	10 Ha	10 Ha	10000	10000	7200	72.6	5.7	4-07-23
2021-22	Panchkula	Baloutl	CA TP	C-97	12.86 Ha	12.86 Ha	12860	12860	9259	83.1	7.3	5-07-23
2021-22	Panchkula	Baloutl	CA TP	C-91	15 Ha	15 Ha	15000	15000	10800	80.6	11.2	5-07-23
2021-22	Pinjore	Mallah	CA TP	DP-244	13 Ha	13 Ha	13000	13000	9360	74.3	8.1	9-07-23
2021-22	Raipur Rani	Bhood	CA TP	C-4	5 Ha	5 Ha	5000	5000	3600	81.2	6.7	8-07-23

Table 6.29: NPV (Net Present Value) plantation sites evaluated in Morni-Pinjore Division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20												
2019-20	Kalka	Nanakpur	NPV TP	Kahi Wala Link Road	10 RKM	10 RKM	2500	2500	1800	29.8	12.7	07-09-23
2019-20	Raipurani	Bhood	NPV TP	C-8	10 RKM	10 RKM	2500	2500	1800	79	9.8	24-07-2023
2019-20	Raipur Rani	Tribkpur	NPV TP	Bhood Plasara Morni Road R/Side, C-78	10 RKM	10 RKM	2500	2500	1800	84.4	17.6	27-07-2023

2020-21												
2020-21	Panchkula	Raiwgarh	NPV TP	NH-7 (PKL to Barwala) KM	20.60 RKM	20.60 RKM	5125	5125	3690	80.2	13.1	13-07-23
2020-21	Morni	Thandog	NPV TP	Thandog to Himachal Bondary 0-8 KM	20 RKM	20 RKM	5000	5000	3600	88	12.4	08-08-2023
2020-21	Morni	Barwa	NPV Ecoresto ration	C-215	5 Ha	5 Ha	5000	5000	3600	72	4.5	08-09-2023
2021-22												
2021-22	Panchkula	Raiwgarh	NPV TP	Kot to Bunga Road	6 RKM	6 RKM	1500	1500	1080	49	7.2	13-07-2023
2021-22	Panchkula	Raiwgarh	NPV TP	Jaswantgarh to Khangesra Road	4 RKM	4 RKM	1000	1000	720	52	9.3	13-07-2023
2021-22	Pinjore	Mallah	NPV TP	Diwanwala to Nandpur	10 RKM	10 RKM	2500	2500	1800	83	18.3	19-07-2023
2021-22	Pinjore	Mallah	NPV TP	Pinjore Mallah Road to Saranhan	4 RKM	4 RKM	1000	1000	720	58.3	9.7	19-07-2023
2021-22	Pinjore	Pinjore	NPV TP	Ambala Kalkato Parwanoo by Pass	6 RKM	6 RKM	1500	1500	1080	66	8.6	08-03-2023

6.4.1. Relevance

6.4.1.1 Site suitability

- Plantations carried out in the Panchkula Range showed good survival and growth

Despite the tough hilly terrain, the plantations carried out in the Panchkula Range showed very good results. Fast-growing tall plants were planted and in some plantations, proper peripheral fencing and tree guards were observed, which led to the successful results of the planted saplings (Figure 6.23).

Figure 6.23: Due to proper monitoring and protection measures, the plantations in Panchkula range showed good result

- Abundance of invasive species

In the Morni Pinjore division, the presence of invasive species like Vilayti Babool (*Prosopis juliflora*), Carrot Grass (*Parthenium hysterophorus*), and *Lantana camara* was observed in most of the plantation sites (Figure 6.24). The presence of these species poses a serious threat to the native herbs as well as planted saplings by releasing allelopathic chemicals into the soil and creating impenetrable low canopy cover. Proper weed removal is needed at regular intervals to ensure the survival and growth of the planted species.

Figure 6.24: Abundance of invasive species inside the plantation site

- Impact of grazing pressure

Both domestic and feral cattle posed a serious threat to the roadside plantations of the Morni Pinjore division. Most of the plantations do not have any kind of protection measures, which exposes them to severe grazing. In many sites, cattle were found roaming inside the plantation area (Figure 6.25).

Figure 6.25: Roadside plantations were severely damaged by the severe grazing pressure

6.4.1.2. Species Suitability

- The highest number of planted species were found in this division.
- Out of the 53 planted species, Sheesham, Kachnar, Amla and Bakain were found to be dominant. Most of the species showed good growth and survival across the division.
- In most of the sites, fast-growing native species like Sheesham, Arjun, Jamun, Bakain, Kadam etc. were planted, which attained very good growth, especially in roadside plantations.
- In the waterlogging sites, resistant species like Arjun, Jamun, Kadam, and Sheesham were planted, which produced good results.
- In some plantation sites, planted species were found to be damaged by the local livestock.
- Exotic species such as Bottle Brush and Siver Oak were planted in some plantation sites. Although these species produced good growth and survival, it is strongly suggested that exotic species should be excluded from the plantation species mix.
- An abundance of invasive species like *Lantana camara*, *Prosopis juliflora*, and *Parthenium hysterophorus* were found in some of the plantation sites, which could be detrimental to the plantation and the native herbs.

Table 6.30: Planted species found in the plantations of Morni-Pinjore Division

Sr. No.	Species planted	
	Local Name	**Botanical Name**
1	Sheesham	*Dalbergia sissoo*
2	Bakain	*Melia azadarach*
3	Baheda	*Terminalia bellirica*
4	Imli	*Tamarindus indica*
5	Papdi	*Holoptelea integrifolia*
6	Amla	*Phyllanthus emblica*
7	Nirgudi	*Vitex nirgundo*
8	Arjun	*Terminalia arjuna*
9	Dudhi	*Holarrhena pubescens*
10	Kachnar	*Bauhinia variegata*
11	Gular	*Ficus recemosa*
12	Mahogany	*Swietenia mahagoni*
13	Neem	*Azadirachta indica*
14	Jamun	*Syzygium cumini*
15	Bargat	*Ficus benghalensis*

16	Peepal	*Ficus religiosa*
17	Bel	*Aegle mermalos*
18	Harra	*Terminalia chebula*
19	Aam	*Mnagifera indica*
20	Moyan	*Lannea coromandelica*
21	Pilkhan	*Ficus virens*
22	Oroxylum	*Oroxylum indicum*
23	Silver Oak	*Grevillea robusta*
24	Kathal	*Artocarpus heterophylla*
25	Semal	*Bombax ceiba*
26	Amaltas	*Cassia fistula*
27	Palas	*Butea monosperma*
28	Kadam	*Neolamarckia cadamba*
29	Kusum	*Schleichera oleosa*
30	Bottlebrush	*Callistemon*
31	Siris	*Albizia lebback*
32	Lagerstroemia	*Lagerstroemia speciosa*
33	Chir Pine	*Pinus roxburghi*
34	Aloe	*Aloe vera*
35	Giloy	*Tinospora*
36	Kalanchoe	*Kalanchoe daigremontiana*
37	Tulsi	*Ocimum*
38	Garlic Vine	*Mansoa aliacea*
39	Asparagus	*Asparagus recemosus*
40	Khair	*Acacia catechu*
41	Teak	*Tectona grandis*
42	Bans	*Dendrocalamus*
43	Harsingar	*Nyctanthus arbortristis*

44	Chamror	*Ehretia laevis*
45	Balamkheera	*Kigelia pinnata*
46	Jamoa	*Eugenia cuspidata*
47	Babool	*Acacia nilotica*
48	Reetha	*Sapindus mukorossi*
49	Mahua	*Maduca indica*
50	Ber	*Ziziphus mauritiana*
51	Shahtoot	*Moras alba*
52	Putranjiva	*Putranjiva roxburghi*
53	Alsotnia	*Alstonia scholaris*

6.4.2. Effectiveness

6.4.2.1. Survival of the plantation

The overall survival rate of plantations in the Morni-Pinjore division was found to be impressive at 72.6%. Among the three plantation years, the highest survival rate was observed in the plantations carried out during 2020-21, with a rate of 76.9%. Conversely, the lowest survival rate was recorded for the plantations from 2019-20, which had a survival rate of 66.3% (Table 6.31).

Table 6.31: Year-wise survival rate and average height of the plantation sites

Year	Average survival (%)	Average Height (ft.)
2019-20	66.3	12.3
2020-21	76.9	5.6
2021-22	74.6	7.4

6.4.2.2. Growth of the plantation

Bel (*Aegle mermalos*), Sheesham (Dalbergia sissoo) and Balamkheera (*Kigelia pinnata*) were the highest-growing species for the year 2019-20, 2020-21 and 2021-22 respectively (Table 6.32).

Table 6.32: Average height of different plant species across three plantation years

Sr. No.	Species planted		Plantation year		
	Local Name	**Botanical Name**	**2019-20**	**2020-21**	**2021-22**
1	Sheesham	*Dalbergia sissoo*	15.8	20.3	9.2
2	Bakain	*Melia azedarach*	13.2	-	1.5

3	Baheda	*Terminalia bellirica*	12.0	5.5	7.3
4	Imli	*Tamarindus indica*	11.0	4.5	4.5
5	Papdi	*Holoptelea integrifolia*	10.7	3.8	5.4
6	Amla	*Phyllanthus emblica*	13.5	6.3	8.3
7	Nirgudi	*Vitex nirgundo*	10.2	3.8	-
8	Arjun	*Terminalia arjuna*	8.1	10.1	10.3
9	Dudhi	*Holarrhena pubescens*	10.5	5.0	
10	Kachnar	*Bauhinia variegata*	8.5	5.8	7.1
11	Gular	*Ficus recemosa*	11	4.3	-
12	Mahogany	*Swietenia mahagoni*	8	-	-
13	Neem	*Azadirachta indica*	13	5.7	7.3
14	Jamun	*Syzygium cumini*	12	6.5	5.9
15	Bargat	*Ficus benghalensis*	8	-	7
16	Peepal	*Ficus religiosa*	8	-	-
17	Bel	*Aegle mermalos*	20	5.3	7.1
18	Harra	*Terminalia chebula*	15	4.9	6.1
19	Aam	*Mnagifera indica*	15	5.8	7.3
20	Moyan	*Lannea coromandelica*	12		-
21	Pilkhan	*Ficus virens*	-	5.8	-
22	Oroxylum	*Oroxylum indicum*	-	6.1	6.2
23	Silver Oak	*Grevillea robusta*	-	8.22	-
24	Kathal	*Artocarpus heterophylla*	-	5.5	5.8
25	Semal	*Bombax ceiba*	-	6.5	6.8
26	Amaltas	*Cassia fistula*	-	4.0	7
27	Palas	*Butea monosperma*	-	5	-
28	Kadam	*Neolamarckia cadamba*	-	19.3	10
29	Kusum	*Schleichera oleosa*	-	18.3	-
30	Bottlebrush	*Callistemon*	-	10.2	9.6

31	Siris	*Albizia lebback*	-	12.2	
32	Lagerstroemia	*Lagerstroemia speciosa*	-	10.2	5.8
33	Chir Pine	*Pinus roxburghi*	-	4.5	-
34	Aloe	*Aloe vera*	-	2.5	-
35	Giloy	*Tinospora*	-	4	-
36	Kalanchoe	*Kalanchoe daigremontiana*	-	2.5	-
37	Tulsi	*Ocimum*	-	3.5	-
38	Garlic Vine	*Mansoa alliacea*	-	2	-
39	Asparagus	*Asparagus recemosus*	-	6	-
40	Khair	*Acacia catechu*	-	4.3	5
41	Teak	*Tectona grandis*	-	2.3	4.7
42	Bans	*Dendrocalamus*	-	5.0	4.8
43	Harsingar	*Nyctanthus arbortristis*	-	1	-
44	Chamror	*Ehretia laevis*	-	1	-
45	Balamkheera	*Kigelia pinnata*	-	7	10.7
46	Jamoa	*Eugenia cuspidata*	-	5	-
47	Babool	*Acacia nilotica*	-	2	-
48	Reetha	*Sapindus mukorossi*	-	-	6.5
49	Mahua	*Maduca indica*	-	-	7
50	Ber	*Ziziphus mauritiana*	-	-	3.3
51	Shahtoot	*Moras alba*	-	-	9
52	Putranjiva	*Putranjiva roxburghi*	-	-	12
53	Alsotnia	*Alstonia scholaris*	-	-	4.5

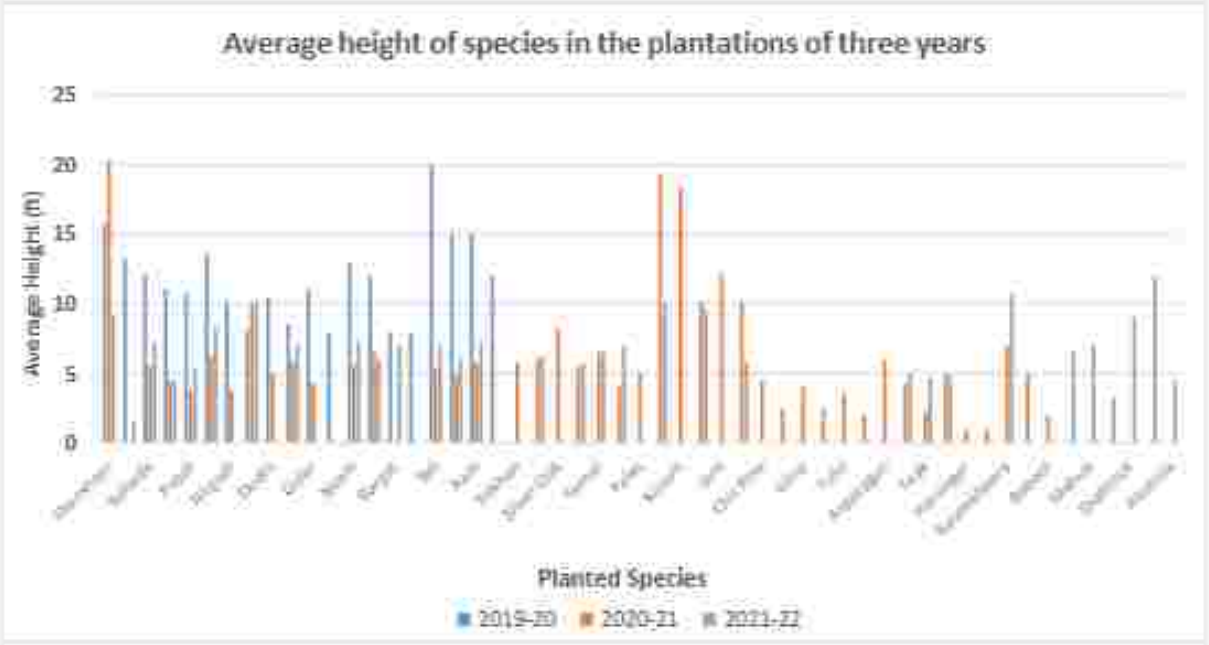


Figure 6.26: Growth of the planted species in three plantation years

6.4.3. Sustainability

6.4.3.1. Protection

Almost all the plantations were carried out without any kind of protection measures e.g. Barbed Wire Fencing, Cattle Proof Trench tree guards, etc. Only in some plantations in Panchkula Range, complete or partial peripheral fencings were found. Adequate protection measures should be taken before initiating the plantation activities to avoid damages by grazing animals, trespassers, and illegal cutting.

6.4.4.2. Maintenance

Despite severe grazing pressure, most of the plantations produced good growth and survival and were maintained properly. This is the result of the hard work done by forest guards and chowkidaar/watchers. The KII revealed that most of the officers and forest guards are very dedicated and passionate about the afforestation initiative and look after the sites regularly.

6.4.4.3. Monitoring

Regular monitoring of the plantation is reported in all the plantation sites of the division. Chowkidaar/Watchers have been appointed in all the forest ranges to take care of plantation sites.

6.4.4. Scoring of the plantations

The plantations of the Morni Pinjore division scored a total of 178.7 out of 250, which is very good. Almost all the plantation sites have performed very well, despite the effects of fire, severe grazing pressure, waterlogging, and other unfavorable factors. This happened due to the collective efforts and dedication of the forest ground staff.

Table 6.33. Score obtained by the plantations in Morni-Pinjore

S.No.	Component	Range	Year	Name of site	Survival % (100)	Growth (20)	Species Suitability (10)	Site Suitability (10)	Protection (20)	Extent (20)	Journal (20)	Map (10)	Invasive (10)	Species composition (10)	Weeding and Hoeing (10)	Watch and ward (10)
1	CA SP	Pinjore	2019-20	R 62, C2	72.00	18	10	10	15	20	20	10	5	10	5	10
2	NPV TP	Kalka	2019-20	Kahi Wala Link Road	29.76	20	10	10	10	20	20	10	0	10	0	0
3	NPV TP	RaipurRani	2019-20	C-8	79.00	18	10	10	0	20	0	0	10	10	10	0
4	CA TP	RaipurRani	2019-20	Bhood Plasara Morni Road R/Side C-76	84.36	20	10	10	0	20	0	0	10	10	10	10
5	CA TP	Panchkula	2020-21	Ketpurali-C-81	82.14	20	10	10	6	20	20	10	0	10	0	10
6	CA TP	RaipurRani	2020-21	C-34	84.00	20	10	10	0	20	20	10	5	10	5	10
7	CA TP	RaipurRani	2020-21	C-50	79.20	10	10	10	0	20	20	10	0	10	0	10

8	CA TP	RaipurRani	2020-21	C-80	70.20	20	10	20	0	20	0	0	0	10	0	10
9	CA SP	RaipurRani	2020-21	C-72	72.13	20	10	10	0	20	0	0	0	10	0	10
10	CA SP	RaipurRani	2020-21	C-5	69.00	20	10	10	0	20	0	0	10	10	10	10
11	CA TP	RaipurRani	2020-21	C-19	80.20	20	10	10	0	20	0	0	0	10	0	10
12	NPV TP	Panchkula	2020-21	NH-7 (PKL to Barwala) KM	88.00	20	10	10	20	20	20	10	6	8	6	0
13	NPV TP	Morni	2020-21	Thandog to Himachal Bondary 0-8 KM	72.00	20	10	10	0	20	20	0	0	10	0	10
14	NPV Eco-restoration	Morni	2020-21	C-215	85.60	20	10	10	5	20	0	0	5	10	5	10
15	CA SP	Kalka	2020-21	R-71 C-7	71.00	20	10	6	0	20	20	10	0	10	0	10
16	CA SP	RaipurRani	2020-21	C-80	68.40	20	10	20	0	20	0	0	0	10	0	10
17	CA SP	RaipurRani	2020-21	C-50	82.70	15	10	10	0	20	20	10	10	10	10	10
18	CA SP	RaipurRani	2020-21	C-34	71.60	10	10	10	0	20	20	10	5	10	5	10
19	CA TP	RaipurRani	2020-21	C-72	72.13	20	10	10	0	20	20	10	5	10	5	10

20	CA TP	RaipurRani	2020-21	C-5	73.00	16	10	10	20	20	0	0	10	10	10	10
21	CA SP	Panchkula	2020-21	Ketpurali-C-81	81.23	18	10	10	20	20	20	10	0	10	0	10
22	CA TP	Morni	2021-22	C-129	82.00	20	10	10	0	20	20	10	0	10	0	10
23	CA TP	Morni	2021-22	C-122	81.20	20	10	10	0	20	20	10	0	10	0	10
24	CA TP	Morni	2021-22	C-185	83.60	20	10	10	0	20	0	0	0	10	0	10
25	CA TP	Morni	2021-22	C-218	86.00	20	10	10	0	20	20	10	0	10	0	10
26	CA SP+TP	RaipurRani	2021-22	C-73	78.26	20	8	10	0	20	0	0	0	10	0	10
27	CA TP+SP	RaipurRani	2021-22	C-73	67.22	20	10	20	0	20	0	0	0	10	0	10
28	CA TP+SP	RaipurRani	2021-22	C-19	81.19	20	10	10	10	20	0	0	0	10	0	10
29	CA SP	Panchkula	2021-22	R-70, C-5	84.20	20	10	10	0	20	20	10	0	10	0	10
30	CA TP	Panchkula	2021-22	DP-247	72.61	10	10	10	0	20	20	10	10	10	10	10
31	CA TP	Panchkula	2021-22	C-97	83.12	18	10	10	6	20	20	10	0	10	0	10

32	CA TP	Panchkula	2021-22	C-91	80.61	20	10	10	6	20	20	10	0	10	0	10
33	CA TP	Pinjore	2021-22	DP-244	74.32	15	8	0	20	20	10	10	0	10	0	10
34	CA	RaipurRani	2021-22	C-4	81.24	20	10	10	10	20	0	0	10	10	10	10
35	NPV TP	Panchkula	2021-22	Kol to Bunga Road	49.00	10	10	10	0	20	20	10	0	10	0	0
36	NPV TP	Panchkula	2021-22	Jaswantgarh to Khangesra Road	52.00	20	10	10	0	20	20	10	0	10	0	0
37	NPV TP	Pinjore	2021-22	Diwanwala to Nandpur	83.00	20	10	10	0	20	20	10	0	10	0	0
38	NPV TP	Pinjore	2021-22	Pinjore Mallah Road to Saranhan	58.30	20	10	10	0	20	20	10	0	10	0	0
39	NPV TP	Pinjore	2021-22	Ambala Kalka to Parwanoo by Pass	65.00	12	10	10	10	20	20	0	0	8	0	0
			Total		74.63	18.21	9.90	10.41	4.05	20.00	12.56	5.90	2.59	9.90	2.59	7.95

6.4.5 Non-plantation activities

6.4.5.1 Fencing

A total of four Barbed wire fencing sites and two sites with Bamboo tree guards were evaluated. All the sites were found to be working very effectively.

Table 6.34: Fencing Sites (Barbed Wire) evaluated in Morni Pinjore Division

Sr. No.	Year	Name of Range	Kind of Fencing	Name of Reach where fencing done	Target achieved	Effectiveness
1	2020-21	Panchkula	Barbed wire with cement Post (2500 No)	NH-7 Panchkula to barwala road KM 4-12	10 RKM	Very effective
2	2020-21	Panchkula	Barbed wire with cement Post (2500 No.)	NH-7 Panchkula to barwala road KM 15-22	10 RKM	Very effective
3	2021-22	Panchkula	Barbed Wire	Jaswantgard to Khangesra Road	4 RKM	Very effective
4	2021-22	Panchkula	Barbed Wire	Toka to Sabilpur Road	6 RKM	Very effective

Figure 6.27: Barbed Wire Fencing

Table 6.35: Sites with Bamboo tree guards with plastic jaali

Sr. No.	Year	Range	Site name	Tree guard nos.	Effectiveness
1	2019-20	Morni-Pinjore	R-62, C-2 (15.05 Ha)	9045	Moderately Effective
2	2019-20	Morni-Pinjore	Total	14980	Moderately Effective

Figure 6.28: Fencing and tree guards in Morni-Pinjore Division

Table 6.36: Score obtained by the Fencing works

Sr no.	Scoring components	Full score	Obtained score
1	Working Status	20	20
2	Serving the purpose intended	20	20
3	Actual extent	20	20
4	Site suitability	10	10
5	Measurement book	10	10
6	Expenditure as per the APO	20	20
		100	100

6.4.5.2. Soil and Moisture Conservation (SMC) works

A total of 140 SMC sites were evaluated in the Morni-Pinjore Division. All of the sites adequately met the evaluation criteria and are working effectively.

Table 6.37: SMC Sites evaluated in Morni-Pinjore Division

Sr. No.	Name of Range	Name of Beat	Site name	Name of SMC Work	No. of Work	Expenditure	Effectiveness
1	Kalka	Nawan Nagar	Const. of SDD, Devi Wala Choe R-71 C-11, Khokhra at Thappal (Kalka Range)	Const. Of SDD	1	456581	Very effective
2	Kalka	Nanakpur	Const. of CSMS, Toran Wala Choe, R-71 C-9 (Kalka Range)	Const. Of CSMS	1	169064	Very effective
3	Raipur rani	Raipur rani	Const. Of WHS at Khairi Khopar, (Raipur Rani Range)	Const. Of WhS	1	861074	Very effective
4	Morni	Chaplana	Const of RCC Structure , Bijlag Choe, (Morni Range)	Const. Of RCC Structure	1	232308	Very effective
5	Kalka	Nanakpur	Dhanga Wala Choe (CA)	Crate wire Structure No.1	1	240432.00	Very effective
6	Kalka	Nanakpur	Dhanga Wala Choe (CA)	Crate wire Structure No.2	1	259016.00	Very effective
7	Kalka	Nanakpur	Dhanga Wala Choe (CA)	SMCS No.1	1	390890.00	Very effective
8	Kalka	Nanakpur	Dhanga Wala Choe (CA)	SMCS No.2	1	476396.00	Very effective
9	Kalka	Nanakpur	Dhanga Wala Choe (CA)	SMCS No.3	1	435210.00	Very effective

10	Kalka	Basolan	R-71 C-5, Dhoom Wala choe	Crate wire Structure No. 1	1	268356.00	Very effective
11	Kalka	Basolan	R-71 C-5, Dhoom Wala choe	Crate wire Structure No. 2	1	273403.00	Very effective
12	Kalka	Basolan	R-71 C-5, Dhoom Wala choe	Crate wire Structure No. 3	1	265785.00	Very effective
13	Kalka	Basolan	R-71 C-5, Dhoom Wala choe	Crate wire Structure No. 4	1	286618.00	Very effective
14	Kalka	Basolan	R-71 C-5, Dhoom Wala choe	Crate wire Structure No. 5	1	266882.00	Very effective
15	Kalka	Basolan	R-71 C-5, Dhoom Wala choe	SMCS No:1	1	439705.00	Very effective
16	Kalka	Basolan	R-71 C-5, Dhoom Wala choe	SMCS No.2	1	370335.00	Very effective
17	Kalka	Basolan	R-71 C-5, Dhoom Wala choe	SMCS No:3	1	492750.00	Very effective
18	Kalka	Basolan	R-71 C-5, Dhoom Wala choe	SMCS No:4	1	429085.00	Very effective
19	Kalka	Basolan	R-71 C-5, Dhoom Wala choe	SMCS No:5	1	434098.00	Very effective
20	Kalka	Basolan	R-71 C-5 Madho Wala Choe (CA)	CWS	1	327943.0(	Very effective
21	Panchkula	Burajkotian	R- 70, C- 5	Stone Masonry with RCC WHS	1	4109731.00	Very effective

22	Panchkula	Burajkotian	R- 70, C- 5	Stone Masonry with RCC WHS	1	4295691.00	Very effective
23	Panchkula	Burajkotian	R-70, C-5	Const. of CSMS No-1, 26000- Gulabi Tun Wala Choi	1	431342.0	Very effective
24	Panchkula	Burajkotian	R-70, C-5	Const. of CSMS No-1, Palle wali Choi	1	423780.00	Very effective
25	Panchkula	Burajkotian	R-70, C-5	Const. of CSMS No-1, Malljan Wali Choi	1	465301.00	Very effective
26	Panchkula	Assrewali	Moran Wala Choe Assrewali PF	Const. of Silt Detention Dam Cum water Body (Earthen) No-1	1	2463281.00	Very effective
27	Kalka	Nawan Nagar	R-71, C-10 Lamba Choe	Crate wire Structure NO.1	1	215813.00	Very effective
28	Kalka	Nawan Nagar	R-71, C-10 Lamba Choe	Crate wire Structure NO.2	1	244252.00	Very effective
29	Kalka	Nawan Nagar	R-71, C-10 Lamba Choe	Crate wire Structure NO.3	1	213670.00	Very effective
30	Kalka	Nawan Nagar	R-71, C-10 Lamba Choe	Crate wire Structure NO.4	1	277581.00	Very effective
31	Kalka	Nawan Nagar	R-71, C-10 Lamba Choe	Crate wire Structure NO.5	1	251181.00	Very effective
32	Kalka	Nawan Nagar	R-71, C-10 Lamba Choe	SMCS No.1	1	439157.00	Very effective
33	Kalka	Nawan Nagar	R-71, C-10 Lamba Choe	SMCS No.2	1	401627.00	Very effective

34	Kalka	Nawanagar	R-71 C-11 Langa Wala Choe	Crate wire Structure No:1	1	234342.00	Very effective
35	Kalka	Nawanagar	R-71 C-11 Langa Wala Choe	Crate wire Structure No:2	1	245016.00	Very effective
36	Kalka	Nawanagar	R-71 C-11 Langa Wala Choe	Crate wire Structure No:3	1	253395.00	Very effective
37	Kalka	Nawanagar	R-71 C-11 Langa Wala Choe	Crate wire Structure No:4	1	253395.00	Very effective
38	Kalka	Nawanagar	R-71 C-11 Langa Wala Choe	Crate wire Structure No:5	1	233840.00	Very effective
39	Kalka	Nawanagar	R-71 C-11 Langa Wala Choe	Crate wire Structure No:6	1	234346.00	Very effective
40	Kalka	Nawanagar	R-71 C-11 Langa Wala Choe	Crate wire Structure No:7	1	260743.00	Very effective
41	Kalka	Nawanagar	R-71 C-11 Langa Wala Choe	SMCS No:1	1	460042.00	Very effective
42	Kalka	Nawanagar	R-71 C-11 Langa Wala Choe	SMCS No:2	1	437801.00	Very effective
43	Kalka	Nawanagar	R-71 C-11 Langa Wala Choe	SMCS No:3	1	424619.00	Very effective
44	Panchkula	Nada	Ghaggar Choe	Cons. CWR Spur No-1, Ghaggar Choe	1	285088.00	Very effective
45	Panchkula	Nada	Ghaggar Choe	Cons. CWR Spur No-2, Ghaggar Choe	1	285088.00	Very effective

46	Panchkula	Nada	Ghaggar Choe	Cons. CWR Spur No-3, Ghaggar Choe	1	285088.00	Very effective
47	Panchkula	Nada	Ghaggar Choe	Cons. CWR Spur No-4, Ghaggar Choe	1	285087.00	Very effective
48	Panchkula	Nada	Ghaggar Choe	Cons. CWR Spur No-5, Ghaggar Choe	1	285086.00	Very effective
49	Panchkula	Chowki	Kholu wala Choe	CSMS No. 1, Kholu wala Choe	1	443691.00	Very effective
50	Panchkula	Chowki	Kholu wala Choe	CSMS No. 2, Kholu wala Choe	1	527731.00	Very effective
51	Panchkula	Chowki	Kholu wala Choe	CSMS No. 3, Kholu wala Choe	1	559054.00	Very effective
52	Panchkula	Chowki	Kholu wala Choe	CSMS No. 4, Kholu wala Choe	1	574105.00	Very effective
53	Panchkula	Chowki	Pachhokar Wala Khala	CSMS No.1, Pachhokar Wala Khala	1	409462.00	Very effective
54	Panchkula	Chowki	Pachhokar Wala Khala	CSMS No.2, Pachhokar Wala Khala	1	448890.00	Very effective
55	Panchkula	Chowki	Pachhokar Wala Khala	CSMS No.3, Pachhokar Wala Khala	1	452366.00	Very effective
56	Panchkula	Chowki	Pachhokar Wala Khala	CSMS No.4,Pachhokar Wala Khala	1	386277.00	Very effective
57	Panchkula	Chowki	Devi Wala Choe	CSMS No. 1, Devi Wala Choe	1	421320.00	Very effective

58	Panchkula	Chowki	Devi Wala Choe	CSMS No. 2, Devi Wala Choe	1	423538.00	Very effective
59	Panchkula	Chowki	Devi Wala Choe	CSMS No. 3, Devi Wala Choe	1	471681.00	Very effective
60	Panchkula	Chowki	Devi Wala Choe	CSMS No. 4,Devi Wala Choe	1	427330.00	Very effective
61	Panchkula	Chowki	Devi Wala Choe	CSMS No. 5,Devi Wala Choe	1	417959.00	Very effective
62	Panchkula	Chowki	Devi Wala Choe	Crate wire Structure No. 1,Devi Wala Choe	1	263650.00	Very effective
63	Panchkula	Nada	Devi Wala Choe	Crate wire Structure No. 2,Devi Wala Choe	1	251728.00	Very effective
64	Panchkula	Nada	Devi Wala Choe	Crate wire Structure No. 3,Devi Wala Choe	1	265290.00	Very effective
65	Panchkula	Nada	Devi Wala Choe	Crate wire Structure No. 4,Devi Wala Choe	1	300098.00	Very effective
66	Panchkula	Berwala	Singh Wala Choe	Crate wire Structure No. 1,Singh Wala Choe	1	256642.00	Very effective
67	Panchkula	Berwala	Singh Wala Choe	Crate wire Structure No. 2,Singh Wala Choe	1	270897.00	Very effective
68	Panchkula	Berwala	Gabli wala Choe	CSMS No. 1,Gabli wala Choe	1	418693.00	Very effective
69	Panchkula	Berwala	Gabli wala Choe	CSMS No. 2,Gabli wala Choe	1	417687.00	Very effective

70	Panchkula	Berwala	Gabli wala Choe	CSMS No. 3,Gabli wala Choe	1	415291.00	Very effective
71	Panchkula	Berwala	Gabli wala Choe	CSMS No. 4,Gabli wala Choe	1	418136.00	Very effective
72	Panchkula	Berwala	Gabli wala Choe	Crate wire Structure No. 1,Gabli wala Choe	1	312965.00	Very effective
73	Panchkula	Berwala	Gabli wala Choe	Crate wire Structure No. 2,Gabli wala Choe	1	310307.00	Very effective
74	Panchkula	Khetpurali	Bel Wala Choe, C-97	CSMS No-1Bel Wala Choe, C-97	1	506835.00	Very effective
75	Panchkula	Khetpurali	Bel Wala Choe, C-97	CSMS No-2,Bel Wala Choe, C-97	1	461763.00	Very effective
76	Panchkula	Khetpurali	CSMS No-3,Bel Wala Choe, C-97	CSMS No-3,Bel Wala Choe, C-97	1	461133.00	Very effective
77	Panchkula	Khetpurali	Bel Wala Choe	Wire Create Structure No-1,Bel Wala Choe	1	275563.00	Very effective
78	Panchkula	Khetpurali	Bel Wala Choe	Wire Create Structure No-2,Bel Wala Choe	1	408879.00	Very effective
79	Panchkula	Khetpurali	Belka Wala Choe	CSMS No-1, Belka Wala Choe	1	555161.00	Very effective
80	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 1	1	257294.53	Very effective
81	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 2	1	482172.08	Very effective

82	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 3	1	514017.25	Very effective
83	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 4	1	420853.69	Very effective
84	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 5	1	565797.50	Very effective
85	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 6	1	428932.60	Very effective
86	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 7	1	471795.25	Very effective
87	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 8	1	494966.13	Very effective
88	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 9	1	416056.00	Very effective
89	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 10	1	525669.97	Very effective
90	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 11	1	488363.23	Very effective
91	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 12	1	488363.23	Very effective
92	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 13	1	271681.23	Very effective
93	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 14	1	357587.04	Very effective

94	Raipur Rani	Trilokpur	Palasara Ka Khala	Wire Crate Str. 15	1	264106.35	Very effective
95	Morni	Morni	Ghaggar River	C.C. Stud-1	1	932735.00	Very effective
96	Morni	Morni	Ghaggar River	C.C. Stud-2	1	932760.00	Very effective
97	Morni	Morni	Ghaggar River	C.C. Stud-3	1	932916.00	Very effective
98	Morni	Morni	Ghaggar River	C.C. Stud-4	1	932976.00	Very effective
99	Morni	Morni	Ghaggar River	C.C. Stud-5	1	932876.00	Very effective
100	Morni	Koti	Near Vill. Khati/Jabal Choe	RCC Structure	1	1056880.00	Very effective
101	Morni	Koti	Ghaggar River, C-200	C.C. Stud-1	1	1001339.00	Very effective
102	Morni	Koti	Ghaggar River, C-200	C.C. Stud-2	1	992341.00	Very effective
103	Morni	Koti	Ghaggar River, C-200	C.C. Stud-3	1	922072.00	Very effective
104	Morni	Koti	Ghaggar River, C-208	C.C. Stud-1	1	1001100.00	Very effective
105	Morni	Koti	Ghaggar River, C-208	C.C. Stud-2	1	1001300.00	Very effective

106	Momi	Koti	Ghaggar River, C-208	C.C. Stud-3	1	1001499.00	Very effective
107	Momi	Koti	Ghaggar River, C-208	C.C. Stud-4	1	1001433.00	Very effective
108	Momi	Koti	Barisher to Badar Path/Kathi Mammal Choe	R.Wall-1	1	969675.00	Very effective
109	Momi	Koti	Barisher to Badar Path/Kathi Mammal Choe	B.Wall-1	1	583439.00	Very effective
110	Momi	Koti	Barisher to Badar Path/Kathi Mammal Choe	R.Wall-2	1	347308.00	Very effective
111	Momi	Koti	Barisher to Karag/Koti Choe	R. Wall-1	1	721299.00	Very effective
112	Momi	Koti	Barisher to Karag/Koti Choe	R. Wall-2	1	408240.00	Very effective
113	Pinjore	Bhawana	DP 235, C-3	Wire Crate Structure No. 1	1	350332.00	Very effective
114	Pinjore	Pinjore	Bitna Sec. 4&5	Wire Crate Structure No. 1	1	354639.00	Very effective
115	Pinjore	Pinjore	Bitna Sec. 4&5	Wire Crate Structure No. 2	1	532959.00	Very effective
116	Pinjore	Pinjore	Bitna Sec. 4&5	Wire Crate Structure No. 3	1	416051.00	Very effective
117	Pinjore	Pinjore	Bitna Sec. 4&5	Wire Crate Structure No. 4	1	245655.00	Very effective

118	Pinjore	Pinjore	Bitna Sec. 4&5	Wire Crate Structure No. 5	1	272614.00	Very effective
119	Pinjore	Pinjore	Bitna Sec. 4&5	Wire Crate Structure No. 6	1	373143.00	Very effective
120	Pinjore	Pinjore	Bitna Sectio-4 & 5	RCC Dam	1	5801482.00	Very effective
121	Pinjore	Janouli	R-63, C-3	SMCS No-1	1	420210.00	Very effective
122	Pinjore	Janouli	R-63, C-3	SMCS No-2	1	455667.00	Very effective
123	Pinjore	Janouli	R-63, C-3	SMCS No-3	1	483604.00	Very effective
124	Pinjore	Janouli	R-63, C-3	SMCS No-4	1	449293.00	Very effective
125	Pinjore	Janouli	R-63, C-3	SMCS No-5	1	465010.00	Very effective
126	Pinjore	Janouli	R-63, C-3	SMCS No-6	1	450382.00	Very effective
127	Pinjore	Thapli	C-119	Wire Crate Structure No. 1	1	357987.00	Very effective
128	Pinjore	Thapli	C-119	Wire Crate Str. No 2	1	390049.00	Very effective
129	Pinjore	Thapli	C-119	Wire Crate Str. No 3	1	387810.00	Very effective

130	Pinjore	Thapli	C-119	Wire Crate Str. No 4	1	393683.00	Very effective
131	Pinjore	Thapli	C-119	Wire Crate Str. No 5	1	625633.00	Very effective
132	Pinjore	Thapli	C-119	Wire Crate Str. No 6	1	354598.00	Very effective
133	Pinjore	Thapli	C-119	Wire Crate Str. No 7	1	387809.00	Very effective
134	Pinjore	Thapli	C-119	Wire Crate Str. No 8	1	354590.00	Very effective
135	Pinjore	Thapli	C-119	Wire Crate Str. No 9	1	354591.00	Very effective
136	Pinjore	Thapli	C-119	Wire Crate Str. No 10	1	358030.00	Very effective
137	Pinjore	Thapli	C-119	Wire Crate Str. No 11	1	358035.00	Very effective
138	Pinjore	Thapli	C-119	Wire Crate Str. No 12	1	384370.00	Very effective
139	Pinjore	Thapli	C-119	Wire Crate Str. No 13	1	403139.00	Very effective
140	Pinjore	Thapli	C-119	Wire Crate Str. No 14	1	385744.00	Very effective

Figure 6.29: Check Dam (CC)

Figure 6.30: Check Dam (Stone)

Figure 6.31: Dam

Figure 6.32: RCC Dam

Figure 6.33: Retaining Wall

Table 6.38: Score obtained by the SMC Works

	Scoring components	Full score	Obtained score
1	Working status	20	20
2	Site suitability	20	20
3	Measurement as per the APO	20	20
4	Fulfilling design specification	20	20
5	Measurement book	20	10
	TOTAL	**100**	**90**

6.5 YAMUNANAGAR DIVISION

Table 6.39: CA (Compensatory Afforestation) plantation sites evaluated in Yamunanagar division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (FL)	Date of visit
					2019-20							June-July, 2023
2019-2020	Chhachhrauli	Ganouli R.F.	CATP	Ganouli R.F.	8.18 Ha	8.18 Ha	8180	8180	2699	33	5.1	
2019-2020	Kalesar	Khizorabad R.F.	CATP	sl.no.2 Khizaraba RF	3.39 Ha	3.39 Ha	3390	3390	3187	94	5.3	
					2021-22							
2021-2022	Jagadhri	Dadupur	CATP	Devdhar PF D-III-8573	3.8 Ha	3.8 Ha	5000	5000	4350	87	5.3	
2021-2022	Jagadhri	Dadupur	CATP	Devdhar PF D-III-5974	3.8 Ha	3.8 Ha	3800	3800	3230	85	5.5	
2021-2022	Jagadhri	Mazadwala	CATP	Muzadwala P.F D-III-7080	4.56 Ha	4.56 Ha	21000	21000	19530	93	5.4	
2021-2022	Chhachhrauli	Balachour RF	CATP	Balachour PF C-2	12.6 Ha	12.6 Ha	5000	5000	4400	88	5.5	
2021-2022	Chhachhrauli	Kot	CATP	Bansantour C-2 39, 40	32 RKM	32 RKM	12600	12600	11214	89	4.8	

2021-22	Chhachhrauli	Kot	CA	Kot Ahmed Majra	0.864 ha	0.864 ha	5000	5000	4520	90.4	4.8	

Table 6.40: NPV (Net Present Value) plantation sites evaluated in Yamunanagar division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20												June-July, 2023
2019-2020	Jagadhri	Yamuna nagar	NPV-TP	Jorion Harnoul Kheri Lakha Singh Road	5 RKM	5 RKM	1250	1250	1188	95	5.2	
2019-2020	Jagadhri	Yamuna nagar	NPV-TP	Werstrn Jamuna Canal (WJC)	10 RKM	10 RKM	2500	2500	2075	83	5.3	
2019-2020	Jagadhri	Yamuna nagar	NPV-TP	NH-344KM(82-86KM)	5 RKM	5 RKM	1250	1250	1100	88	6	
2019-2020	Jagadhri	Jagadhri YNR	NPV-TP	NH-344 km 86-90	5 RKM	5 RKM	1250	1250	1150	92	5.6	
2019-2020	Jagadhri	Jagadhri YNR	NPV-TP	Damla Tubewell Channel	5 RKM	5 RKM	1250	1250	1138	91	5.5	
2020-21												

2020-202	Jagadhri	Radaur	NPV-TP	Chaitang Drain Bapouli Bridge to SK road Bridge	10 RKM	10 RKM	1250	1250	1138	91	5.8
2020-202	Chhachhraul i	Chhachhraul i	NPV-TP	Chhachhraul i RF C-II	10 RKM	10 RKM	1200	1200	576	48	5.6
2020-202	Kalesar	Khillanwala	NPV-TP	Ragadwali	20 RKM	20 RKM	4250	4250	3570	84	5.5
					2021-22						
2021-202	Chhachhraul i	Chhachhraul i	NPV-TP	Balachour PF Plantation	20 RKM	20 RKM	4566	4566	3470	76	4.8
2021-202	Kalesar	Khizorabad	NPV-TP	Chuhadpur RF	20 RKM	20 RKM	8000	8000	7096	88.7	5.3
2021-202	Kalesar	Khizrabad	NPV-TP	WJC 0 to 5 L&R	20 RKM	20 RKM	5000	5000	4480	89.6	5
2021-202	Kalesar	Tajewala	NPV-TP	Hydal Channal L&R 3100 to 9400	20 RKM	20 RKM	5000	5000	4505	90.1	5.1

6.5.1. Relevance

6.5.1.1 Site Suitability

- Roadside plantations have performed well

Most of the roadside plantations were situated adjacent to agricultural fields (Figure 6.34). Fertilizers and manures applied to the agricultural crop also benefitted the planted saplings. Planted saplings also have a steady supply of water from the irrigated agricultural field. Some of the roadside plantations have barbed wire fencing as a protection measure which prevents grazing and other anthropogenic activities.

Figure 6.34: Roadside plantation showed good results

- Abundance of invasive species

In Yamunanagar division, the presence of invasive species such as *Prosopis juliflora, Parthenium hysterophorus, Argemone mexicana,* etc. was observed in most of the sites (Figure 6.35). Most of the planted species under the canopy of *Prosopis* were found to be stunted. The presence of these invasive species could be detrimental to the planted saplings, as well as the native flora. Pre-plantation eradication and frequent weeding after are highly recommended to secure the survival of the plantation.

Figure 6.35: Presence of Parthenium and Lantana in the plantation site

6.5.1.2. Species suitability

- Overall, the species selection in the Yamuna Nagar division was found to be satisfactory.
- A total of 26 planted species were noted in the sample sites during the evaluation.
- Out of the 26 species, Sheesham (*Dalbergia sissoo*), Jamun (*Syzygium cumini*), and Arjun (*Terminalia arjuna*) were found to be the dominant species.
- Fruit-bearing species such as Mango (*Mangifera indica*), Kadam (*Neolamarckia cadamba*), Jamun (*Syzygium cumini*), Mahua (*Madhuca indica*), and Imli (*Tamarindus indica*) were planted in the plantations.
- Plants with medicinal properties such as Putranjiva (*Putranjeeva roxburghii*), Harra (*Terminali chebula*), Baheda (*Terminalia bellirica*), Amla (*Phyllanthus emblica*), Reetha (*Sapindus sp.*) were planted.
- Fast-growing *Ficus* species such as Bargat (*Ficus benghalensis*), Gular (*Ficus glomerata*), Pilkhan (*Ficus virens*), Pipal (*Ficus religiosa*) etc were planted.

Table 6.41: Planted species found in the plantation of Yamunanagar Division

Sr. No.	Planted Species	
	Local Name	**Botanical Name**
1	Amla	*Phyllanthus emblica*
2	Arjun	*Terminalia arjuna*
3	Bahera	*Terminalia bellirica*
4	Bargad	*Ficus benghalensis*
5	Gular	*Ficus glomerata*
6	Harra	*Terminalia chebula*
7	Imli	*Tamarindus indica*
8	Jamoa	*Eugenia cuspidata*
9	Jamun	*Syzygium cumini*
10	Kachnar	*Bauhinia variegata*
11	Kadam	*Neolamarckia cadamba*
12	Kusum	*Schleichera oleosa*
13	Lagerstroemia	*Lagerstroemia speciosa*
14	Mahua	*Maduca indica*
15	Mango	*Mangifera indica*
16	Neem	*Azadirachta indica*
17	Papri	*Holoptelea integrifolia*

18	Pilkhan	*Ficus recemosa*
19	Pipal	*Ficus religiosa*
20	Pipli	*Exbucklandia populnea*
21	Putranjiva	*Putranjiva roxburghii*
22	Ritha	*Sapindus mukorossi*
23	Shisham	*Dalbergia sissoo*
24	Silver Oak	*Grevillea robusta*
25	Siras	*Albizia procera*
26	Toon	*Toona ciliata*

6.5.2 Effectiveness

6.5.2.1 Survival of the Plantation

The overall survival rate of plantations in the Yamunanagar division was found to be very good at 78.6%. Among the three plantation years, the highest survival rate was observed in the plantations carried out during 2019-20, with a rate of 82.29%. Conversely, the lowest survival rate was recorded for the plantations from 2020-21, which had a survival rate of only 74.33% (Table 6.42).

Table 6.42: Year-wise survival rate and average height of the plantation sites

Plantation Year	Survival (%)	Av. Height (ft.)
2019-20	82.29	5.43
2020-21	74.33	5.63
2021-22	79.18	4.60
Average	**78.60**	

6.5.2.2 Growth of the planted species

Sheesham (*Dalbergia sisoo*), and Gular (*Ficus glomerata*) were found to be the highest-growing species for the year 2019-20, 2020-21 and 2021-22 respectively (Table 6.43).

Table 6.43: Average height of different plant species across three plantation years

Sr. No.	Planted Species		Plantation year		
	Local Name	Botanical Name	2019-20	2020-21	2021-22
1	Amla	*Phyllanthus emblica*	-	5.3	4.5
2	Arjun	*Terminalia arjuna*	5.4	5.6	4.8
3	Bahera	*Terminalia bellirica*	5.4	-	5.0

4	Bargad	*Ficus benghalensis*	-	-	5.6
5	Gular	*Ficus glomerata*	5.6	-	6.1
6	Harra	*Terminalia chebula*	-	-	5.0
7	Imli	*Tamarindus indica*	-	-	4.0
8	Jamoa	*Eugenia cuspidata*	-	5.6	4.5
9	Jamun	*Syzygium cumini*	5.1	5.5	4.9
10	Kachnar	*Bauhinia variegata*	5.5	-	4.8
11	Kadam	*Neolamarckia cadamba*	-	-	5.6
12	Kusum	*Schleichera oleosa*	-	-	4.5
13	Lagerstroemia	*Lagerstroemia speciosa*	-	-	5.6
14	Mahua	*Maduca indica*	-	5.7	5.5
15	Mango	*Mangifera indica*	-	-	5.9
16	Neem	*Azadirachta indica*	-	-	5.5
17	Papri	*Holoptelea integrifolia*	-	-	5.1
18	Pilkhan	*Ficus recemosa*	-	-	6.0
19	Pipal	*Ficus religiosa*	-	-	5.0
20	Pipli	*Exbucklandia populnea*	-	-	4.6
21	Putranjiva	*Putranjiva roxburghii*	-	-	4.0
22	Ritha	*Sapindus mukorossi*	-	5.5	4.5
23	Shisham	*Dalbergia sissoo*	6.0	6.0	5.6
24	Silver Oak	*Grevillea robusta*	-	5.4	-
25	Siras	*Albizia procera*	4.6	-	-
26	Toon	*Toona ciliata*	-	-	4.8

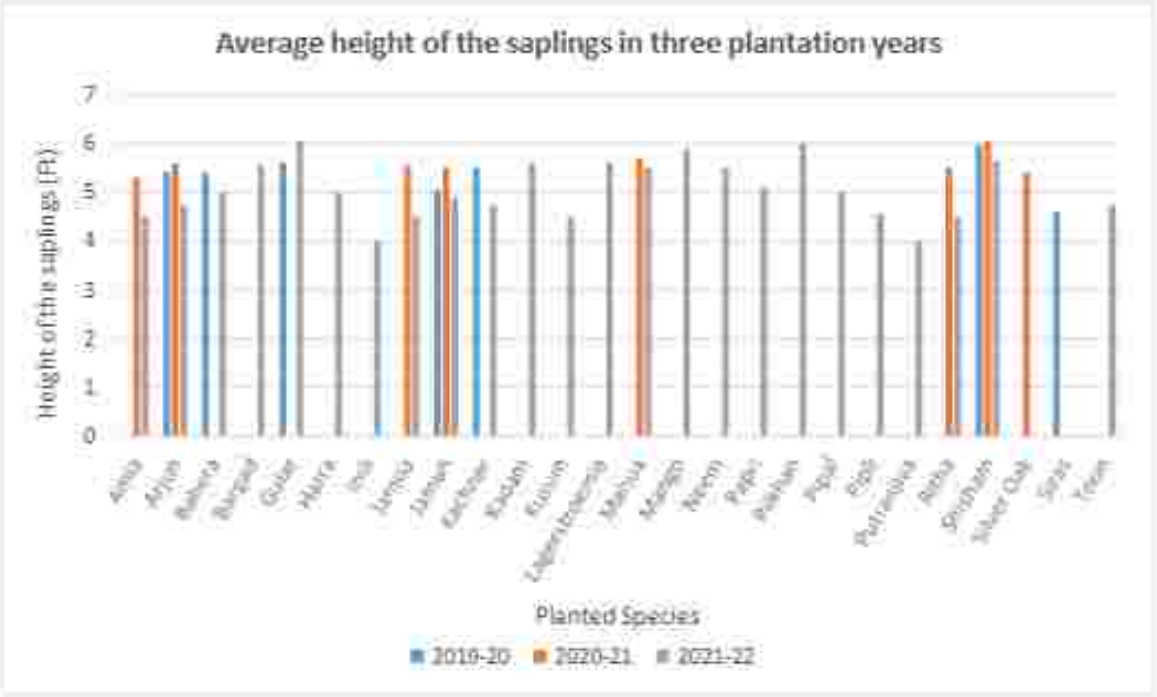


Figure 6.36. Growth of the planted species in three plantation years

6.5.3. Sustainability

6.5.3.1 Protection

Most of the plantation sites are found without any proper protection measures such as fencing, tree guards, cattle-proof trenches etc., making these plantation sites prone to the damage inflicted by grazing and browsing animals. Adequate protection measures should be taken before conducting plantation activities to avoid damage to the plantation by grazing animals, trespassers, and unauthorised harvesting.

6.5.4.2 Monitoring

Regular monitoring of the plantation is reported in all the plantation sites of the division. Chowkidaar/Watchers have been appointed in all the forest ranges to take care of plantation sites.

6.5.4.3 Maintenance

The written information/evidence/records for maintenance/replacement of plants such as plantation journals, APOs, plantation maps etc., have not been maintained in any forest range. This is one of the major shortcomings seen across the ranges of the Yamuna Nagar division.

6.5.4. Scoring of the plantation works

The plantations carried out under the CAMPA scheme in the year of 2019-20, 2020-21 and 2021-22 scored an average of 178.7, out of 250 (Table 6.44). Overall, the score obtained was satisfactory, considering severe anthropogenic disturbances observed in most of the plantation sites.

Table 6.44. Scores obtained by the plantation in Yamuna Nagar

Sr. No.	Components	Full score	Obtained score
1	Survival	100	74.6

2	Growth	20	18.2
3	Species suitability	10	9.9
4	Site suitability	10	10.4
5	Protection	20	4.1
6	Extent	20	20.0
7	Plantation Journal	20	12.6
8	Plantation Map	10	5.9
9	Invasive Species	10	2.6
10	Species composition	10	9.9
11	Weeding and hoeing	10	2.6
12	Watch and ward	10	7.9
	Total	**250**	**178.7**

6.5.5. Non-Plantation Activity

6.5.5.1. Fencing

Three sample fencing sites were evaluated in Yamunanagar Division. Both of the fencings are intact and working effectively.

Table 6.45: Details of evaluated fencing sites in Yamunanagar division

Sl. No	Range	Barbed wire Fence ID	Length in measurement Book	Actual Length in field (RKM)	% Variation (+/-)	Present status	Effectiveness
1	Jagadhri	Kalawad link Road	2 RKM	2	nil	Intact	Effective
2	Jagadhri	Sugh tubewell chanal	5 RKM	5	nil	Intact	Effective
3	Jagadhri	Kotakhana	4 RKM	4	nil	Intact	Effective

Figure 6.37: Fencing site in Jagadhri Range

6.5.5.2. Soil and Moisture Conservation (SMC) works

A total of 121 SMC sites were evaluated in Yamunanagar Division. These SMCs include CC Studs, Crate Wire Walls, Abutment Walls, Wire Crate spur, Dry Stone walls and Check Dams (Table 6.46).

Table 6.46: SMC Sites evaluated in Yamunanagar Division

Sl. No.	Year	Components	Range	Name	Size in Measurement Book	Actual Size (Width * Depth* Length) in field	Expenditure (Rs.)
1	2020-2021	SMC	Jagadhri	CC Stud 1	NA	3(1.2)	169939
2	2020-2021	SMC	Jagadhri	CC Stud 2	NA	3(1.2)	169939
3	2020-2021	SMC	Jagadhri	CC Stud 3	NA	3(1.2)	169939
4	2020-2021	SMC	Jagadhri	CC Stud 4	NA	3(1.2)	169939
5	2020-2021	SMC	Jagadhri	CC Stud 5	NA	3(1.2)	169939
6	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
7	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
8	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
9	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
10	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
11	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
12	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
13	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561

14	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
15	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
16	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
17	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
18	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
19	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
20	2020-2021	SMC	Jagadhri	Bir Tapu RF on Yamuna River	NA	10(1.2L*2W*1.2D)	839561
21	2020-2021	SMC	Chhachhrauli	Chhachhrauli Soom Nadi CC Stud 1	NA	7 block (1.5D*1.5W)	544240
22	2020-2021	SMC	Chhachhrauli	Chhachhrauli Soom Nadi CC Stud 2	NA	45 blocks upper (1.5m*1.5m)	176497
23	2020-2021	SMC	Chhachhrauli	Chhachhra CC Stud 1	NA	14.9L*2.4W*1.2D	3491272
24	2020-2021	CC Stud	Chhachhrauli	Chhachhra CC Stud 2	NA	14.9L*2.4W*1.2D	
25	2020-2021	CC Stud	Chhachhrauli	Chhachhra CC Stud 3	NA	14.9L*2.4W*1.2D	
26	2020-2021	CC Stud	Chhachhrauli	Chhachhra CC Stud 4	NA	14.9L*2.4W*1.2D	
27	2020-2021	Wire crate	Chhachhrauli	Wire crate spur no 1(chand sot)	NA	1.5W*5.1L*1D	

28	2020-2021	Wire crate	Chhachhraul i	Wire crate spur no 2(chand sot)	NA	upper = 1.5W*1D*4.5L, foundation 2.1W*0.1D*5L
29	2020-2021	Wire crate	Chhachhraul i	Wire crate spur no 3(chand sot)	NA	upper = 1.5W*1D*4.6L, foundation 2W*0.1D*5L
30	2020-2021	Wire crate	Chhachhraul i	Wire crate spur no 4(chand sot)	NA	upper = 1.5W*1D*5L, foundation 2W*0.2D*6L
31	2020-2021	Crate Abutment	Chhachhraul i	Crate Abutment Wall no.2 (Chand Sot)	NA	1.5W*1.2D*33.5L
32	2020-2021	Crate Abutment	Chhachhraul i	Crate wall Abutment 1	NA	1.4W*1.1D*35L
33	2020-2021	Crate Abutment	Chhachhraul i	Crate wall Abutment 2	NA	1.5W*1D*47L
34	2020-2021	Wire crate	Chhachhraul i	Crate wire structure no.2	NA	2W*P1=1.5D, Dam stage =0.8*6.32L,entire structure length=5.15m
35	2020-2021	Wire crate	Chhachhraul i	Crate wire structure no.1	NA	8.7L*2W*1.2D,total=1.5 D, Entire structure length=5.2m
36	2020-21	Spur	Chhachhraul i	spur no.1	NA	1.5W*1.65D*11.25L
37	2020-21	Spur	Chhachhraul i	spur no.2	NA	1.5W*1.65D*11.25L
38	2020-21	Spur	Chhachhraul i	spur no.3	NA	1.5W*1.65D*11.25L
39	2020-21	Spur	Chhachhraul i	spur no.4	NA	1.5W*1.65D*11.25L

40	2020-21	Spur	Chhachhraul i	spur no.5	NA	1.5W*1.65D*11.25L	
41	2020-21	Spur	Chhachhraul i	spur no.6	NA	Destroyed	
42	2020-21	Spur	Chhachhraul i	spur no.7	NA	1.77W*1.3D*9.47L	
43	2020-21	Spur	Chhachhraul i	spur no.8	NA	1.47W*1.19D*11.57L	
44	2020-21	Spur	Chhachhraul i	spur no.9	NA	1.33*1.6*11.3	
45	2020-21	Spur	Chhachhraul i	spur no.10	NA	1.55W*10.95L*1.5D	
46	2020-21	Wire crate	Kalesar range	Khizrabad Bagpat main khala	NA	15L*1.5W*0.5D, 15L*2W*0.5D, 15L*2.5W*1D, total D=2	233565
47	2020-21	Wire crate	Kalesar range	Khizrabad Bagpat main khala	NA	15L*1.5W*0.5D, 15L*2W*0.5D, 15L*2.5W*1D, total D=2	233565
48	2020-21	Wire crate	Kalesar range	Khizrabad Bagpat main khala	NA	15L*1.5W*0.5D, 15L*2W*0.5D, 15L*2.5W*1D, total D=2	233565

49	2020-21	Abutment wall	Kalesar range	Urjani Abutment wall	NA	w=1.5m+1.5m=3m, H=0.5+1m+1m=1.5m L=6.3+118=124.3m upper=30.4L*1.5W*1mH mid=87.6L*1.5W*0.5H lower=124.3L*1.5W*1mH	4147445.00
50	2020-21	Abutment wall	Kalesar range	Urjani Abutment wall	NA	w=1.5m+1.5m=3m, H=0.5+1m+1m=1.5m L=6.3+118=124.3m upper=30.4L*1.5W*1mH mid=87.6L*1.5W*0.5H lower=124.3L*1.5W*1mH	
51	2020-21	CC stud	Kalesar range	Khillanwala Khizri naked main Khala, Khizri	NA	3*7=21	71085
52	2020-21	CC stud	Kalesar range	Khillanwala Khizri naked main Khala, Khizri	NA	upper=2*9*1.2 middle= 3*9*1.2	71085
53	2020-21	CC stud	Kalesar range	Khillanwala Khizri naked main Khala, Khizri	NA	upper=2*9*1.2 middle= 3*9*1.2	71085
54	2020-21	CC stud	Kalesar range	Khillanwala Khizri naked main Khala, Khizri	NA	upper=2*9*1.2 middle= 3*9*1.2	71085
55	2020-21	Dry stone	Kalesar range	Khillanwala Kansli RF Ragadwali Dry stone	NA	1.5D*7L*1W	1057505
56	2020-21	Dry stone	Kalesar range	Khillanwala Kansli RF Ragadwali Dry stone	NA	1.2D*5L*1W	
57	2020-21	Dry stone	Kalesar range	Khillanwala Kansli RF Ragadwali Dry stone	NA	1.2D*5L*1W	
58	2020-21	Dry stone	Kalesar range	Khillanwala Kansli RF Ragadwali Dry stone	NA	1D*4L*1W	

59	2020-21	Dry stone	Kalesar range	Khillanwala Kansli RF Ragadwali Dry stone	NA	1D*4L*1W	
60	2020-21	Dry stone	Kalesar range	Khillanwala Kansli RF Ragadwali Dry stone	NA	1.2*5L*1W	
61	2020-21	CC stud	Kalesar range	Khillanwala Kansli RF main khala	NA	1.2(D*W) Side(S)=1.2m bed foundation = 3*10* S(cube) means= 3*10*1.2	124056
62	2020-21	Check dam	Kalesar range	Kalesar RF Thathwali kholi drystone checkdam	NA	Total =560.32meter L=2.70+4.85meter W= 1.8m H= 2.3m	1773882
63	2020-21	Check dam	Kalesar range	Kalesar RF Gugga kholi drystone checkdam	NA	L=5.2meter W= 1.5meter H= 2.2meter	
64	2020-21	Check dam	Kalesar range	RF Matoliyawala khda drystone checkdam	NA	L=5.2meter W= 1meter H= 1.2meter	
65	2020-21	Check dam	Kalesar range	RF Matoliyawala khda drystone checkdam	NA	L= 4.8meter W= 1meter H= 1.4 meter	
66	2020-21	CC stud	Sadhaura	Malikpur Bangar	NA	upper= 2*9*1.2m	2166173
67	2020-21	CC stud	Sadhaura	Malikpur Bangar	NA		
68	2020-21	CC stud	Sadhaura	Malikpur Bangar	NA		
69	2020-21	RCC structure	Sadhaura	Sadhaura Ranjitpur Dhanoura sec 4*4	NA		3526479

70	2020-21	RCC structure	Sadhaura	Sadhaura Ranjitpur Dhanoura sec 4*4	NA			
71	2020-21	RCC structure	Sadhaura	RCC structure	NA			
72	2020-21	RCC structure	Sadhaura	RCC structure	NA			
73	2020-21	Wire crate	Sadhaura	Sadhaura range Ranjitpur SB pur RF crate wire	NA	length= width= W1.7w+2.3W	7L+4L+7L=13L	
74	2020-21	Wire crate	Sadhaura	Sadhaura range Ranjitpur SB pur RF crate wire	NA	length= width= W1.7w+2.3W	5.5L+4L+5.5L	
75	2020-21	Dry stone	Sadhaura	Dry stone 1	NA	1.2*1.3*3.5		3526479
76	2020-21	Dry stone	Sadhaura	Dry stone 2	NA	1.2*1*3.3		
77	2020-21	Dry stone	Sadhaura	Dry stone 3	NA	1*1.1*3.1		
78	2020-21	Dry stone	Sadhaura	Dry stone 4	NA	1.1*1.4*3.4		
79	2021-2022	SMC	Jagadhri	Retaining wall	NA	57L*4.5W*1.2D		19,04,704
80	2021-2022	SMC	Jagadhri	Retaining wall	NA	72L*4.5W*1.2D		36,00,271
81	2021-2022	SMC	Jagadhri	Retaining wall	NA	33L*4.5W*1.2D		19,04,704
82	2020-21	Checkdam	Sadhaura	Checkdam	NA	wall length= Width= 1.25H	width=0.5m 8.3L+6mL+8.3L 0.5w	3526479

83	2020-21	Checkdam	Sadhaura	Checkdam	NA	wall length= Width= 1.25H	width=0.5m 8.3L+6mL+8.3L 0.5w
84	2020-21	Checkdam	Sadhaura	Checkdam	NA	wall length= Width= 1.25H	width=0.5m 8.3L+6mL+8.3L 0.5w
85	2020-21	Checkdam	Sadhaura	Checkdam	NA	wall length= Width= 1.25H	width=0.5m 8.3L+6mL+8.3L 0.5w
86	2020-21	CC stud	Sadhaura	CC stud	NA	block = s*s =1.5m =5L*3W*1.5mH foundation block= 4*5(estimate value differ)	4351283
87	2020-21	CC stud	Sadhaura	CC stud	NA	block = s*s =1.5m =5L*3W*1.5mH foundation block= 4*5(estimate value differ)	
88	2020-21	CC stud	Sadhaura	CC stud	NA	block = s*s =1.5m =5L*3W*1.5mH foundation block= 4*5(estimate value differ)	
89	2020-21	CC stud	Sadhaura	CC stud	NA	block = s*s =1.5m =5L*3W*1.5mH foundation block= 4*5(estimate value differ)	
90	2020-21	CC stud	Sadhaura	CC stud	NA	block = s*s =1.5m =5L*3W*1.5mH foundation block= 4*5(estimate value differ)	
91	2020-21	CC stud	Sadhaura	CC stud	NA	block = s*s =1.5m =5L*3W*1.5mH foundation block= 4*5(estimate value differ)	

92	2020-21	CC stud	Sadhaura	CC stud	NA	7L*3W*1.5mH	2166173
93	2020-21	CC stud	Kalesar	Kalesar Khizrabad Bagpat main khala	NA	7mL*3mW*1.2mH	233565
94	2020-21	CC stud	Kalesar	Kalesar Khizrabad Bagpat main khala	NA	7mL*3mW*1.2mH	
95	2020-21	CC stud	Kalesar	Kalesar Khizrabad Bagpat main khala	NA	7mL*3mW*1.2mH	
96	2020-21	CC stud	Kalesar	Kalesar, Khizrabad Ambwlali, main khala	NA	9L*3W*1.2mH	264031
97	2020-21	CC stud	Kalesar	Kalesar, Khizrabad Ambwlali, main khala	NA	3L*8W*1.2H	
98	2020-21	CC stud	Kalesar	Kalesar, Khizrabad Ambwlali, main khala	NA	3L*6W*1.2H	
99	2020-21	Wire crate	Kalesar	Kalesar, Khizrabad Ambwlali, main khala	NA	13L*2D*1.5W	124056
100	2020-21	Wire crate	Kalesar	Kalesar, Khizrabad Ambwlali, main khala	NA	13L*2.5W*2D, Foundation 7w*16L*1D	
101	2021-22	Wire crate	Kalesar	Kalesar, Khizrabad Ambwlali, main khala	NA	2.5W*13L*2D	
102	2021-22	Wire crate	Kalesar	Khillanwala Khizri naked main Khala, Khizri	NA	9L*1.5W*2D	71085
103	2021-22	Wire crate	Kalesar	Khillanwala Khizri naked main Khala, Khizri	NA	9L*1.5W*2D	71085
104	2021-22	Wire crate	Kalesar	Khillanwala Khizri naked main Khala, Khizri	NA	14L*1.5W*2D	71085
105	2021-22	CC stud	Kalesar	Ambawali Khol Chakbaba Sahib RF	NA	12L*2W*1.2m S=1.2m	4796229.00

106	2021-22	CC stud	Kalesar	Ambawali Khol Chakbaba Sahib RF	NA	12L*2W*1.2mh S=1.2m Foundation=12*5*1.2
107	2021-22	CC stud	Kalesar	Ambawali Khol Chakbaba Sahib RF	NA	12L*2W*1.2mh S=1.2m Foundation=12*5*1.2
108	2021-22	CC stud	Kalesar	Ambawali Khol Chakbaba Sahib RF	NA	12L*2W*1.2mh S=1.2m Foundation=12*5*1.2
109	2021-22	CC stud	Kalesar	Ambawali Khol Chakbaba Sahib RF	NA	12L*2W*1.2mh S=1.2m Foundation=12*5*1.2
110	2021-22	CC stud	Kalesar	Ambawali Khol Chakbaba Sahib RF	NA	12L*2W*1.2mh S=1.2m Foundation=12*5*1.2
111	2021-22	CC stud	Kalesar	Ambawali Khol Chakbaba Sahib RF	NA	12L*2W*1.2mh S=1.2m Foundation=12*5*1.2
112	2021-22	CC stud	Kalesar	Ambawali Khol Chakbaba Sahib RF	NA	12L*2W*1.2mh S=1.2m Foundation=12*5*1.2
113	2021-22	CC stud	Kalesar	Ambawali Khol Chakbaba Sahib RF	NA	12L*2W*1.2mh S=1.2m Foundation=12*5*1.2
114	2021-22	CC stud	Kalesar	Ambawali Khol Chakbaba Sahib RF	NA	12L*2W*1.2mh S=1.2m Foundation=12*5*1.2

115	2021-22	CC stud	Kalesar	Yamuna River Mandewala PF	NA	Side(s)=1.5m upper first line= 12*Side mid= 2line*12 foundation=3line*12	9467994
116	2021-22	CC stud	Kalesar	Yamuna River Mandewala PF	NA	1stud=S=(1.5m)2 step 1 upper=12*1stud step 2=24*1stud foundation step 3= 36 stud foundation step 4 = 60 stud	
117	2021-22	CC stud	Kalesar	Yamuna River Mandewala PF	NA	1stud=Side(s)=1.5m upper = 1*12*1.5 mid = 2*12*1.5 foundation= 3*12*1.5	
118	2021-22	CC stud	Kalesar	Yamuna River Mandewala PF	NA	Side(s)=1.5m upper first line= 11*1.5*1 mid= 2*11*1.5 lower = 3*11*1.5	
119	2021-22	CC stud	Kalesar	Yamuna River Mandewala PF	NA	Side(s)=1.5m=s*s upper = 11*1.5 mid = 2*11*1.5 lower = 3*11*1.5	
120	2021-22	CC stud	Kalesar	Yamuna River Mandewala PF	NA	1 stud=Side*side=1.5 upper = 11*1.5 middle = 2*11*1.5 lower = 3*11*1.5	
121	2021-22	CC stud	Kalesar	Yamuna River Mandewala PF	NA	upper= 11*1.5 mid = 2*11*1.5 lower = 3*11*1.5m	

Figure 6.38: CC Stud

Figure 6.39: Crate Wired Wall

Figure 6.5.7: Abutment Wall

Figure 6.40: Check Dam

6.5.5.3. Civil Works: Building

All the building works were found effective and compliant with the required standards.

Table 6.47: Details of evaluated Civil Works in Yamunanagar division

Sr. No	Range	Building Name/ ID	Expenditure as per the APO	Actual Expenditure
1	Chhachhrauli	Chhachharauli Head quarter	12,00,000	12,00,000
2	Kalesar	Kalesar Range office	29,21,000	29,21,000

Figure 6.41: Civil Works (Building) in Kalesar Range

Table 6.46: Effectiveness of civil works (Building)

Sr. No	Components	Effectiveness
1	Site Location	Good
2	Serving the intended purpose	Good
3	Structurally sound and free of cracks	Good
4	Free of dampness and leakage	Good
5	Overall finish and look	Good

6.5.5.4. Scoring of the Non-plantation activities

Table 6.49: Score obtained by the fencing sites in Yamunanagar division

	Scoring components	Full score	Obtained score
1	Working Status	20	20
2	Serving the purpose intended	20	20
3	Actual extent	20	20
4	Site suitability	10	10
5	Measurement book	10	10
6	Expenditure as per the APO	20	20
	TOTAL	**100**	**100**

Table 6.50: Score obtained by the SMC Works

	Scoring components	Full score	Obtained score
1	Working status	20	20
2	Site suitability	20	20
3	Measurement as per the APO	20	20
4	Fulfilling design specification	20	20
5	Measurement book	20	0
	TOTAL	**100**	**80**

7. Chapter 7: West Circle

The West circle consists of six divisions, Hisar, Jind, Sirsa, Fatehabad, Bhiwani and Chakhri-Dadri. Each and every division is unique in terms of the terrain, local vegetation, drivers of degradation, and results produced. The findings are categorized into three dimensions: Relevance, Effectiveness and Sustainability by measuring five principal variables namely site suitability, species selection, growth, survival and sustainability.

Table 7.1: Plantation Target and achievement for 2019-20

Divisions	CATP			NPVTP		
	Target (Ha)	Achieved (Ha)	Plants	Target (RKM)	Achieved (RKM)	Plants
Hisar	32.47	32.47	32468	30	30	7500
Sirsa	0.76	0.76	760	30	30	7500
Bhiwani	2.76	2.79	2789	40	40	10000
Fatehabad	29.04	29.04	29036	40	40	10000
Jind	1.74	1.74	1740	30	30	7500
Chakhri Dadri	0	0	0	30	30	7500

Divisions	NPV RIDGE		
	Target (RKM)	Achieved (RKM)	Plants
Hisar	9.5	9.5	9500
Sirsa	0	0	0
Bhiwani	0	0	0
Fatehabad	0	0	0
Jind	0	0	0
Chakhri Dadri	0	0	0

Table 7.2: Plantation Target and achievement for 2020-21

Divisions	CATP			NPVTP		
	Target (Ha)	Achieved (Ha)	Plants	Target (RKM)	Achieved (RKM)	Plants
Hisar	76.611	106.361	106361	100	100	25000

Sirsa	47.47	47.47	47470	100	100	25000
Bhiwani	18.1134	18.1134	18120	260	260	64500
Fatehabad	97.8	97.8	97800	300	300	75000
Jind	32.458	31.667	31658	225	225	56250
Chakhri Dadri	0	0	0	50	50	125

Divisions	NPV RIDGE			NPV ECO-RESTORATION		
	Target (RKM)	Achieved (RKM)	Plants	Target (RKM)	Achieved (RKM)	Plants
Hisar	0	0	0	0	0	0
Sirsa	0	0	0	0	0	0
Bhiwani	0	0	0	100	100	0
Fatehabad	0	0	0	0	0	0
Jind	23	23	6260	0	0	0
Chakhri Dadri	0	0	0	60	60	12000

Table 7.3: Plantation Target and achievement for 2021-22

Divisions	CATP			NPVTP		
	Target (Ha)	Achieved (Ha)	Plants	Target (RKM)	Achieved (RKM)	Plants
Hisar	150	150	150000	240	240	60000
Sirsa	190.32	190.32	190320	100	100	25000
Bhiwani	28.807	28.807	28807	300	300	75000
Fatehabad	16.642	16.646	16646	594	594	148500
Jind	114.633	114.633	114633	400	400	100000
Chakhri Dadri	0.118	0.12	120	50	50	12500

Divisions	NPV RIDGE			NPV ECO-RESTORATION		
	Target (RKM)	Achieved (RKM)	Plants	Target (RKM)	Achieved (RKM)	Plants
Hisar	0	0	0	0	0	0
Sirsa	73	73	36500	0	0	0
Bhiwani	0	0	0	0	0	0
Fatehabad	0	0	0	0	0	0
Jind	0	0	0	0	0	0
Chakhri Dadri	0	0	0	59	59	7800

7.1 SIRSA DIVISION

Table 7.4: CA (Compensatory Afforestation) plantation sites evaluated in Sirsa Division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (FL)	Date of visit
						2019-20						
2019-20	Rania	Ellenabad	CA	Ellenabad Distry. RD 44-49 L/R	0.76 ha	745 m	760	769	689	80.1	5.6	10.10.2023
						2020-21						
2020-21	Dabwali	Dabwali	CA	BMB (Bhakra main Branch) RD 325-449.5 LR	47.47 ha	32.4 ha	21280	21280	18250	85.8	6.7	07.10.2023
						2021-22						
2021-22	Sirsa	Ding	CA	Gigorani Distry. RD 25-57 L/R	9 ha	9.3 RKM	9004	9004	6668	74.1	5.7	06.10.2023
2021-22	Dabwali	Dabwali	CA	Mamarkhera Distry. RD 83-127 L/R	12 ha	13.1 RKM	12000	12000	9264	77.2	7.4	07.10.2023
2021-22	Dabwali	Dabwali	CA	Chautala Distry. RD 37-81 L/R	9 ha	13 RKM	9000	9000	6309	70.1	6	07.10.2023

2021-22	Dabwali	Dabwali	CA	Gang Canal RD 0-18 L/R	17 ha	6.4 RKM	17000	17000	10440	61.4	5.8	08.10.2023
2021-22	Rania	Rania	CA	Old Right Ghaghar Bandh 41-50 L/R	5 ha	3 RKM	5000	5000	4145	82.9	5.5	10.10.2023
2021-22	Rania	Rania	CA	Old lEFT Ghaghar Bandh 0-25 L/R	7 ha	8 RKM	7000	7000	5530	79.0	6.6	10.10.2023

Table 7.5: NPV (Net Present Value) plantation sites evaluated in Sirsa Division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20												
2019-20	Rania	Rania	NPV	Sheranwali Distry. RD and Kasaba Subminor RD 82-112 L/R and 0-8 L/R sides	15 RKM	11.8 RKM	3750	3750	2847	75.9	6.1	10.10.2023
2020-21												
2020-21	Sirsa	Ding	NPV	Kusumbi Minor RD 0-30 L/R	11 RKM	8.1RKM	2750	2750	1990	72.4	5.7	06.10.2023

2020-21	Sirsa	Ding	NPV	Kusumbi Minor RD 30-50 L/R	5 RKM	8.1RKM	1250	1250	963	77.0	5.9	06.10.2023
2020-21	Kalanwali	Rori	NPV	Ranga Minor RD 0-36 L/R	13 RKM	10.6RKM	3250	3250	2805	86.3	11.3	09.10.2023
2020-21	Kalanwali	Rori	NPV	Rori-Talwanid Road km 0-13 L/R	12 RKM	9.4 RKM	3000	3000	2390	79.7	5.7	09.10.2023
						2021-22						
2021-22	Sirsa	Nathusari	NPV	Bhattu-Jamal Road km 28-38 L/R	10 RKM	10.6 RKM	2500	2500	1940	77.6	5.7	05.10.2023
2021-22	Sirsa	Sirsa	NPV	Ghagghar Bund RD Farmai-Nejadela to Chopra Bhand	2 RKM	2.1 RKM	500	500	387	77.4	6.6	06.10.2023
2021-22	Sirsa	Nathusari	NPV	Rampura minor RD 0-36 L/R	7 RKM	10.4 RKM	3500	3500	2780	79.4	6.1	06.10.2023
2021-22	Sirsa	Nathusari	NPV	Baruwali Nohar Feeder RD 28-50 L/R	7 RKM	7.7 RKM	3500	3500	2274	65.0	5.3	11.10.2023

2021-22	Dabwali	Abubshahar	NPV	Abubshahar to Ganga Jamaily Road km vill. Abubshahar to Chautala Distty	5 RKM	5.2 RKM	2500	2500	2250	90.0	5.9	07.10.2023
2021-22	Dabwali	Odhan	NPV	Ghukanwali to Nuhiyanwali, Rajpura-Rattakhera Road km 0-12 L/R	4 RKM	8 RKM	2000	2000	1669	83.5	6.1	07.10.2023
2021-22	Kalanwali	Baragudha	NPV	Sahuwala-Lakkranwali Road 0-14 L/R	6 RKM	13.3 RKM	1500	1500	1254	83.6	5.9	09.10.2023
2021-22	Kalanwali	Khairekan	NPV	Khairekan-Mattar Road) 0-10 L/R	13.5 RKM	13.2 RKM	3375	3375	2763	81.9	6.3	09.10.2023

7.1.1. Relevance

7.1.1.1. Site Suitability

- Plantations along the canals/distributary performed well

Plantations carried out along a canal or drain have performed very good growth (Figure 7.1). Due to the presence of the canal, moisture is retained in the soil and the saplings have enough water. Most of these plantations were inaccessible by vehicle, so the grazing or any other anthropogenic pressure is almost absent. Arjun, Jamun, Sheesham etc. which can grow in waterlogged conditions were planted to ensure the survival of the plantation. Planting trees on the sides of drains and canals brings about ecological benefits such as soil stabilization, improved water quality, and enhanced biodiversity. However, this initiative also faces some challenges in terms of selecting suitable tree species and ensuring proper maintenance.

Figure 7.1: Canalside plantation with Neem saplings

- Roadside plantations have performed well

Most of the roadside plantations were situated adjacent to agricultural fields (Figure 7.1). Fertilizers and manures applied to the agricultural crop also benefitted the planted saplings. Planted saplings also have a steady supply of water from the irrigated agricultural field. Some of the roadside plantations have barbed wire fencing as a protection measure which prevents grazing and other anthropogenic activities.

Figure 7.2: Roadside plantation with tall Sheesham saplings

- Impact of agricultural burning

In some sites, plants were found to be severely damaged due to the stubble burning on the adjacent agricultural fields (Figure 7.3). Proper fire lines should be made to keep the fire away from the plantations. Consultation with the local landowners is required before the afforestation initiative to secure the survival of the planted species.

Figure 7.3: Agricultural burning affected the plantation

- Impact of Grazing

Both domestic and feral cattle posed a serious threat to the plantations of the Sirsa division. Most of the plantations do not have any kind of protection measures, which exposes them to severe grazing. In many sites, cattle (sheep and goats) were found roaming adjacent and even inside the plantation area (Figure 7.4).

Figure 7.4: Cattle were found to be roaming in the roadside plantations

7.1.1.2. Species Suitability

- Overall, the species selection in the Sirsa division was found to be satisfactory.
- A total of 22 planted species were noted in the sample sites during the evaluation.
- Out of the 22 species, Sheesham (*Dalbergia sissoo*), Jamun (*Syzygium cumini*), Papdi (*Holoptelea integrifolia*), and Arjun (*Terminalia arjuna*) were found to be the dominant species.
- In roadside plantations, fast growing species such as Balamkheera (*Kigelia pinnata*), Bargat (Ficus benghalensis), Peepal (*Ficus religiosa*) were planted, which attained great height within 3-4 years of plantation.
- Papdi (*Holoptelea integrifolia*) was found in almost all plantations and attained good growth since cattle do not prefer it for grazing. Neem (*Azadirachta indica*) and Bakain (*Melia azadarach*) are also found to be the preferred species for roadside plantations for the same reason.

Table 7.5: Planted species observed in Sirsa Division

Sl. No.	Species Planted	
	Local Name	**Botanical Name**
1	Amaltas	*Cassia fistula*
2	Amla	*Phylanthus emblica*

3	Arjun	*Terminalia arjuna*
4	B. Deck	
5	B. Papdi	*Terminalia catappa*
6	Bahera	*Terminalia bellirica*
7	Bakain	*Melia azaderach*
8	Bargad	*Ficus benghalensis*
9	Chakresia	*Chukrasia tabularis*
10	Gular	*Ficus glomerata*
11	Imli	*Tamarindus indica*
12	Jamun	*Syzygium cumini*
13	Jand	*Prosopis cineraria*
14	Balamkheera	*Kigelia pinnata*
15	Lasora	*Cordia myxa*
16	Neem	*Azadirachta indica*
17	P. Papdi	*Holoptelea integrifolia*
18	Pilkhan	*Ficus recemosa*
19	Pipal	*Ficus religiosa*
20	Shehtoot	*Morus alba*
21	Shisham	*Dalbergia sisoo*
22	Siris	*Albizia lebbeck*

7.1.2. Effectiveness

7.1.2.1. Survival of the plantation

The average survival rate of the plantations in Sirsa division was 78.54 %, and it varied from as low as 61.4% to as high as 90 %. Maximum plantation activities have been conducted in the year 2021-2022 and fewer plantation activities have been carried out in the year 2019-2020 and 2020-21. Among three plantation years, the highest survival rate (80.23%) was observed in plantations established during 2020-21, while the lowest rate (77.36%) was recorded in the 2019-20 plantations.

Table 7.7: Year-wise average survival and height of the plantations

Plantation Year	Av. Survival (%)	Av. Height (ft)
2019-20	78.03	5.83
2020-21	80.23	7.07
2021-22	77.36	6.08
Average	78.54	

7.1.2.2. Growth of the planted species

Among the 22 planted species, Arjun and Sheesham have attained the most height. Bakain, Lasora, Balamkheera and Gular have also attained impressive heights in most plantations (Table 7.8, Figure 7.5).

Table 7.8: Average height (ft.) of the species planted in three plantation years

Sl. No.	Species Planted		Plantation year		
	Local Name	**Botanical Name**	**2019-20**	**2020-21**	**2021-22**
1	Amaltas	*Cassia fistula*			4.5
2	Amla	*Phylanthus emblica*			6.4
3	Arjun	*Terminalia arjuna*	7.4	9.3	5.7
4	B. Deck		5.9	7.2	5.9
5	B. Papdi	*Terminalia catappa*			5.8
6	Bahera	*Terminalia belirica*		5.0	4.4
7	Bakain	*Melia azaderach*			7.4
8	Bargad	*Ficus benghalensis*			5.9
9	Chakresia	*Chukrasia tabularis*			5.7
10	Gular	*Ficus glomerata*		8.8	5.6
11	Imli	*Tamarindus indica*			3.2
12	Jamun	*Syzygium cumini*	7.4	6.7	6.1
13	Jand	*Prosopis cineraria*			4.8
14	Balamkheera	*Kigelia pinnata*			6.7
15	Lasora	*Cordia myxa*	3.0	9.6	5.3

16	Neem	*Azadirachta indica*	5.7	6.2	6.1
17	P. Papdi	*Holoptelea integrifolia*	6.0	5.8	5.8
18	Pilkhan	*Ficus recemosa*		5.2	5.7
19	Pipal	*Ficus religiosa*		6.3	5.3
20	Shehtoot	*Morus alba*	6.3	7.3	6.6
21	Shisham	*Dalbergia sisoo*	6.3	9.0	7.8
22	Siris	*Albizia lebbeck*		6.3	5.8

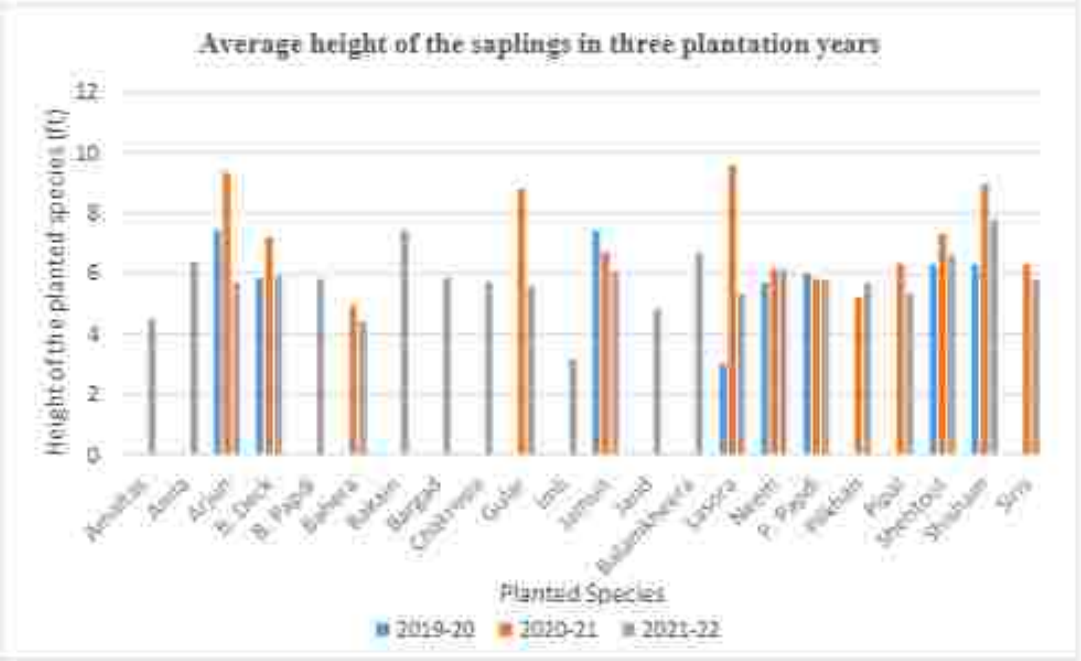


Figure 7.3: Growth of the planted species in three plantation years

7.1.3. Sustainability

7.1.3.1 Protection

Most of the plantation sites are found without any proper protection measures such as fencing, tree guards, cattle-proof trenches etc., making these plantation sites prone to the damage inflicted by grazing and browsing animals. Only three sites were found with partial fencing (Figure 7.1.6). Adequate protection measures should be taken before conducting plantation activities to avoid damage to the plantation by grazing animals, trespassers, and unauthorized harvesting.

7.1.3.2 Maintenance

The written information/evidence/records for maintenance/replacement of plants such as plantation journals, APOs, plantation maps, etc., have not been maintained in any forest range. This is one of the major shortcomings seen across the ranges of Sirsa division.

Figure 7.6: Partial protection measure in the plantation of Khairekan-Mattar Road 0-10 L&R

7.1.3.3 Monitoring

Regular monitoring was observed in all the plantation sites of the Sirsa division. Chowkidaar/watchers have been appointed in all the forest ranges to take care of plantation sites.

7.1.3.4. Scoring of the plantation activities

The plantations carried out under the CAMPA scheme in the Sirsa division in the year of 2019-20, 2020-21 and 2021-22 scored an average of 174.3, out of 250 (Table 7.9). Overall, the score obtained was satisfactory, considering the immense grazing pressure and other anthropogenic disturbances observed in most of the plantation sites.

Table 7.9: Score obtained by the plantations in Sirsa division

Year	Range	Component	Name of the Site	Survival	Growth	Species Suitability	Site Suitability	Protection	Extent	Journal	Map	Invasive	Species composition	Weeding and Hoeing	Watch and Ward
2019-20	Rania	NPV	Sheranwali Distry. RD and Kasaba Submino r RD 82-112 L/R and 0-8 L/R sides	75.9	17.0	10	10	0	10	0	0	17	10	10	10
2019-20	Rania	CA	Ellenaba d Distry. RD 44-49 L/R	80.1	17.0	10	10	0	10	0	0	17	10	10	10
2020-21	Sirsa	NPV	Kusumbi Minor RD 0-30 L/R	72.4	17.0	10	10	0	10	0	0	17	10	10	10
2020-21	Sirsa	NPV	Kusumbi Minor RD 30-50 L/R	77.0	17.0	10	10	0	10	0	0	17	10	10	10

2020-21	Dabwali	CA	BMB (Bhakra main Branch) RD 325-449.5 LR	85.8	17.0	10	10	20	10	0	0	17	10	10	10
2020-21	Kalanwali	NPV	Ranga Minor RD 0-36 L/R	86.3	20.0	10	10	0	10	0	0	17	10	10	10
2020-21	Kalanwali	NPV	Rori-Talwanid Road km 0-13 L/R	79.7	17.0	10	10	0	10	0	0	17	10	10	10
2021-22	Sirsa	NPV	Bhattu-Jamal Road km 28-38 L/R	77.6	17.0	10	10	0	10	0	0	17	10	10	10
2021-22	Sirsa	NPV	Ghaggha r Bund RD Farmai-Nejadela to Chopra Bhand	77.4	17.0	10	10	0	10	0	0	17	10	10	10
2021-22	Sirsa	CA	Gigorani Distry. RD 25-57 L/R	74.1	17.0	10	10	0	10	0	0	17	10	10	10

2021-22	Sirsa	NPV	Rampura minor RD 0-36 L/R	79.4	17.0	10	10	0	10	0	0	17	10	10	10
2021-22	Sirsa	NPV	Baruwali Nohar Feeder RD 28-50 L/R	65.0	17.0	10	10	0	10	0	0	17	10	10	10
2021-22	Dabwali	NPV	Abubshahar to Ganga Jamaily Road km vill. Abubshahar to Chautala Distty.	90.0	17.0	10	10	0	10	0	0	17	10	10	10
2021-22	Dabwali	NPV	Ghukanwali to Nuhiyanwali, Rajpura-Rattakhera Road km 0-12 L/R	83.5	17.0	10	10	0	10	0	0	17	10	10	10
2021-22	Dabwali	CA	Mamarkhera Distry. RD 83-127 L/R	77.2	20.0	10	10	0	10	0	0	17	10	10	10

2021-22	Dabwali	CA	Chautala Distry. RD 37-81 L/R	70.1	17.0	10	10	0	10	0	0	17	10	10	10
2021-22	Dabwali	CA	Gang Canal RD 0-18 L/R	61.4	17.0	10	10	10	10	0	0	17	10	10	10
2021-22	Kalanwali	NPV	Sahuwala-Lakkranwali Road 0-14 L/R	83.6	17.0	10	10	0	10	0	0	17	10	10	10
2021-22	Kalanwali	NPV	Khairekan-Mattar Road) 0-10 L/R	81.9	17.0	10	10	10	10	0	0	17	10	10	10
2021-22	Rania	CA	Old Right Ghaghar Bandh 41-50 L/R	82.9	17.0	10	10	0	10	0	0	17	10	10	10
2021-22	Rania	CA	Old lEFT Ghaghar Bandh 0-25 L/R	79.0	17.0	10	10	0	10	0	0	17	10	10	10
				78.1	17.3	10.0	10.0	1.9	10.0	0.0	0.0	17.0	10.0	10.0	10.0

7.1.4. Non-Plantation activities

7.1.4.1 Fencing

Two sample fencing sites were evaluated in Sirsa Division. Both of the fencings are intact and working adequately.

Table 7.10: Details of evaluated fencing sites in Sirsa division

Year	Division	Range	Barbed wire Fence ID	Length in measurement Book	Actual Length in field	% Variation	Present status	Effectiveness
2020-21	Sirsa	Dabwali	BMB RD 325-449.5 L/R	47.47 RKM	32.4	67.6	Intact	Very Effective
2021-22	Sirsa	Dabwali	Gang Canal RD 0-18 L/R	8 RKM	6.4	93.6	Intact	Very Effective

Figure 7.7: Fencing at Gang Canal RD 0-18 L/R Site

Figure 7.8: Fencing at BMB RD 325 to 449.5 L/R Site

Table 7.11: Score obtained by the fencing sites in Sirsa division

	Scoring components	Full score	Obtained score
1	Working Status	20	20
2	Serving the purpose intended	20	20
3	Actual extent	20	20
4	Site suitability	10	10
5	Measurement book	10	10
6	Expenditure as per the APO	20	20
	TOTAL	**100**	**100**

7.1.4.2 Civil Works: Building

Table 7.12: Details of evaluated Civil Works in Sirsa division

Sr.No.	Name of Range	Name of Site Where building constructed	Name and No. of building	Expenditure	GPS Coordinates		Effectiveness
					Lattitude	Longitude	
1	Debwali	Range Complex Debwali	Range Forest Office	2310346.00	29°57'46.36 N	74°42'36.84 E	Effective
2	Kalanwali	Daulatpur Khera Nty (Canal Colony)	Range Forest Office	2233830.00	29°43'29.26 N	74°59'55.33 E	Effective

All the building works were found effective and compliant with the required standards.

Figure 7.9 Civil work site Dabwali Range Complex

Figure 7.10 Civil Work Site Daulatpur Khera Nty Canal Colony

Table 7.13. Effectiveness of civil works (Building)

Sr. No	Components	Effectiveness
1	Site Location	Good
2	Serving the intended purpose	Good
3	Structurally sound and free of cracks	Good
4	Free of dampness and leakage	Good
5	Overall finish and look	Good

7.2 JIND DIVISION

Table 7.14:CA (Compensatory Afforestation) plantation sites evaluated in Jind Division

Year	Range	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20	Jind	CATP	Bir-Bara Ban Jind	1.74 Ha	1.74 Ha	1740	1740	870	50	7.2	13-10-2023
2020-21	Jind	CATP	DJ Railway line	10.66 Ha	10.66 Ha	10660	10660	8528	80	10.3	13-10-2023
2020-21	Narwana	CATP	Sarbara Distry	1.92 Ha	1.92 Ha	1922	1922	1440	74.9	5.8	14-10-2023
2020-21	Safidon	CATP	Bagru to Mal - Siwan mal road km 0-4 L/R	1.199 Ha	1.199 Ha	1199	1199	1018	84.9	6.4	15-10-2023

Table 7.15:NPV (Net Present Value) plantation sites evaluated in Jind Division

Year	Range	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20											
2019-20	Jind	NPVTP	Jind new bypass	3 RKM	3 RKM	750	750	735	98	8.5	12-10-2023
2019-20	Jind	NPVTP	Jind New Bypass	2 RKM	2 RKM	500	500	479	95.7	9.9	12-10-2023
2019-20	Safidon	NPVTP	Paju to Rohad Road km 0-4 L/R	6 RKM	6 RKM	1500	1500	1400	93.33	13.8	16-10-2023
2019-20	Safidon	NPVTP	Shanpur to Badoth Road Km 0-4 L/R side	4 RKM	4 RKM	1000	1000	800	80	8.9	16-10-2023

2020-21										
2020-21	Jind	NPVTP	Bibipur Ponkari Kheri Road Rd 0-4 L/R	6 RKM	6 RKM	1500	1500	1382	92.1	13.4	12-10-2023
2020-21	Jind	NPVTP	Jind new bypass (Safidon raod pul to Gohana Road pul)	10 RKM	10 RKM	2500	2500	2125	85	14.0	12-10-2023
2020-21	Jind	NPVTP	Thua to Mandi Road km 0-5 L/R	6 RKM	6 RKM	2000	2000	1900	95	16.2	14-10-2023
2020-21	Narwana	NPVTP	DL Road km 238-245 L/R	21 RKM	21 RKM	5250	5250	4510	85.9	9.8	14-10-2023
2020-21	Narwana	NPVTP	DL Road km 264-269 L/R	14 RKM	14 RKM	3500	3500	2898	82.8	8.5	14-10-2023
2020-21	Narwana	NPVTP	DL Road km 246-253 L/R	19 RKM	19 RKM	4750	4750	4308	90.7	7.4	14-10-2023
2020-21	Narwana	NPVRID	DL Road km 256-258 L side	5 RKM	5 RKM	1650	1650	1079	65.4	8.9	14-10-2023
2020-21	Safidon	NPVRID	Shak no 1 Minor	2.5 RKM	2.5 RKM	825	825	436	52.9	9.8	15-10-2023
2020-21	Safidon	NPVRID	Bambheba Drain RD JS railway line + Jind - Gohana Road	2.5 RKM	2.5 RKM	825	825	660	80	7.6	15-10-2023
2020-21	Safidon	NPVTP	BHML	14.8 RKM	14.8 RKM	3700	3700	2749	74.3	7.0	15-10-2023
2021-22										

2021-22	Jind	NPVTP	Jind-Rohtak Road km 17-32	54 RKM	54 RKM	13500	13500	9923	73.5	6.0	13-10-2023
2021-22	Jind	NPVTP	Jind-Rohtak Road km 5-17	42 RKM	42 RKM	10500	10500	8306	79.1	6.3	13-10-2023
2021-22	Jind	NPVTP	Alewa to Gohian Mandi Road km 0-4 L/R	5 RKM	5 RKM	1500	1500	1050	70	5.4	14-10-2023
2021-22	Jind	NPVTP	Pegan to Shamdo Minor RD 11	4 RKM	4 RKM	1000	1000	745	74.5	10.3	14-10-2023
2021-22	Jind	NPVTP	Sandeel to Songari Road km 0-3 L/R	3 RKM	3 RKM	750	750	450	60	4.8	14-10-2023
2021-22	Jind	NPVTP	Alewa to Pokhra Road km 0-4 L/R	5 RKM	5 RKM	1500	1500	1200	80	9.2	14-10-2023
2021-22	Jind	NPVTP	Mohammad Khera Road km 0-4 L/R	5 RKM	5 RKM	1500	1500	900	60	6.6	13-10-2023

7.2.1. Relevance

7.2.1.1 Site Suitability

- Roadside plantations have performed well

Most of the roadside plantations were situated adjacent to agricultural fields (Figure 7.11). Fertilizers and manures applied to the agricultural crop also benefitted the planted saplings. Planted saplings also have a steady supply of water from the irrigated agricultural field. Some of the roadside plantations have barbed wire fencing as a protection measure which prevents grazing and other anthropogenic activities.

Figure 7.11:Sheesham saplings attained excellent growth in the roadside plantations

- Plantations along the canals produced good results

Plantations carried out along a canal or drain have performed very well. Due to the presence of the canal, moisture is retained in the soil and the saplings have enough water. Most of these plantations were inaccessible by vehicle, so the grazing or any other anthropogenic pressure is almost absent. Arjun, Jamun, Sheesham, etc. which can grow in waterlogged conditions were planted to ensure the survival of the plantation.

Figure 7.12: Saplings planted along the nalas showed very good results

- Impact of Grazing

Both domestic and feral cattle posed a serious threat to the plantations of the Fatehabad division. Most of the plantations do not have any kind of protection measures, which exposes them to severe grazing. In many sites, cattle (sheep and goats) were found roaming inside the plantation area.

- Impact of anthropogenic disturbances

The impact of disturbances created by the local communities was very prominent in some sites. In the plantation of Alewa to Gohan Mandi Road, the planted saplings were cut down and stacked beside the road (Figure 7.13). According to the forest officials, land disputes between the FD and the landowners led to this unfortunate incident.

Proper consultation with the local community should be held before the plantation. To ensure the survival of the plantation the local community should be involved in the decision making process such as species selection, site selection etc.

Figure 7.13 Sheesham saplings were cut down by the local people

7.2.1.2. Species Suitability

1. Out of the 20 planted species, (Table 7.16) Arjun, Sheesham, Papdi and Balamkheera were found to be dominant. Most of the species showed good growth and survival across the ranges.
2. In most of the sites, fast-growing native species like Sheesham, Kadam, Gulmohor etc. were planted, which attained very good growth, especially in roadside plantations.
3. In the waterlogging sites, resistant species like Arjun, Jamun and Sheesham were planted, which produced good results.
4. Economically important timber species such as Teak were planted. It is also considered a good carbon-sequestering species.

Table 7.16: List of planted species in Jind Division

Sl. No	Species Planted	
	Local Name	**Botanical Name**
1	Amla	*Phyllanthus emblica*
2	Amrud	*Psidium guajava*
3	Arjun	*Terminalia arjuna*
4	Baalamkheera	*Kigelia pinnata*
5	Bahera	*Terminalia belirica*
6	Bakain	*Melia azadarach*
7	Bottle Brush	*Callistemon lanceolatus*
8	Gulmohar	*Delonix regia*
9	Jamoa	*Eugenia cuspidata*
10	Jamun	*Syzygium cumini*
11	Kachnar	*Bauhinia variegata*
12	Kadam	*Neolamarckia cadamba*
13	Lasoda	*Cordia myxa*
14	Neem	*Azadirachta indica*
15	Papdi	*Holoptelea integrifolia*
16	Pipal	*Ficus religiosa*
17	Sagon	*Tectona grandis*
18	Shehtoot	*Moras alba*
19	Sheesham	*Dalbergia sisoo*
20	Siris	*Albizia leback*

7.2.2. Effectiveness

7.2.2.1 Survival of the plantation

The overall survival rate of plantations in the Jind division was found to be excellent at 78.2 %. Among the three plantation years, the highest survival rate was observed in the plantations carried out during 2019-20, with a rate of 83.4%. Conversely, the lowest survival rate was recorded for the plantations from 2021-22, with an average survival rate of 71% (Table 7.14).

Table 7.17 Year-wise average survival and height of the plantations

Year	Average Survival (%)	Average Height (ft)
2019-20	83.4	9.7
2020-21	80.3	9.6
2021-22	71.0	6.9

7.2.2.2 Growth of the plantation

Balamkheera (*Kigelia pinnata*), Sagon (*Tectona grandis*), and Kadam (*Neolamarckia cadamba*) have attained the highest growth in the plantations of 2019-20, 2020-21 and 2021-22 respectively (Table 7.18). Other than these, Arjun (*Terminalia arjuna*), Bakain (*Melia azadarach*), Sheesham (*Dalbergia sisoo*), and Lasoda (*Cordia myxa*) showed good growth.

Table 7.18 Average height (ft.) of the species planted in three plantation years

Sl. No.	Species Planted		Plantation year		
	Local Name	Botanical Name	2019-20	2020-21	2021-22
1	Amla	*Phyllanthus emblica*	9.8	11.5	-
2	Amrud	*Psidium guajava*	-	7.2	-
3	Arjun	*Terminalia arjuna*	10.0	11.8	6.4
4	Baalamkheera	*Kigelia pinnata*	12.5	8.5	9.5
5	Bahera	*Terminalia belirica*	-	8.2	-
6	Bakain	*Melia azadarach*	11.9	14.7	6.4
7	Bottle Brush	*Callistemon lanceolatus*	-	5.3	-
8	Gulmohar	*Delonix regia*	6.9	10.8	5.6
9	Jamoa	*Eugenia cuspidata*	-	6.7	5.6
10	Jamun	*Syzygium cumini*	6.6	6.6	5.2
11	Kachnar	*Bauhinia variegata*	5.6	5.9	-
12	Kadam	*Neolamarckia cadamba*	-	13.5	10.8
13	Lasoda	*Cordia myxa*	12.3	9.8	-
14	Neem	*Azadirachta indica*	5.2	7.2	5.9

15	Papdi	*Holoptelea integrifolia*	10.5	7.2	6.0
16	Pipal	*Ficus religiosa*	7.2	5.4	-
17	Sagon	*Tectona grandis*	-	18.3	-
18	Shehtoot	*Moras alba*	-	8.1	6.2
19	Sheesham	*Dalbergia sisoo*	10.7	10.1	7.4
20	Siris	*Albizia leback*	6.6	12.2	-

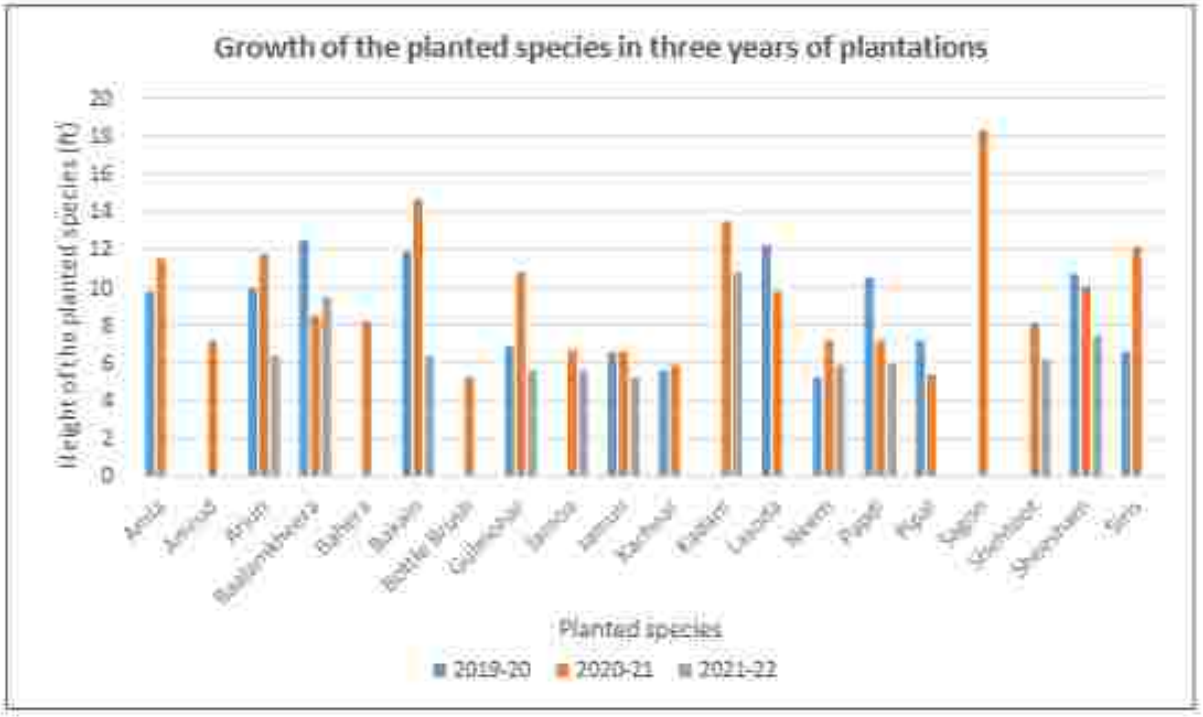


Figure 7.14: Average height (ft.) of the species planted in three plantation years.

7.2.3. Sustainability

7.2.3.1 Protection

All the plantation sites of Hisar division lack any kind of protective measure to prevent grazing except one. Only in the plantations of DJ Railway Line (CA, 2020-21) and Jind New Bypass Safidon Pul to Gohana Pul (NPV, 2020-21) barbed wire fencings were found (Figure 5). According to the forest officials, no funding was primarily allocated for fencing. Even if there were some, it takes usually almost 2 years (after plantation) to come through the proper channel. It is strongly recommended, that funding should be allocated for adequate perimeter/tree-specific fencing (Barbed wire/CPT or bamboo tree guard), and should be released on time.

Figure 7.15 Barbed wire fencing in the plantation of Jind New Bypass

7.2.3.2 Maintenance

The written information/evidence/records for maintenance/replacement of plants such as plantation journals, plantation maps, etc., have not been maintained in any forest ranges. This is one of the major shortcomings seen across the ranges of the division.

7.2.3.3 Monitoring

Regular monitoring was clearly observed in all the plantation sites of the Hisar division. Chowkidaar/ watchers have been appointed in all the forest ranges to take care of plantation sites. It was the hard work and dedication of forest guards and watchers that ensured the growth and survival of the planted saplings.

7.2.4. Scoring of the plantation activities

The plantations carried out under the CAMPA scheme in the Jind division in the year 2019-20, 2020-21 and 2021-22 scored an average of 168.5, out of 250 (Table 7.19). Overall, the score was good, considering the immense grazing pressure and other anthropogenic disturbances observed in most plantation sites.

Table 7.19: Score obtained by the plantations in Jind division

Year	Components	Name of Reach/ Site	Survival	Growth	Species suitability	Site suitability	Protection	Extent	Journal	Map	Invasive	Species composition	Weeding and hoeing	Watch and ward
2019-20	NPV	Jind new bypass	98	18.0	10	10	0	10	0	0	10	10	10	10
2019-20	NPV	Jind New Bypass	95.7	18.0	10	10	0	10	0	0	10	10	10	10
2019-20	CA	Bir-Bara Ban Jind	50	16.0	10	10	0	10	0	0	10	10	10	10
2019-20	NPV	Paju to Rohad Road km 0-4 L/R	93.33	20.0	10	10	0	10	0	0	10	10	10	10
2019-20	NPV	Shanpur to Badoth Road Km 0-4 L/R side	80	18.0	10	10	0	10	0	0	10	10	10	10
2020-21	NPV	Bitripur Ponkari Kheri Road Rd 0-4 L/R	92.1	20.0	10	10	0	10	0	0	10	10	10	10
2020-21	NPV	Jind new bypass (Safidon raod pul to Gohana Road pul)	85	20.0	10	10	20	10	0	0	10	10	10	10
2020-21	CA	DJ Railway line	80	20.0	10	10	20	10	0	0	10	10	10	10

2020-21	NPV	Thua to Mandi Road km 0-5 L/R	95	20.0	10	10	0	10	0	0	10	10	10	10
2020-21	NPV	DL Road km 238-245 L/R	85.9	20.0	10	10	0	10	0	0	10	10	10	10
2020-21	NPV	DL Road km 264-269 L/R	82.8	20.0	10	10	0	10	0	0	10	10	10	10
2020-21	NPV	DL Road km 246-253 L/R	90.7	18.0	10	10	0	10	0	0	10	10	10	10
2020-21	NPV	DL Road km 256-258 L side	65.4	20.0	10	10	0	10	0	0	10	10	10	10
2020-21	CA	Sarbara Distry	74.9	16.0	10	10	0	10	0	0	10	10	10	10
2020-21	NPV	Shak no.1 Minor	52.9	20.0	10	10	0	10	0	0	10	10	10	10
2020-21	NPV	Bambheba Drain RD JS railway line + Jind - Gohana Road	80	18.0	10	10	0	10	0	0	10	10	10	10
2020-21	CA	Bagru to Mal - Siwan mal road km 0-4 L/R	84.9	18.0	10	10	0	10	0	0	10	10	10	10
2020-21	NPV	BHML	74.3	18.0	10	10	0	10	0	0	10	10	10	10
2021-22	NPV	Jind-Rohtak Road km 17-32	73.5	18.0	10	10	0	10	0	0	10	10	10	10
2021-22	NPV	Jind-Rohtak Road km 5-17	79.1	18.0	10	10	0	10	0	0	10	10	10	10

2021-22	NPV	Alewa to Gohian Mandi Road km 0-4 L/R	70	16.0	10	10	0	10	0	0	10	10	10	10
2021-22	NPV	Pegan to Shamdo Minor RD 11	74.5	20.0	10	10	0	10	0	0	10	10	10	10
2021-22	NPV	Sandeel to Songari Road km 0-3 L/R	60	16.0	10	10	0	10	0	0	10	10	10	10
2021-22	NPV	Alewa to Pokhra Road km 0-4 L/R	80	20.0	10	10	0	10	0	0	10	10	10	10
2021-22	NPV	Mohammad Khera Road km 0-4 L/R	60	18.0	10	10	0	10	0	0	10	10	10	10
			78.3	18.6	10	10	1.6	10	0	0	10	10	10	10

7.2.5. Non-plantation activities

7.2.5.1. Fencing

Barbed wire fencing is essential to provide adequate protection to the forest area. It prevents the forest from excessive grazing, illegal cutting, and other anthropogenic disturbances.

Three fencing sites were comprehensively evaluated, and all the sites were found very effective with intact barbed wire.

Table 7.20: Fencing sites evaluated in Jind Division

Sl. No.	Year	Range	Barbed wire Fence Name	Length in measurement Book	Actual Length	Present status	Effectiveness of the Fence
1	2020-21	Jind	Jind New bypass	7 RKM	7.2 RKM	Intact	Very Effective
2	2020-21	Jind	DJ Railwaty Line 104/22 to 119 L/R	3 RKM	5.6 RKM	Intact	Very Effective
3	2019-20	Jind	Bir Bara Ban Jind	7 RKM	7.3 RKM	Intact	Very Effective

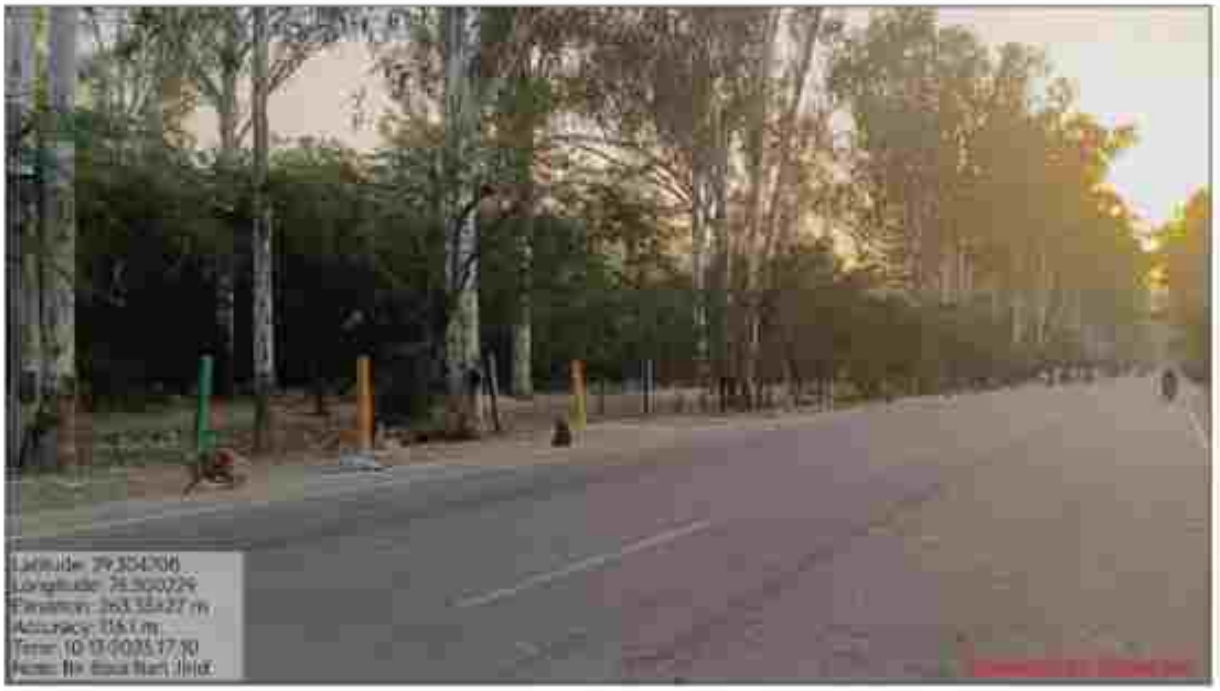


Figure 7.16: Fencing site Bir Bara Ban (7 RKM)

7.2.5.2 Soil and Moisture Conservation (SMC)

Six SMC sites (trench) were comprehensively evaluated. These trenches were dug to retain moisture during the dry season and secure proper water flow during the monsoon. All the trenches were found to be working adequately.

Table 7.21: SMC sites evaluated in Jind Division

Sl No	Year	Range	Name	Size in Measurement Book	Actual Size	Expenditure (Rs.)
1	2021-22	Jind	Shadipur Minor RD 0-10 (Ramkali)	2×0.8×0.6	2×0.8×0.6	28000
2	2021-22	Jind	Shadipur Minor RD 10 to tail (Julana)	2×0.8×0.6	2×0.8×0.6	25760
3	2021-22	Narwana	Dharodi to Rajgarh Dhobi Road km 0-8 L/R side	2×0.8×0.6	2×0.8×0.6	28000
4	2021-22	Jind	Hansi Branch RD 215-235	2×0.8×0.6	2×0.8×0.6	56000
5	2021-22	Jind	Jind No.8 RD 0-tail	2×0.8×0.6	2×0.8×0.6	16800
6	2021-22	Safidon	Joshi Drain RD Panipat Seema to Railway line (Anita beat)	2×0.8×0.6	2×0.8×0.6	28000

Figure 7.17: Trench (SMC) in Hansi Brach RD 215-235

Figure 7.18 Trench (SMC) in Jind No. 8 Rd 0-Tail

Figure 7.19: Trench (SMC) in Joshi Drain

7.2.5.3 Civil Works (Building)

Table 7.22: Civil Works (building) evaluated in the Jind Division

Year	Range	Building Name	Expenditure as per the APO	Actual Expenditure
2020-21	Hansi	Pilkhera Seed Store	-	-

The building work was found effective and compliant with all the required standards.

Figure 7.20: Pilkhera Seed Store

7.2.5.4 Scoring of the non-plantation activities

Table 7.23: Score obtained by the fencing sites in Jind division

	Scoring components	Full score	Obtained score
1	Working Status	20	20
2	Serving the purpose intended	20	20
3	Actual extent	20	20
4	Site suitability	10	10
5	Measurement book	10	0
6	Expenditure as per the APO	20	20
	TOTAL	100	90

Table 7.24: Score obtained by the SMC sites in Jind division

	Scoring components	Full score	Obtained score
1	Working status	20	20
2	Site suitability	20	20
3	Measurement as per the APO	20	20
4	Fulfilling design specification	20	20
5	Measurement book	20	0
	TOTAL	**100**	**80**

Table 7.25: Effectiveness of the Civil Works (Building)

Sr. No.	Components	Effectiveness
1	Site Location	Good
2	Serving the intended purpose	Good
3	Structurally sound and free of cracks	Good
4	Free of dampness and leakage	Good
5	Overall finish and look	Good

7.3 HISAR DIVISION

Table 7.26: CA (Compensatory Afforestation) plantation sites evaluated in Hisar Division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20												
2019-20	Hisar	Uklana	CA	Hisar Jakhal Railway Line 30-45 L & R	26 ha.	30.4 RKM	30000	30000	22581	75.27	12.2	21-09-2023
2020-21												
2020-21	Hisar	Uklana	CA	Hisar Jakhal Railway Line 25.6-48.13 L & R	106.05 ha.	Plantation not done						21-09-2023
2021-22												
2021-22	Hansi	Hansi	CA	Bhatla Minor RD 0-31 L & R	5 ha.	10 RKM	5000	5000	4500	90	6	19-09-2023
2021-22	Hansi	Hansi	CA	Sunder Sub Branch RD 86-105 L& R	5 ha.	13.4 RKM	5000	5000	4450	89	7.2	19-09-2023
2021-22	Hisar	Hisar-i	CA	Jakhkal Hisar Railway Line 62-70 L/R	6 ha.	10.3 RKM	6000	6000	5520	92	5.1	21-09-2023
2021-22	Hisar	Gangwa	CA	Deva Distry RD 21-85 R/side	6 ha.	16.1 RKM	6000	6000	3768	62.8	6	22-09-2023

2021-22	Adampur	Agroha	CA	Kishangarh Sub Branch RD 47-87 L&R	6 ha.	20.6 RKM	6000	6000	3006	50.1	5.3	19-09-2023
2021-22	Adampur	Agroha	CA	Kishangarh Sub Branch RD 23-47 L&R	5 ha.	13.8 RKM	5000	5000	4075	81.5	4.8	19-09-2023
2021-22	Adampur	Agroha	CA	Sidhmukh Feeder RD 23-47 L/Side	1.3 ha.	9.3 RKM	1380	1380	1270	92	5	19-09-2023
2021-22	Adampur	Pabra	CA	Agroha Minor RD 0-24 L&R	7 ha.	21.6 RKM	7000	7000	6104	87.2	9.5	19-09-2023
2021-22	Adampur	Pabra	CA	Siwani Minor RD 0 to tail L&R	7 ha.	22.84 RKM	7000	7000	6209	88.7	5.1	20-09-2023
2021-22	Adampur	Pabra	CA	Pabra Disty RD 70-116 L&R	7 ha.	28 RKM	6930	6930	3285	47.4	5.2	20-09-2023

Table 7.27: NPV (Net Present Value) plantation sites evaluated in Hisar Division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20												
2019-20	Hisar	Uklana	NPV	Old Pabra Nahar	6 RKM	5.472 RKM	9500	9500	8075	85	32	21-09-2023
2019-20	Hisar	Gangwa	NPV	NH 52 Hisar Rajgarh Road Km 127-131 L & R	10 RKM	Plantation not done						22-09-2023
2019-20	Adampur	Agroha	NPV	Landhri to Thaska Road KM 0-5 L/R	6 RKM	7 RKM	1500	1500	1263	85.5	11	19-09-2023
2020-21												
2020-21	Hansi	Sarsana	NPV	Hansi Barwala Road to Rajli Road Km 0-4 L & R	6 RKM	6.4 RKM	1500	1500	1305	87	8.4	19-09-2023
2020-21	Hisar	Barwala	NPV	Barwala Sub Minor RD 0-10 7 & Gabipur Minor	5 RKM	2.4 RKM	1250	1250	890	71.2	10.1	20-09-2023

2020-21	Hisar	Barwala	NPV	Surbura Minor RD 30-54 L & R	12 RKM	15.4 RKM	3000	3000	2130	71	7.1	20-09-2023
2020-21	Hisar	Barwala	NPV	Sarsod Distry Butry RD 10-26 L/R	4 RKM	7 RKM	1000	1000	930	93	8	21-09-2023
2020-21	Hisar	Gangwa	NPV	NH 52 Hisar Rajgarh Road Km 123-133	14 RKM	22 RKM	3500	3500	2951	84.31	7.6	22-09-2023
2021-22												
2021-22	Hansi	Namound	NPV	Sisai to Luhari Road Km 0-3 L & R	12 RKM	7.4 RKM	3000	3000	1800	60	9.5	19-09-2023
2021-22	Hansi	Hansi	NPV	Dhanana Minor RD 0-20 L & R	18 RKM	13 RKM	4500	4500	3240	72	11.3	19-09-2023
2021-22	Hisar	Barwala	NPV	Gabipur to Parbhuwala Road 0-6 L & R	10 RKM	7.4 RKM	2500	2500	1875	75	9	20-09-2023
2021-22	Hisar	Barwala	NPV	Gaibipur to Litani Dunanpur 0-10 L & R	17 RKM	21 RKM	4250	4250	3400	80	7.8	20-09-2023

2021-22	Hisar	Barwala	NPV	Barwala Matloda 1-9 Kharkra Road 0-6 Km. L & R	15 RKM	26.2 RKM	3750	3750	3470	92.53	8.2	20-09-2023
2021-22	Hisar	Mangali	NPV	Balawas Minor	6 RKM	4.28 RKM	1500	1500	669	44.6	12	22-09-2023
2021-22	Adampur	Balsamand	NPV	Hisar-Balsamand Road KM 3-15 L&R	14 RKM	13.4 RKM	3500	3500	3203	91.5	5.4	19-09-2023
2021-22	Adampur	Pabra	NPV	Pabra-Kandool-Kheri Road KM 0-4 L&R	5 RKM	9.2 RKM	1250	1250	870	69.6	6.1	20-09-2023

7.3.1. Relevance

7.3.1.1 Site Suitability

- Roadside plantations have performed well

Most of the roadside plantations were situated adjacent to agricultural fields (Figure 7.21). Fertilizers and manures applied to the agricultural crop also benefitted the planted saplings. Planted saplings also have a steady supply of water from the irrigated agricultural field. Some of the roadside plantations have barbed wire fencing as a protection measure which prevents grazing and other anthropogenic activities.

Figure 7.21: Roadside plantation showed excellent growth of Sheesham

- Plantation along the canals performed well

Plantations carried out along a canal or drain have performed very well. Due to the presence of the canal, moisture is retained in the soil and the saplings have enough water. Most of these plantations were inaccessible by vehicle, so the grazing or any other anthropogenic pressure is almost absent. Arjun, Jamun, Sheesham etc. which can grow in waterlogged conditions were planted to ensure the survival of the plantation.

Figure 7.22: Sheesham saplings in Carissa plantation

- Impact of grazing pressure

Both domestic and feral cattle posed a serious threat to the plantations of the Hisar division. Most of the plantations do not have any kind of protection measures, which exposes them to severe grazing. In many sites, cattle were found roaming inside the plantation area (Figure 7.23).

Figure 7.23: Herds of livestock were spotted inside the plantation site, browsing on the planted saplings

7.3.1.2 Species Suitability

1. Out of the 19 planted species, (Table 7.28) Arjun, Neem and Sheesham were found to be dominant. Most of the species showed good growth and survival across the ranges.
2. In most of the sites, fast-growing native species like Sheesham, Arjun, Jamun etc. were planted, which attained very good growth, especially in roadside plantations.
3. In the waterlogging sites, resistant species like Arjun, Jamun and Sheesham were planted, which produced good results.
4. Exotic species such as *Eucalyptus* were planted in some plantation sites. Although it produced excellent growth and survival, it is strongly suggested that exotic species should be excluded from the plantation species mix.

Table 7.28: List of planted species in Hisar Division

Sl. No.	Species Planted	
	Local Name	Botanical Name
1	Amaltas	*Cassia fistula*
2	Amla	*Phyllanthus emblica*
3	Arjun	*Terminalia arjuna*
4	Bakain	*Melia azadarach*
5	Balamkheera	*Kigelia pinnata*
6	Gular	*Ficus glomerata*
7	Imli	*Tamarindus indica*
8	Jamun	*Syzygium cumini*
9	Jungle Jalebi	*Pithecellobium dulce*
10	Kachnar	*Bauhinia variegata*
11	Kadam	*Neolamarckia cadamba*
12	Lasoda	*Cordia myxa*
13	Neem	*Azadirachta indica*
14	Papdi	*Holoptelea integrifolia*
15	Pilkhan	*Ficus virens*
16	Safeda	*Eucalyptus sp.*
17	Shahtoot	*Morus alba*
18	Sheesham	*Sdalbergia sisoo*
19	Siris	*Albizia lebback*

7.3.2. Effectiveness

7.3.2.1 Survival of the Plantation

The overall survival rate of plantations in the Hisar division was found to be excellent at 79.7 %. Among the three plantation years, the highest survival rate was observed in the plantations carried out during 2019-20, with a rate of 81.9%. Conversely, the lowest survival rate was recorded for the plantations from 2021-22, with an average survival rate of 75.9% (Table 7.29).

Table 7.29: Year-wise average survival and height of the plantations

Year	Average Survival (%)	Average Height (ft)
2019-20	81.9	18.4
2020-21	81.3	8.2
2021-22	75.9	7.3

7.3.2.2 Growth of the Plantation

Safeda (*Eucalyptus spp.*), Arjun (*Terminalia arjuna*) and Neem (*Azadirachta indica*) attained the highest growth among the planted species in 2019-20, 2020-21 and 2021-22 respectively.

Table 7.30: Average height (ft.) of the species planted in three plantation years

Sl. No.	Species Planted		Plantation year		
	Local Name	**Botanical Name**	**2019-20**	**2020-21**	**2021-22**
1	Amaltas	*Cassia fistula*	-	-	5.3
2	Amla	*Phyllanthus emblica*	-	-	6.6
3	Arjun	*Terminalia arjuna*	-	10.8	6.9
4	Bakain	*Melia azadarach*	-	-	5.5
5	Balamkheera	*Kigelia pinnata*	-	5.7	6.8
6	Gular	*Ficus glomerata*	-	-	4.0
7	Imli	*Tamarindus indica*	-		5.6
8	Jamun	*Syzygium cumini*	-	5.2	4.9
9	Jungle Jalebi	*Pithecellobium dulce*	-	-	6.2
10	Kachnar	*Bauhinia variegata*	-	-	5.2
11	Kadam	*Neolamarckia cadamba*	-	10.5	3.3
12	Lasoda	*Cordia myxa*	11.6	5.5	5.1

13	Neem	*Azadirachta indica*	8.0	7.0	7.6
14	Papdi	*Holoptelea integrifolia*	-	8.7	6.3
15	Pilkhan	*Ficus virens*	-	-	4.2
16	Safeda	*Eucalyptus sp.*	32	-	-
17	Shahtoot	*Morus alba*	-	9.7	7.1
18	Sheesham	*Sdalbergia sisoo*	14.9	10.7	7.4
19	Siris	*Albizia lebbeck*		5.6	7.5

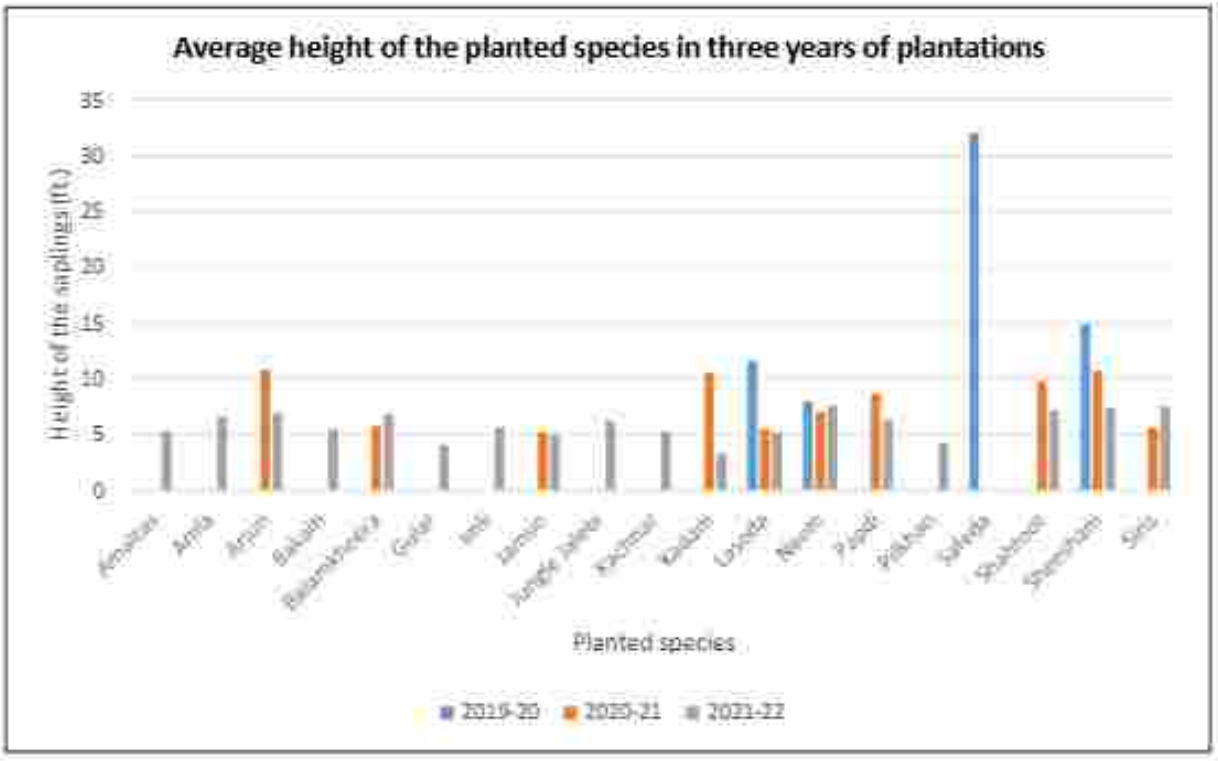


Figure 7.24 Graph showing the average height of the planted species in three years of plantations

7.3.3. Sustainability

7.3.3.1 Protection

All the plantation sites of Hisar division lack any kind of protective measure to prevent grazing except one. Only in the plantations of Hisar-Jakhal Railway Line 25.50-48.13 (CA, 2019-20), Dhamana Minor RD 0-20 (NPV, 2021-22) partial barbed wire fencings were found (Figure 7.25 & 7.26). According to the forest officials, no funding was primarily allocated for fencing. Even if there were some, it takes usually almost 2 years (after plantation) to come through the proper channel. It is strongly recommended, that funding should be allocated for adequate perimeter/tree-specific fencing (Barbed wire/CPT or bamboo tree guard), and should be released on time.

7.3.3.2 Maintenance

The written information/evidence/records for maintenance/replacement of plants such as plantation journals, plantation maps, etc., have not been maintained in any forest ranges. This is one of the major shortcomings seen across the ranges of the Hisar division.

7.3.3.3 Monitoring

Regular monitoring was clearly observed in all the plantation sites of the Hisar division. Chowkidaar/ watchers have been appointed in all the forest ranges to take care of plantation sites. It was the hard work and dedication of forest guards and watchers that ensured the growth and survival of the planted saplings.

Figure 7.25: Barbed wire fencing in the plantation site of Hisar-Jakhal Railway Line 25.60-48.13 (2019-20)

Figure 7.25: Barbed wire fencing in the plantation site of Dhamana Minor RD 0-20 (2021-22).

7.3.4. Scoring of the plantation activities

The plantations carried out under the CAMPA scheme in the Hisar division in the year 2019-20, 2020-21 and 2021-22 scored an average of 177.5, out of 250 (Table 7.31). Overall, the score was good, considering the immense grazing pressure and other anthropogenic disturbances observed in most plantation sites.

Table 7.31: Score obtained by the plantations in the Hisar division

Year	Components	Name of Reach/ Site	Survival	Growth	Species suitability	Site suitability	Protection	Extent	Journal	Map	Invasive	Species composition	Weeding and hoeing	Watch and ward
2019-20	CA	Hisar Jakhal Railway Line 30-45 L & R	75.27	20	10	10	20	20	0	0	10	10	10	10
2019-20	NPV	Old Pabra Nahar	85	20	10	10	0	20	0	0	10	10	10	10
2019-20	NPV	NH 52 Hisar Rajgarh Road Km 127-131 L & R												
2019-20	NPV	Landhri to Thaska Road KM 0-5 L/R	85.5	20	10	10	0	20	0	0	10	10	10	10
2020-21	NPV	Hansi Barwala Road to Rajli Road Km 0-4 L & R	87	18	10	10	0	20	0	0	10	10	10	10
2020-21	NPV	Barwala Sub Minor RD 0-10 7 & Gabipur Minor	71.2	20	10	10	0	20	0	0	10	10	10	10

2020-21	NPV	Surbura Minor RD 30-54 L & R	71	18	10	10	0	20	0	0	10	10	10	10
2020-21	NPV	Sarsod Distry Butry RD 10-26 L/R	93	20	10	10	0	20	0	0	10	10	10	10
2020-21	NPV	NH 52 Hisar Rajgarh Road Km 123-133	84.31	18	10	10	0	20	0	0	10	10	10	10
2020-21	CA	Hisar Jakhal Railway Line 25.6-48.13 L & R												
2021-22	CA	Bhatla Minor RD 0-31 L & R	90	18	10	10	0	20	0	0	10	10	10	10
2021-22	NPV	Sisai to Luhari Road Km 0-3 L & R	60	20	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Sunder Sub Branch RD 86-105 L& R	89	18	10	10	0	20	0	0	10	10	10	10
2021-22	NPV	Dhanana Minor RD 0-20 L & R	72	20	10	10	20	20	0	0	10	10	10	10
2021-22	NPV	Gabipur to Parbhuwala Road 0-6 L & R	75	20	10	10	0	20	0	0	10	10	10	10

2021-22	NPV	Gaibipur to Lilani Durjanpur 0-10 L & R	80	18	10	10	0	20	0	0	10	10	10	10
2021-22	NPV	Banvala Matloda 1-9 Kharkra Road 0-6 Km L & R	92.53	20	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Jakhkal Hisar Railway Line 62-70 L/R	92	16	10	10	0	20	0	0	10	10	10	10
2021-22	NPV	Balawas Minor	44.6	20	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Deva Distry RD 21-85 R/side	62.8	18	10	10	0	20	0	0	10	10	10	10
2021-22	NPV	Hisar-Balsamand Road KM 3-15 L&R	91.5	16	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Kishangarh Sub Branch RD 47-87 L&R	50.1	16	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Kishangarh Sub Branch RD 23-47 L&R	81.5	16	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Sidhmukh Feeder RD 23-47 L/Side	92	16	10	10	0	20	0	0	10	10	10	10

2021-22	CA	Agroha Minor RD 0-24 L&R	87.2	20	10	10	0	20	0	0	10	10	10	10
2021-22	NPV	Pabra-Kandool-Kheri Road KM 0-4 L&R	69.6	18	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Siwani Minor RD 0 to tail L&R	88.7	16	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Pabra Disty. RD 70-116 L&R	47.4	16	10	10	0	20	0	0	10	10	10	10
			77.6	18.3	10	10	1.5	20	0	0	10	10	10	10

Success Story: Landhri to Thaska Road Km 0-5, Adampur Range (2019-20)

The roadside NPV plantation of Landhri to Thaska Road in Admapur Range shows incredible growth and decent survival. The local people proactively protected the plantation by barbed wire fencing, which also protects their agricultural fields. Due to the coordination of the FD with the local community the planted saplings were regularly watered by the adjacent field owners. Mostly Sheesham, Lasoda and Neem were planted in this plantation, all of them showed excellent growth.

7.3.5. Non-Plantation activities

7.3.5.1 Fencing

Barbed wire fencing is essential to provide adequate protection to the forest area. It prevents the forest from excessive grazing, illegal cutting, and other anthropogenic disturbances. Out of five evaluated fencing sites, 4 were found moderately effective, and one very effective (Table 7.32).

Table 7.32: Barbed wire fencing sites evaluated in Hisar Division

Year	Range	Barbed wire Fence Id/NO/Name	Length in measurement book (RKM)	Actual Length (RKM)	% Variation (+/-)	Present status-intact/wor n oof	Effectiveness
2020-21	Hansi	Hisar Major Disty. RD 74-118 L/R side	24	7.2	70	Intact	Moderately effective
2020-21	Hisar	Hisar Major Disty. RD 118-150	4	2.7	32.5	Intact	Moderately effective

2020-21	Adam pur	Hisar Major Disty RD 275-301 L & R	18	14.8	17.77	Intact	V. effective
2019-20	Hisar	Hisar- Jakhal Railway line Km 30-45 L/R	3	3	0	Worn out	moderately effective
2019-20	Hisar	NH 52 Km 127-131 L/R	8	7.6	5	Intact	moderately effective

Figure 7.27: Fencing site in Hisar Division

Figure 7.28: Fencing sites in Hisar Division

7.3.5.2 Civil Works (Building)

Table 7.33 Buildings evaluated in the Hisar Division

Year	Range	Building Name	Expenditure as per the APO	Actual Expenditure	Effectiveness
2020-21	Hansi	Hisar Major Pali Nursery (Forester Quarter)	13,41,255	12,00,000	Working Effectively

The building work was found effective and compliant with all the required standards.

Table 7.34: Effectiveness of the civil works

Sr. No	Components	Effectiveness
1	Site Location	Good
2	Serving the intended purpose	Good
3	Structurally sound and free of cracks	Good
4	Free of dampness and leakage	Good
5	Overall finish and look	Good

7.3.5.3. Scoring of the non-plantation activities

Table 7.35. Score obtained by the fencing sites in Hisar Division

Year	Components	Name of Reach/ Site	Survival	Growth	Species suitability	Site suitability	Protection	Extent	Journal	Map	Invasive	Species composition	Weeding and hoeing	Watch and ward
2019-20	CA	Hisar Jakhal Railway Line 30-45 L & R	75.2	20	10	10	20	20	0	0	10	10	10	10
2019-20	NPV	Old Pabra Nahar	85	20	10	10	0	20	0	0	10	10	10	10
2019-20	NPV	NH 52 Hisar Rajgarh Road Km 127-131 L & R												
2019-20	NPV	Landhri to Thaska Road KM 0-5 L/R	85.5	20	10	10	0	20	0	0	10	10	10	10
2020-21	NPV	Hansi Barwala Road to Rajli Road Km 0-4 L & R	87	18	10	10	0	20	0	0	10	10	10	10
2020-21	NPV	Barwala Sub Minor RD 0-10 7 & Gabipur Minor	71.2	20	10	10	0	20	0	0	10	10	10	10
2020-21	NPV	Surbura Minor RD 30-54 L & R	71	18	10	10	0	20	0	0	10	10	10	10
2020-21	NPV	Sarsod Distry Butry RD 10-26 L/R	93	20	10	10	0	20	0	0	10	10	10	10
2020-21	NPV	NH 52 Hisar Rajgarh Road Km 123-133	84.31	18	10	10	0	20	0	0	10	10	10	10

2020-21	CA	Hisar Jakhal Railway Line 25.6-48.13 L & R												
2021-22	CA	Bhatla Minor RD 0-31 L & R	90	16	10	10	0	20	0	0	10	10	10	10
2021-22	NPV	Sisai to Luhari Road Km 0-3 L & R	60	20	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Sunder Sub Branch RD 86-105 L& R	89	16	10	10	0	20	0	0	10	10	10	10
2021-22	NPV	Dhanana Minor RD 0-20 L & R	72	20	10	10	20	20	0	0	10	10	10	10
2021-22	NPV	Gabipur to Parbhuwala Road 0-6 L & R	75	20	10	10	0	20	0	0	10	10	10	10
2021-22	NPV	Gaibipur to Litani Durjanpur 0-10 L & R	80	16	10	10	0	20	0	0	10	10	10	10
2021-22	NPV	Barwala Matloda 1-9 Kharkra Road 0-6 Km. L & R	92.53	20	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Jakhkal Hisar Railway Line 62-70 L/R	92	16	10	10	0	20	0	0	10	10	10	10
2021-22	NPV	Balawas Minor	44.6	20	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Deva Distry RD 21-85 R/side	62.8	16	10	10	0	20	0	0	10	10	10	10

2021-22	NPV	Hisar-Balsamand Road KM 3-15 L&R	91.5	16	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Kishangarh Sub Branch RD 47-87 L&R	50.1	16	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Kishangarh Sub Branch RD 23-47 L&R	81.5	16	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Sidhmukh Feeder RD 23-47 L/Side	92	16	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Agroha Minor RD 0-24 L&R	67.2	20	10	10	0	20	0	0	10	10	10	10
2021-22	NPV	Pabra-Kandool-Kheri Road KM 0-4 L&R	69.6	18	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Siwani Minor RD 0 to tail L&R	88.7	16	10	10	0	20	0	0	10	10	10	10
2021-22	CA	Pabra Disty. RD 70-116 L&R	47.4	16	10	10	0	20	0	0	10	10	10	10
			77.6	18.3	10	10	1.5	20	0	0	10	10	10	10

7.4 FATEHABAD DIVISION

Table 7.36: CA (Compensatory Afforestation) plantation sites evaluated in Fatehabad Division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20	Tohana	Chandpur	CA	Jakhal-Hisar Railway line km 2-20.9 L/R Side	29 ha	19.5 RKM	10000	10000	7485	90	5.6	03.10.2023
2020-21	Tohana	Tohana	CA	Delhi-Bhatinda Railwayline km 190-199 L/R	31.75 ha	29.8 RKM	31751	31751	26264	83	7.1	27.09.2023
2020-21	Tohana	Chandpur	CA	Jakhal-Hisar Railway Line km 2-7 L/R	8.29 ha	12.8 RKM	8290	8290	6041	72.87	9.4	03.10.2023
2021-22	Tohan	Tohana	CA	Chandel Minor RD 0-54 L/R	13.9800 ha	16.2 RKM	4000	4000	3589	89.73	7.5	27.09.2023
2021-22	Tohana	Chandpur	CA	Rangoi Nala km 0-15 L side	10 RKM	14.8 RKM	10000	10000	8500	85	6.6	03.10.2023

Table 7.37: NPV (Net Present Value) plantation sites evaluated in Fatehabad Division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
					2019-20							
2019-20	Fatehabad	Bramanwala	NPV	Ratangarh Distry. RD 15-40 L	5 RKM	5.15 RKM	1250	1250	767	61.4	9.9	27.09.2023
2019-20	Fatehabad	Fatehabad	NPV	Khara Kheri to Bhattu Road km 0-2 L/R	5 RKM	3.4 RKM	1250	1250	1025	82	8.5	28.09.2023

2019-20	Tohana	Chandpur	NPV	Girnor to Budhanpur Road 0-3 L/R side	5 RKM	6 RKM	1250	1250	1125	90	11.5	03.10.2023
2019-20	Fatehabad	Ratia	NPV	Nakta Road km 0-2.5 L/R	5 RKM	6.2 RKM	1250	1250	1125	75	6.3	04.10.2023
					2020-21							
2020-21	Tohana	Bhuna	NPV	Fatehabad Distt. RD 78-130 L/R	12RKM	11.9 RKM	3000	3000	2350	78.33	8.2	27.09.2023
2020-21	Tohana	Bhuna	NPV	Fatehabad to Bhuna road Km 16 to 26 L/R	12 RKM	23.8 RKM	3000	3000	2549	85	8.4	27.09.2023
2020-21	Fatehabad	Brahamanwala	NPV	BMB Canal RD 135-167 R side	14 RKM	9.8 RKM	3500	3500	2329	66.5	5.9	27.09.2023
2020-21	Fatehabad	Brahamanwala	NPV	BMB Canal RD 110-134 R side	14 RKM	8.3 RKM	3500	3500	1580	45	5.8	27.09.2023
2020-21	Fatehabad	Brahamanwala	NPV	Ghaghar Nali Ratiya pul to Tohana Bypass	5 RKM	8 RKM	1250	1250	885	71	4.8	27.09.2023
2020-21	Fatehabad	Bramanwala	NPV	Bireta Drain RD 0-10 L/R	10 RKM	6.7 RKM	2500	2500	2115	85	5.5	27.09.2023
2020-21	Fatehabad	Fatehabad	NPV	Old Fathebad Branch RD 160-183	11 RKM	10.3 RKM	2750	2750	2450	89	5.5	28.09.2023
2020-21	Bhattu	Bhattu	NPV	Fatehabad Branch RD 234 -255 L side and Fatehabad Branch 234-255 R side	11 RKM	12.6 RKM	2750	2750	2500	91	7	28.09.2023

2020-21	Tohana	Chandpur	NPV	Sirhind Drain km 0-3 L side	22 RKM	22.6 RKM	5500	5500	4606	84	6.1	03.10.2023
2020-21	Fatehabad	Ratia	NPV	Rattakheda Distry. RD 50-55 L/R	3 RKM	4.2 RKM	750	750	420	56	5.8	04.10.2023
2020-21	Fatehabad	Fatehabad	NPV	Fatehabad to Bhuna Road km 3-16 L/R	20 RKM	20.8 RKM	5000	5000	3630	72.6	5.8	04.10.2023
2020-21	Fatehabad	Ratia	NPV	Bhirdana Distry. RD. 48-60 L/R	7 RKM	13.6 RKM	1750	1750	970	55.43	8.2	04.10.2023
					2021-22							
2021-22	Tohana	Tohana	NPV	Gajuwala Minor & Parta to Gajuwala TO Hansewala road RD 0 to Tail L/R & km 0 to 5 L/R	10RKM	13.6 RKM	2500	2500	1640	65.6	5.2	27.09.2023
2021-22	Tohana	Tohana	NPV	Tohana to Bhuna Road Km 6-17 L/R	20 RKM	14.2 RKM	5000	5000	4350	87	16.1	27.09.2023
2021-22	Tohana	Tohana	NPV	BMB Road 0-10 L/R	6 RKM	8 RKM	1500	1500	1070	71.33	5.8	27.09.2023
2021-22	Tohana	Tohana	NPV	BMB road km 14-25 L/R	4 RKM	4.2 RKM	1000	1000	760	76	7	27.09.2023
2021-22	Fatehabad	Ratiya	NPV	Ratiya to Hanspur Road km 12-22 L/R	20 RKM	24 RKM	5000	5000	4750	95	6.4	27.09.2023
2021-22	Fatehabad	Ratiya	NPV	Ratiya to hanspur Road 3-11 L/R	16 RKM	9.6 RKM	4000	4000	3429	85.73	7.9	27.09.2023

2021-22	Fatehabad	Brahmanwala	NPV	Ratiya to Budhladha Road km 3-10 L/R	10 RKM	13.197 RKM	2500	2500	2125	85	6.4	27.09.2023
2021-22	Fatehabad	Brahmanwala	NPV	BMB neher RD 92-100 L side	13 RKM	2.2 RKM	3250	3250	2932	90.22	4.2	27.09.2023
2021-22	Fatehabad	Bhattu	NPV	Kheri Distry. RD 20-44 L/R	10 RKM	12.4 RKM	2500	2500	2175	87	5.9	28.09.2023
2021-22	Fatehabad	Ratiya	NPV	Rangoi Nala RD 19-20 LR	11.6 RKM	11.9 RKM	2900	2900	1950	67.24	5	03.10.2023
2021-22	Tohana	Chandpur	NPV	Bhuna to Jakhal Road km 11-21 L/R side	20 RKM	21.4 RKM	5000	5000	3885	77.7	7.1	03.10.2023
2021-22	Tohana	Chandpur	NPV	Ratia to Tohana Road km 12-23	20 RKM	13.8 RKM	5000	5000	2220	44.4	5.6	03.10.2023
2021-22	Fatehabad	Fatehabad	NPV	Fatehabad to Bhuna Road km 3-16 L/R	20 RKM	20.8 RKM	5000	5000	3630	72.6	5.7	04.10.2023

7.4.1. Relevance

7.4.1.1 Site Suitability

- Plantations carried out on bunds produced good results

Unlike most of the forest divisions, the plantations carried out on bunds showed good results in the Fatehabad division (Figure 7.29). Mostly saplings of Papdi and Neem were planted, which showed good growth and survival.

Figure 7.29: Papdi saplings planted on bunds showed good growth and survival

- Plantations along the canals have performed well

Plantations carried out along a canal or drain have performed very well (Figure 7.30). Due to the presence of the canal, moisture is retained in the soil and the saplings have enough water. Most of these plantations were inaccessible by vehicle, so the grazing or any other anthropogenic pressure is almost absent. Sheesham, Papdi, Bakain, Arjun, etc. which can grow in waterlogged conditions were planted to ensure the survival of the plantation.

Figure 7.30. Plantation along the canal showed good growth and survival

- Plantation carried out under the canopy could produce stunted growth

Ideally, plantations under the afforestation initiative should not be carried out under existing canopy cover. This could result in stunted growth of the saplings due to the lack of sunlight penetration (Figure 7.31).

Figure 7.31. Slow or stunted growth of Sheesham sapling, planted under dense canopy

❖ Impact of Grazing

Both domestic and feral cattle posed a serious threat to the plantations of the Fatehabad division. Most of the plantations do not have any kind of protection measures, which exposes them to severe grazing. In many sites, cattle (sheep and goats) were found roaming inside the plantation area (Figure 7.32).

Figure 7.32: Herds of cattle roaming inside the plantation

7.4.1.2 Species Suitability

- Overall species selection in the Fatehabad division was found to be satisfactory.
- A total of 20 planted species were found during the evaluation study (Table 7.38).
- In most of the plantations, fast-growing fire-resilient native species like Sheesham (*Dalbergia sissoo*), Arjun (*Terminalia arjuna*), etc. were planted.
- In roadside plantations, Kadam (*Neolamarckia cadamba*), and Bakain (*Melia azadarach*) were planted, which attained a height of 9-10 feet within 1-2 years of plantation.
- Papdi (*Holoptelea integrifolia*) was found in almost all plantation sites and attained good growth since cattle do not prefer it for grazing.

Table 7.38: List of planted species found in the plantations of Fatehabad Division

Sl. No	Species Planted	
	Local Name	**Botanical Name**
1	Bel	*Aegle marmelos*
2	Siris	*Albizia sp.*
3	Neem	*Azadirachta indica*
4	Kachnar	*Bauhinia variegata*

5	Amaltas	*Casia fistula*
6	Sheesham	*Dalbergia sissoo*
7	Gulmohor	*Delonix regia*
8		*Eugenia cuspidata*
9	Pilkhan	*Ficus virens*
10	Papdi	*Holoptelea integrifolia*
11	Jackranda	*Jacaranda mimosifolia*
12	Bottlebrudh	*Callistemon lanceolatus*
13	Bakain	*Melia azedirach*
14	Shahtoot	*Morus alba*
15	Kadam	*Neolamarckia cadamba*
16	Angrezi Babool	*Prosopis cinera*
17	Jamun	*Syzygium cummini*
18	Arjun	*Terminalia arjuna*
19	Baheda	*Terminalia balerica*
20	Imli	*Tmarindus indica*

7.4.2. Effectiveness

7.4.2.1 Survival of the Plantation

The overall survival rate of plantations in the Fatehabad division was found to be very satisfactory at 77.4%. Among the three plantation years, the highest survival rate was observed in the plantations carried out during 2020-21, with a rate of 73.6%. Conversely, the lowest survival rate was recorded for the plantations from 2019-20, which had a survival rate of 61.9% (Table 7.39)

Table 7.39:Year-wise survival rate and average height of the plantation sites

Year	Average Survival (%)	Average Height (Ft)
2019-20	79.6	8.0
2019-21	73.8	6.5
2019-22	78.6	6.8
	77.4	**7.1**

7.4.2.2 Growth of the plantation

Papdi (*Holoptelea integrifolia*), Shahtoot (*Moras alba*), and Kadam (*Neolamarckia kadamba*) attained the most height in the plantations of 2019-20, 2020-21 and 2021-22 respectively (Table 7.40 & Figure 7.32).

Table 7.40: Average height of different plant species across three plantation years

Sl. No.	Species Planted		Plantation year		
	Local Name	Botanical Name	2019-20	2020-21	2021-22
1	Bel	*Aegle marmelos*	4.8	-	-
2	Siris	*Albizia sp.*	-	6.3	6.3
3	Neem	*Azadirachta indica*	5.6	5.6	5.3
4	Kachnar	*Bauhinia variegata*	-	4.3	-
5	Amaltas	*Casia fistula*	-	6.5	5.5
6	Sheesham	*Dalbergia sissoo*	6.2	7.0	6.4
7	Gulmohor	*Delonix regia*	4.9	-	-
8		*Eugenia cuspidata*	5.5	-	-
9	Pilkhan	*Ficus virens*	-	6.2	-
10	Papdi	*Holoptelea integrifolia*	9.4	7.0	6.9
11	Jackranda	*Jacaranda mimosifolia*	4.7	-	-
12	Bottlebrudh	*Callistemon lanceolatus*	-	5.5	5.5
13	Bakain	*Melia azedirach*	6	5.4	6.4
14	Shahtoot	*Morus alba*	6.3	8.7	5.7
15	Kadam	*Neolamarckia cadamba*	-	-	8.4
16	Angrezi Babool	*Prosopis cinera*	-	3.5	-
17	Jamun	*Syzygium cummini*	7.9	6.1	5.5
18	Arjun	*Terminalia arjuna*	8.6	6.8	8.3
19	Baheda	*Terminalia balerica*	8.5	5.6	5.1
20	Imli	*Tmarindus indica*	4.6	-	-

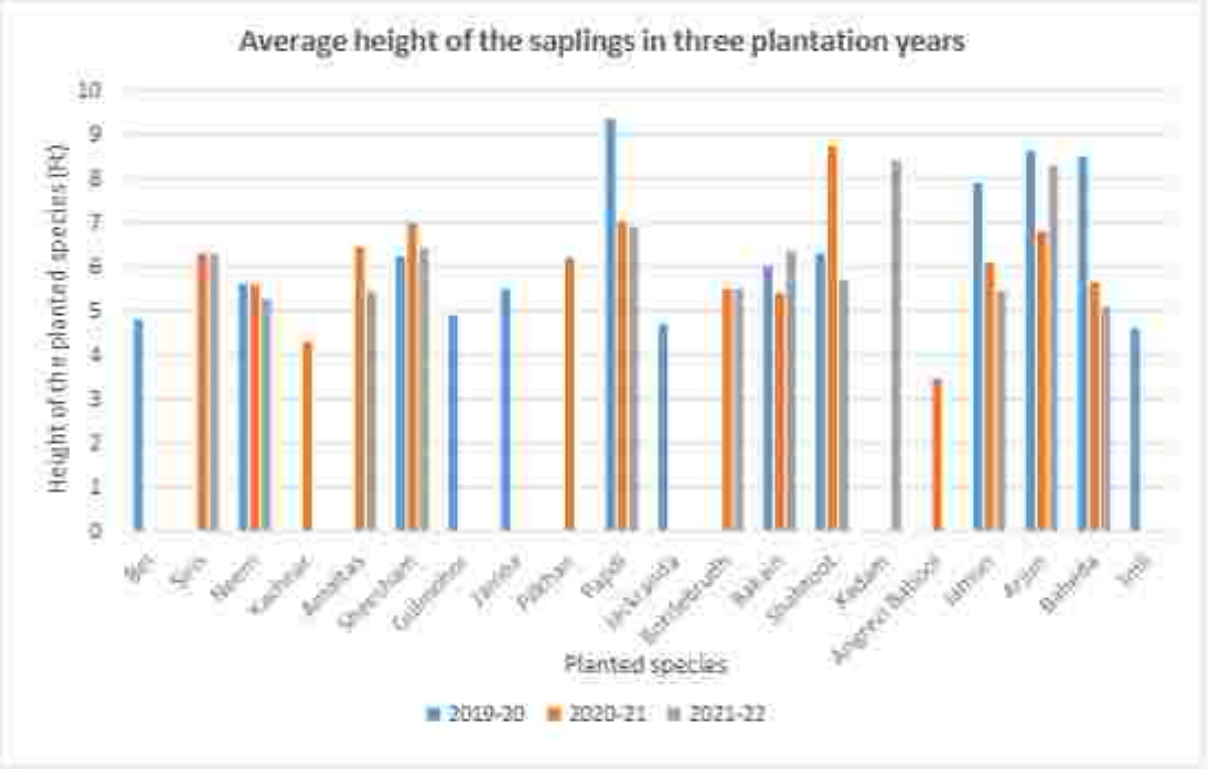


Figure 7.33: Growth of the planted species in three plantation years

7.4.3. Sustainability

7.4.3.1 Protection measure

All the plantation sites of Fatehabad division lack any kind of protective measure to prevent grazing except one. Only in the plantation of Ratia to Hanspur Road 3-11 (NPV, 2021-22), partial barbed wire fencing of was found (Figure 7.34). According to the forest officials, no funding was primarily allocated for fencing. Even if there were some, it takes usually almost 2 years (after plantation) to come through the proper channel. It is strongly recommended, that funding should be allocated for adequate perimeter/tree-specific fencing (Barbed wire/CPT or bamboo tree guard), and should be released on time.

Figure 7.34: Barbed wire fencing in the plantation of Ratia to Hasanpur Road 3-11

7.4.3.2 Maintenance

The written information/evidence/records for maintenance/replacement of plants such as plantation journals, APOs, plantation maps, etc., have not been maintained in any forest ranges. This is one of the major shortcomings seen across the ranges of Fatehabad division.

7.4.3.3 Monitoring

Regular monitoring was observed in all the plantation sites of the Fatehabad division. Chowkidaar/watchers have been appointed in all the forest ranges to take care of plantation sites.

7.4.4. Scoring of the plantation activities

The plantations carried out under CAMPA scheme in Fatehabad division in the year of 2019-20, 2020-21 and 2021-22 scored an average of 155.5, out of 250 (Table 7.41). Overall, the score was satisfactory, considering the immense grazing pressure and other anthropogenic disturbances observed in most plantation sites.

Table 7.41. Score obtained by the plantations in Fatehabad division

Year	Components	Name of Reach/ Site	Survival	Growth	Species suitability	Site suitability	Protection	Extent	Journal	Map	Invasive	Species composition	Weeding and hoeing	Watch and ward
2019-20	NPV	Ratangarh Distry. RD 15-40 L	61.3	20	10	10	0	10	0	0	10	10	0	10
2019-20	NPV	Khara Kheri to Bhattu Road km 0-2 L/R	82	16	10	10	0	10	0	0	10	10	0	10
2019-20	NPV	Girnor to Budhanpur Road 0-3 L/R side	90	20	10	10	0	10	0	0	10	10	0	10
2019-20	NPV	Jakhal-Hisar Railway line km 2-20.9 L/R Side	74.8	16	10	10	0	10	0	0	10	10	0	10
2019-20	CA	Nakta Road km 0-2.5 L/R	90	16	10	10	0	10	0	0	10	10	0	10
2020-21	NPV	Fatehabad Distt. RD 78-130 L/R	78.3	20	10	10	0	10	0	0	10	10	0	10
2020-21	NPV	Fatehabad to Bhuna road Km 16 to 26 L/R	84.9	20	10	10	0	10	0	0	10	10	0	10
2020-21	CA	Delhi-Bhatinda Railwayline km 190-199 L/R	82.7	20	10	10	0	10	0	0	10	10	0	10
2020-21	NPV	BMB Canal RD 135-167 R side	66.5	16	10	10	0	10	0	0	10	10	0	10

2020-21	NPV	BMB Canal RD 110-134 R side	45.1	16	10	10	0	10	0	0	10	10	0	10
2020-21	NPV	Ghaghar Nali Raliya pul to Tohana Bypass	70.8	16	10	10	0	10	0	0	10	10	0	10
2020-21	NPV	Bneta Drain RD 0-10 L/R	84.6	16	10	10	0	10	0	0	10	10	0	10
2020-21	NPV	Old Fathebad Branch RD 160-183	89.0	16	10	10	0	10	0	0	10	10	0	10
2020-21	NPV	Fatehabad Branch RD 234 - 255 L side and Fatehabad Branch 234-255 R side	90.9	18	10	10	0	10	0	0	10	10	0	10
2020-21	NPV	Sirhind Drain km 0-3 L side	83.7	18	10	10	0	10	0	0	10	10	0	10
2020-21	CA	Jakhal-Hisar Railway Line km 2-7 L/R	72.8	20	10	10	0	10	0	0	10	10	0	10
2020-21	NPV	Rattakheda Distry RD 50-55 L/R	56	18	10	10	0	10	0	0	10	10	0	10
2020-21	NPV	Fatehabad to Bhuna Road km 3-16 L/R	72.6	18	10	10	0	10	0	0	10	10	0	10
2020-21	NPV	Bhirdana Distry RD 48-60 L/R	55.4	18	10	10	0	10	0	0	10	10	0	10
2021-22	NPV	Gajuwala Minor & Parta to Gajuwala TO Hansewala road RD 0 to Tail L/R & km 0 to 5 L/R	65.6	18	10	10	0	10	0	0	10	10	0	10
2021-22	CA	Chandel Minor RD 0-54 L/R	89.7	20	10	10	0	10	0	0	10	10	0	10

2021-22	NPV	Tohana to Bhuna Road Km 6-17 L/R	87	20	10	10	0	10	0	0	10	10	0	10
2021-22	NPV	BMB Road 0-10 L/R	71.3	18	10	10	0	10	0	0	10	10	0	10
2021-22	NPV	BMB road km 14-25 L/R	76	18	10	10	0	10	0	0	10	10	0	10
2021-22	NPV	Ratiya to Hanspur Road km 12-22 L/R	95	18	10	10	0	10	0	0	10	10	0	10
2021-22	NPV	Ratiya to hanspur Road 3-11 L/R	85.7	20	10	10	0	10	0	0	10	10	0	10
2021-22	NPV	Ratiya to Budhladha Road km 3-10 L/R	85	18	10	10	0	10	0	0	10	10	0	10
2021-22	NPV	BMB neher RD 92-100 L side	90.2	18	10	10	0	10	0	0	10	10	0	10
2021-22	NPV	Kheri Distry. RD 20-44 L/R	87	18	10	10	0	10	0	0	10	10	0	10
2021-22	NPV	Rangoi Nala RD 19-20 LR	67.2	16	10	10	0	10	0	0	10	10	0	10
2021-22	CA	Rangoi Nala km 0-15 L side	85	18	10	10	0	10	0	0	10	10	0	10
2021-22	NPV	Bhuna to Jakhal Road km 11-21 L/R side	77.7	20	10	10	0	10	0	0	10	10	0	10
2021-22	NPV	Ratia to Tohana Road km 12-23	44.4	18	10	10	20	10	0	0	10	10	0	10
2021-22	NPV	Fatehabad to Bhuna Road km 3-16 L/R	72.6	18	10	10	0	10	0	0	10	10	0	10
			76.8	18.1	10	10	0.6	10	0	0	10	10	0	10

7.4.5. Non-plantation activities

7.4.5.1. Fencing

Barbed wire fencing is essential to provide adequate protection to the forest area. It prevents the forest from excessive grazing, illegal cutting, and other anthropogenic disturbances. Both the Barbed wire fencing sites in the Tohana range were found to be intact and working effectively.

Table 7.42: Barbed wire fencing sites evaluated in Fatehabad Division

Year	Range	Barbed wire Fence Id/NO/Name	Length in measurement Book	Actual Length in field	% Variation (+/-)	Present status-intact/worn out	Effectiveness of the Fence
2019-20	Tohana	Jakhal Hisar Railway line km 10 to 14 L/R	18 RKM	14 RKM	-22%	Intact	Very Effective
2020-21	Tohana	Delhi Bathinda Railway line km 182-190, 195-199 L/R side	100 RKM	60 RKM	-40%	Intact	Very Effective

Figure 7.35: Fencing in Delhi-Bathinda Railway Line Km 182-190, 195-199 L/R side

Figure 7.36: Fencing in Jakhal-Hisar Railway Line Km 10-14 UR

7.4.5.2 Soil and Moisture Conservation (SMC):

Only one SMC site (Trench) was selected for comprehensive evaluation. The trench, situated in the Tohana range was dug to retain moisture during the dry season and secure proper water flow during the monsoon. The trench matches the expectations and working effectively.

Table 7.43: SMC site evaluated in Fatehabad Division

Components	Year	Range	Name	Size in Measurement Book	Actual Size	Expenditure (Rs.)
Trench	2021-22	Tohana	Rangoi Nala RD 0 to 20 L/side	NA	1x0.6x0.5	68,150

Figure 7.37: SMC (Digging of Trench) site in Rangoi Nala RD 0-20 L Side

7.4.5.3 Scoring of the non-plantation activities

Table 7.44: Score obtained by the fencing sites in Fatehabad division

	Scoring components	Full score	Obtained score
1	Working Status	20	20
2	Serving the purpose intended	20	20
3	Actual extent	20	20
4	Site suitability	10	10
5	Measurement book	10	0
6	Expenditure as per the APO	20	20
	TOTAL	100	90

Table 7.45: Score obtained by the SMC site in Fatehabad division

	Scoring components	Full score	Obtained score
1	Working status	20	20
2	Site suitability	20	20
3	Measurement as per the APO	20	20
4	Fulfilling design specification	20	20
5	Measurement book	20	0
	TOTAL	100	80

7.5 CHARKHI-DADRI DIVISION

Table 7.46: CA (Compensatory Afforestation) plantation sites evaluated in Charkhi-Dadri division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2021-22	Charkhi-Dadri	Charkhi-Dadri	CA-TP	Kheri Bura Minor RD 03-06 L&R Side	0.1000 ha	0.1 ha	100	100	90	90	3.5	08.11.23

Table 7.47: NPV (Net Present Value) plantation sites evaluated in Charkhi-Dadri division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20												
2019-20	Dadri	Dadri	NPV-TP	Dadri-Kanina Road	2.4 RKM	2.5 RKM	600	600	303	50.5	8.9	08.11.23
2019-20	Dadri	Dadri	NPV-TP	Mori-Balkara-Mandoli Road	3.2 RKM	3.4 RKM	800	800	600	75	8.7	08.11.23
2019-20	Badhra	Badhra	NPV-TP	Kaluwala Sarangpur Road KM 0-10 L&R & Atela Dudiwala Road 6-10 L&R	10 RKM	10 RKM	2500	2500	1375	55	12.7	09.11.23
2020-21												
2020-21	Badhra	Badhra	NPV-TP	Dadri Loharu Road KM 32-35 L&R	3 RKM	3 RKM	750	750	396	52.8	8.5	08.11.23

2020-21	Badhra	Badhra	NPV-TP	Bhandwa Khorda Road KM 0-10	7 RKM	7 RKM	1750	1750	214	12.2	8.8	09.11.23
2020-21	Badhra	Badhra	NPV-TP	Dadri Loharu Road KM 16-20 L&R	4 RKM	4 RKM	1000	1000	380	38	9.8	08.11.23
2020-21	Badhra	Badhra	NPV-TP	Nangia Minor RD 19-25 L&R	6 RKM	6 RKM	1500	1500	977	65.1	8.7	08.11.23
2020-21	Badhra	Badhra	NPV EcoR	Atela Village Aravali Hill	45 ha	45 ha	9000	9000	0	0	0	09.11.23
2021-22												
2021-22	Badhra	Kadma	NPV-TP	Satnali Fidder 28-36 L&R	7 RKM	7 RKM	1750	1750	739	42.2	8.7	09.11.23
2021-22	Badhra	Badhra	NPV-TP	Umarwas Minor 0-18 L&R	5 RKM	5 RKM	1250	1250	449	35.9	6	09.11.23
2021-22	Badhra	Badhra	NPV-TP	Kharpura Minor 0-8 L&R	3 RKM	3 RKM	750	750	250	33.3	4.5	09.11.23
2021-22	Badhra	Badhra	NPV EcoR	Atela Village Aravali Hill	25 ha	25 ha	1800	1800	0	0	0	09.11.23

7.5.1. Relevance

7.5.1.1. Site Suitability

- Sites adjacent to the agricultural field have performed well

Most of the plantation sites are located beside the agricultural fields (Figure 7.38). These plantation sites have performed well as they benefit from the irrigation and fertilizers being supplied to crops in the agricultural fields.

Figure 7.38: Plantations beside the agricultural fields

- Eco-restoration site was carried out in an unsuitable site

Plantations under Eco-restoration were carried out on the Aravalli hills. The area is mainly consisting of a rocky soil bed with an abundance of *Prosopis juliflora* (Figure 7.39), which hampers the growth of the planted saplings. Hardy species such as Kikar, Reunjh, etc. were planted in this area, but due to the rocky soil, all the saplings were found to be dead.

Figure 7.39: Eco-restoration site on Aravalli

- Impact of grazing pressure

Both domestic and feral cattle posed a serious threat to the plantations of Charkhi-Dadri district. Most of the plantations do not have any kind of protection measures and are thus prone to damage by animals.

- Impact of Fire

Stable burning in the adjacent agricultural fields impacted some of the plantation sites severely. In these sites, most of the young saplings were found dead or severely burned (Figure 7.40). Proper communication with the local communities through meetings, and awareness programs before the plantation initiative is utmost necessary to avoid premature death of the saplings.

Figure 7.40: Burned saplings in fire-affected plantation

- Anthropogenic disturbances

Local communities are affecting plantations to a great extent in many plantation sites. In many plantation sites, where farmers have ploughed over the plantations to claim the land under the plantation (Figure 7.41).

Figure 7.41: Anthropogenic impact on plantations

7.5.1.2 Species Suitability

Papri (Holoptelea integrifolia) is the most common species planted across the plantation sites of the division. Its adaptability is evident as it thrives well across different locations (Fig 7.42), except at some sites the growth of Papri is stunted. Other commonly planted species which show adaptability in the division include Bakain, Lasora, Neem and Siris.

Table 7.48: List of planted species observed in the plantations of Charkhi-Dadri Division

Sl. No.	Planted Species	
	Local Name	**Botanical Name**
1	Arjun	*Terminalia arjuna*
2	Bakain	*Melia azedirach*
3	Balmkhera	*Kigelia pinata*
4	Lasora	*Cordia myxa*
5	Neem	*Azadirachta indica*
6	Papri	*Holoptelea integrifolia*
7	Shisham	*Dalbergia sissoo*
8	Siras	*Albizia labbek*

Figure 7.42: Plant species showing good adaptability across plantation sites.

- ❖ Hardy species were chosen for dry rocky soil

On the sites situated near the Aravali hills, Acacia leucophloea (Ronjh) and Acacia catechu (Khairi) are specifically chosen for their suitability in eco-restoration efforts (Figure 7.43). However, it is important to note that the survival rate of plants in these eco-restoration sites remains negligible, indicating the need for further attention and improvements in this particular aspect of the region's restoration efforts.

Figure 7.43: Planted sapling of Khair (Acacia catechu) in the NPV Eco-restoration site

7.5.2. Effectiveness

7.5.2.1. Plant Survival

The overall survival rate of plantations in the Charkhi-Dadri division was found to be 42.3%. Among the three plantation years, the highest survival rate was observed in the plantations carried out during 2019-20, with a rate of 60.2%. Conversely, the lowest survival rate was recorded for the plantations from 2020-21, which had a survival rate of only 33.6 % (Table 7.49).

Table 7.49: Year-wise survival rate and average height of the plantation sites

	Year	Survival (%)	Avg. Height (ft.)
1	2019-2020	60.2	10.2
2	2020-2021	33.6	9.3
3	2021-2022	40.3	5.6

The plantation sites located on Aravallis [Atela Village Arawali Hill (2020-21) and Atela Village Arawali Hill (2021-22)], involving eco-restoration efforts, exhibited zero survival rates. The forest department encounters numerous challenges in conducting successful plantations due to factors like poor soil quality, water scarcity, and dry climatic conditions. To avoid wasting

resources and efforts, it is imperative to conduct a comprehensive site suitability survey before initiating any plantation activities. This assessment will enable the identification of areas that possess optimal conditions for plant growth, thereby ensuring a higher survival rate and long-term sustainability.

7.5.2.2 Growth of the Plantations

Albizia lebbeck, *Dalbergia sissoo* and *Azadirachta indica* were highest growing species of the year, 2019-20, 2020-21 and 2021-22 respectively (Table 7.50, Figure 7.44).

Table 7.50: Average height of different plant species across three plantation years

Sl. No.	Planted species		Plantation Year		
	Local Name	Botanical Name	2019-20	2020-21	2021-22
1	Arjun	*Terminalia arjuna*	8.6	-	-
2	Bakain	*Melia azedarach*	10.4	7.7	-
3	Balmkhera	*Kigelia piñata*	7.8	-	-
4	Lasora	*Cordia myxa*	6.5	-	-
5	Neem	*Azadirachta indica*	12.4	8.6	7.5
6	Papri	*Holoptelea integrifolia*	9.3	8.8	6.3
7	Shisham	*Dalbergia sissoo*	-	9.2	-
8	Siras	*Albizia labbek*	16.5	12	3.5

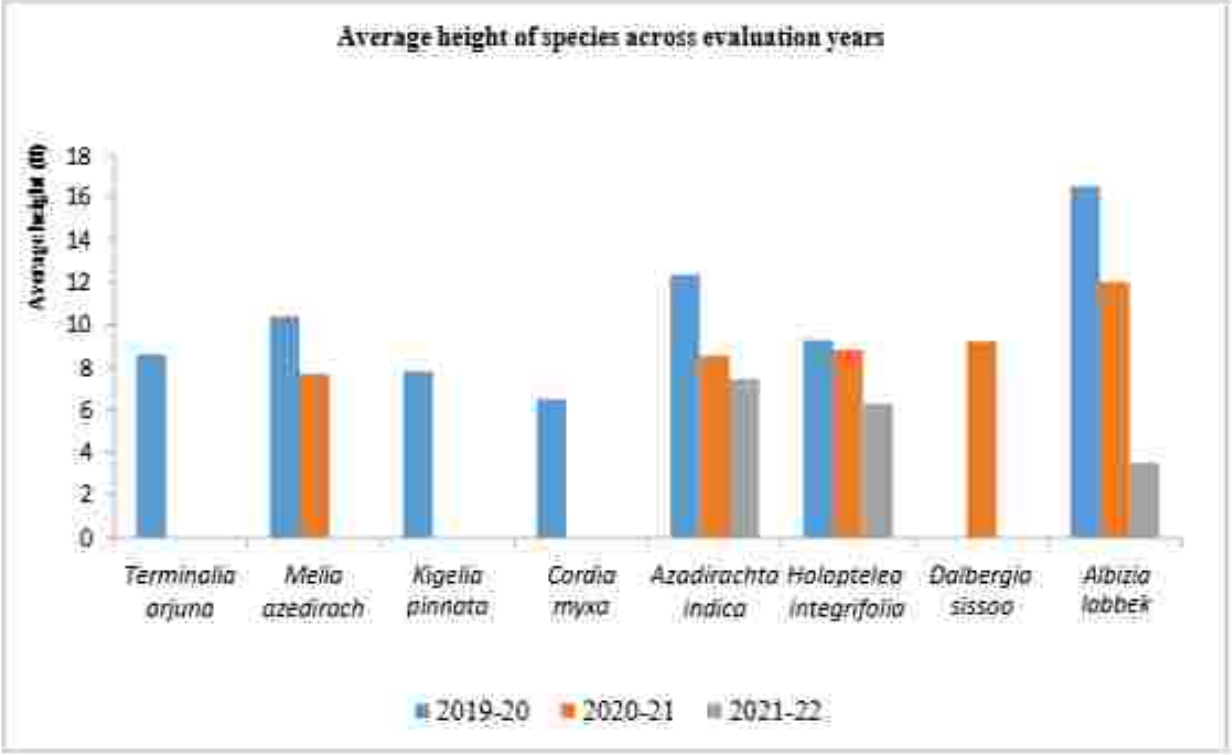


Figure 7.44: Average height of different plant species across three evaluation years

7.5.3. Sustainability

7.5.3.1. Protection

All the plantation sites except Eco-restoration sites have not protection measures such as fencing, tree guards, cow proof trenches etc., making these plantation sites prone to the damage inflicted by grazing and browsing animals. Appropriate protection measures should be taken before conducting plantation activities to avoid damage to the plantation by grazing animals, trespassers and un-authorized harvesting.

7.5.3.2. Maintenance

The written information/evidence/records for maintenance/replacement of plants such as plantation journals, APOs, plantation maps etc., have not been maintained in any forest range.This is one of the major shortcoming seen across the ranges of Charkhi-Dadri division.

7.5.3.3. Monitoring

Regular monitoring of plantation is reported in all the plantation sites of the division. Chowkidaar/Watcher has been appointed in all the forest ranges to take care of plantation sites.

7.5.4. Scoring of the plantation works

The plantations carried out under the CAMPA scheme in the year of 2019-20, 2020-21 and 2021-22 scored an average of 122.5, out of 250 (Table 7.51). Overall, the score obtained was satisfactory, considering the water-scarce in the region, grazing pressure and severe anthropogenic disturbances observed in most of the plantation sites.

Table 7.51. Score obtained by the plantations in Charkhi-Dadri division

	Components	Full score	Obtained Score
1	Survival	100	42.3
2	Growth	20	13.7
3	Species suitability	10	8.3
4	Site suitability	10	8.5
5	Protection	20	1.2
6	Extent	20	14.0
7	Journal	20	0.0
8	Map	10	0.0
9	Invasive	10	9.0
10	Species composition	10	8.5
11	Weeding and hoeing	10	7.0
12	Watch and ward	10	10.0
		250	122.5

7.6 BHIWANI DIVISION

Table 7.52: CA (Compensatory Afforestation) plantation sites evaluated in Bhiwani division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20	Bhiwani	Bhiwani 2nd	CA-TP	Jui feeder RD 88 to 135 L&R	0.31 Ha	0.31 Ha	312	312	0	Damaged by Canal cleaning activities (P259)		07-11-2023
2019-20	Bhiwani	Bhiwani 2nd	CA-TP	Jui feeder RD 88 to 135 L&R	1.38 Ha	1.38 Ha	1380	1380	0	Damaged by Canal cleaning activities (P259)		07-11-2023
2020-21	Loharu	Loharu	CA-TP	Jhumpa disty. Rd 35-70 L&R	8.9 Ha	11 RKM	8450	8450	3042	36	8.5	05-11-2023
2021-22	Loharu	Obra	CA-TP	Bidhnoi Minor RD 0 to Tail L&R	5 Ha	5 Ha	5000	5000	1550	31	8.5	05-11-2023
2021-22	Loharu	Behal	CA-TP	Behal Disty. RD 58-77	2 Ha	2 Ha	2000	2000	902	45.1	10.2	05-11-2023
2021-22	Loharu	Behal	CA-TP	Sorra Disty RD 110-135	2 Ha	2 Ha	2000	2000	596	29.8	10.8	05-11-2023

Table 7.53: NPV (Net Present Value) plantation sites evaluated in Bhiwani Division

Year	Range	Block	Component	Name of the Site	Area of Plantation (As per APO)	Actual area using GPS	Physical Target (No. of plants)	No. of Plants planted	No. of Plants survived	Survival (%)	Average Height (Ft.)	Date of visit
2019-20	Tosham	B. Khera	NPV-TP	Jattu Lohan Baliyali Rd	10 RKM	10 RKM	2500	2500	1940	77.6	14.9	07-11-2023

2019-20	Bhiwani	Kairu	NPV-TP	Deverala - Pohkarwas Road	10 RKM	10 RKM	2500	2500	1105	44.2	13.5	03-11-2023
2020-21	Bhiwani	Bhiwani 1st	NPV-TP	Bapora-Dinod-Bajina Road Km 0-8 L/R	11RKM	11RKM	2750	2750	1587	57.7	7.5	03-11-2023
2020-21	Bhiwani	Bhiwani 1st	NPV-TP	Dinod-Kasumbhi Road Km 0-3 L&R	4 RKM	4 RKM	1000	1000	695	69.5	5.4	03-11-2023
2020-21	Bhiwani	Bhiwani 1st	NPV-TP	Bapora-Devsar-Malwas Road Km 0-5 L&R	10 RKM	10 RKM	2500	2500	1350	54	11.9	03-11-2023
2020-21	Bhiwani	Bhiwani IInd	NPV-TP	Khark - Sai Rewari Road Km 0-5 L/R	8RKM	8RKM	1500	1500	888	59.2	10.9	04-11-2023
2020-21	Bhiwani	Bhiwani IInd	NPV-TP	Bamla - Dhani Harsukh Road Km 0-5 L/R	4RKM	4RKM	1000	1000	615	61.5	13.5	04-11-2023

2020-21	Bhiwani	Bhiwani IInd	NPV-TP	Bhiwani Distributory RD 113-155 R/S	8 RKM	8 RKM	2000	2000	600	30	10.4	04-11-2023
2020-21	Bhiwani	Bhiwani Ist	NPV-TP	Dadri-Bhiwani Road Km 16-27 L/R	10 RKM	10 RKM	2500	2500	1555	62.2	8.7	04-11-2023
2020-21	Loharu	Behal	NPV-TP	Behal-Dhani Sahjmanpur Raod 0-4 KM	8.5 RKM	8.5 RKM	2150	2150	780	36.3	11.2	05-11-2023
2020-21	Loharu	Behal	NPV-TP	Nangal-Sehar Road 0-4 KM	10 RKM	10 RKM	2500	2500	1623	64.9	8.6	05-11-2023
2020-21	Siwani	Siwani	NPV-TP	Siwani Minor RD 30 to 67 L&R Side	5 RKM	5 RKM	1250	1250	585	46.8	11	06-11-2023
2020-21	Siwani	Siwani	NPV-TP	Gurera to Lilas KM 0 to 6 L&R Side	10 RKM	10 RKM	2500	2500	830	33.2	7.3	06-11-2023
2020-21	Siwani	Siwani	NPV-TP	Mohila to Budhsh	9 RKM	9 RKM	2250	2250	918	40.8	9.6	06-11-2023

				eli Road KM 0 to 6 L&R								
2020-21	Siwani	Miran	NPV-TP	Gawar Minor RD 0-12 L&R Side	4 RKM	4 RKM	1000	1000	326	32.6	8.7	06-11-2023
2020-21	Siwani	Siwani	NPV-TP	NH-52 to Dhani Silewali Road KM 0-6 L&R	4 RKM	4 RKM	1000	1000	235	23.5	8.8	06-11-2023
2020-21	Tosham	Tosham	NPV-EcoR	Nigana Hill	30 ha	30 ha	Plantation not done					07-11-2023
2020-21	Tosham	Tosham	NPV-EcoR	Nigana Hill	10 ha	10 ha	Plantation not done					07-11-2023
2021-22	Bhiwani	Kairu	NPV-TP	Sungarpur - Dhanimahu Road Km 0-6 L/R	10 RKM	10 RKM	2500	2500	160	6.4	4	04-11-2023
2021-22	Loharu	Loharu	NPV-TP	Gignow-Barwas Road KM 0-8 L&R	10 RKM	10 RKM	2500	2500	985	39.4	6.7	05-11-2023
2021-22	Loharu	Loharu	NPV-TP	Jhanjhara to Damkor	10 RKM	10 RKM	2500	2500	568	22.7	8.2	05-11-2023

				a Road KM 0-6 L&R Side								
2021-22	Siwani	Siwani	NPV-TP	NH 52 Km 141 to 150 L&R/Side	10 RKM	10 RKM	2500	2500	103	4.1	6.4	06-11-2023
2021-22	Siwani	Siwani	NPV-TP	NH 52 to Devsar-Dhani Silawali Km 0 to 10 L&R/Side	10 RKM	10 RKM	2500	2500	348	13.9	9	06-11-2023
2021-22	Siwani	Jhumpa	NPV-TP	Kalod to Kalali Road Km 0 to 4 L&R/Side	6 RKM	6 RKM	Plantation not done					06-11-2023
2021-22	Siwani	Miran	NPV-TP	Siwani Singhani Road km 16 to 22	5.8 RKM	5.8 RKM	1450	1450	264	18.2	6.1	06-11-2023
2021-22	Siwani	Miran	NPV-TP	Jhulli Chopta To Gadwa Road Km 0 to	10 RKM	10 RKM	2500	2500	473	18.9	6.6	06-11-2023

				& L&R/Sid e								
2021-22	Tosham	Bhiwani khera	NPV-TP	Hansi-Bhiwani Road KM 18-27	10 RKM	10 RKM	2500	2500	743	29.7	9.2	07-11-2023
2021-22	Tosham	Bhiwani khera	NPV-TP	Siwara Link Minor RD 0-24 L&R	10 RKM	10 RKM	2500	2500	740	29.6	7.8	07-11-2023

7.6.1. Relevance

7.6.1.1. Site Suitability

- Plantations along the road have performed well

Most of the roadside plantations were situated adjacent to agricultural fields (Figure 7.45). Fertilizers and manures applied to the agricultural crop also benefitted the planted saplings. Planted saplings also have a steady supply of water from the irrigated agricultural field. Some of the roadside plantations have barbed wire fencing as a protection measure which prevents grazing and other anthropogenic activities.

Figure 7.45: Plantations showing significant growth besides the agricultural fields

- Impact of Grazing pressure

Both domestic and feral cattle posed a serious threat to the plantations of the Bhiwani district (Figure 7.46). Most of the plantations does not have any kind of protection measure. Only a few sites in the division have protective measures like barbed wire fences and stone walls, but even these were found to be broken and poorly maintained, rendering them ineffective in safeguarding plants from animal damage. In many sites, cattle were found to be roaming near the plantation.

Figure 7.46: Severe cattle grazing was observed in the plantation site

- Abundance of invasive species

In the Bhiwani division, the presence of invasive species such as *Prosopis juliflora* was observed in some of the plantation sites (Figure 7.47). Most of the planted species under the canopy of *Prosopis* were found to be stunted. The presence of this invasive species could be detrimental to the planted saplings, as well as the native flora. Pre-plantation eradication and frequent weeding after are highly recommended to secure the survival of the plantation.

Figure:7.47: Prosopis juliflora was found abundantly in some sites of Bhiwani division

- Eco-restoration site was not suitable

The Eco-restoration sites of Nigana Hills in Tosham Range were chosen in a land with unfavourable edaphic conditions. The site was comprised of huge boulders, and on a rocky, hilly terrain, which is not suitable for any plantation species (Figure 7.48). These sites should not be chosen for a tree plantation initiative but developed for grasslands instead.

Figure 7.48: Eco-restoration site in Nigana Hills, Tosham Range

7.6.1.2. Species Suitability

The Papri (*Holoptelea integrifolia*) was seen as the most common planted species across the plantation sites (Figure 7.49). The suitability of Papri is evident from the remarkable growth of the species across these plantation sites. Other commonly planted species such as Shisham (*Dalbergia sissoo*), Bakain (*Melia azedirach*), Lasora (*Cordia myxa*), and Siris (*Albizia labbek*) performed relatively better.

Figure 7.49: Common planted species across plantations in Bhiwani division

- Hardy species were chosen for dry rocky soil

On the sites situated in the Aravali hills, *Acacia leucophloea* (Ronjh) and *Acacia catechu* (Khairi) are specifically chosen for their suitability in eco-restoration efforts. However, it is important to note that the survival rate of plants in these eco-restoration sites remains negligible, indicating the need for further attention and improvements in this particular aspect of the region's restoration efforts.

Table 7.54: List planted species observed in Bhiwani division

Sl. No.	Planted Species	
	Local Name	**Botanical Name**
1	Arjun	*Terminalia arjuna*
2	Bakain	*Melia azedarach*
3	Jamoa	*Eugenia cuspidata*
4	Jamun	*Syzygium cumini*
5	Lasora	*Cordia myxa*

6	Neem	*Azadirachta indica*
7	Papri	*Holoptelea integrifolia*
8	Sahtoot	*Morus alba*
9	Shisham	*Dalbergia sissoo*
10	Siras	*Albizia procera*

7.6.2. Effectiveness

7.6.2.1. Plant Survival

The overall survival rate of plantations in the Bhiwani division was 31.46%. Among the three plantation years, the highest survival rate was observed in the plantations carried out during 2020-21, with a rate of 41.7%. Conversely, the lowest survival rate was recorded for the plantations from 2021-22, which had a survival rate of only 22.2% (Table 7.55).

Table 7.55: Year-wise survival rate and average height of the plantation sites

	Year	Survival (%)	Avg. Height (ft.)
1	2019-2020	30.5	15.3
2	2020-2021	41.7	9.8
3	2021-2022	22.2	7.7

The plantation sites located on Aravallis, involving eco-restoration efforts, exhibited zero survival rates. The forest department encounters numerous challenges in conducting successful plantations due to factors like poor soil quality, water scarcity, and dry climatic conditions. To avoid wasting resources and efforts, it is imperative to conduct a comprehensive site suitability survey before initiating any plantation activities. This assessment will enable the identification of areas that possess optimal conditions for plant growth, thereby ensuring a higher survival rate and long-term sustainability.

7.6.2.2. Growth of the Plantations

Melia azedarach was the highest-growing species of 2019-20 and 2021-22 plantations, while *Albizia procera* and *Eugenia cuspidata* were the highest-growing species of the year 2020-21 (Table 7.56, Figure 7.50).

Table 7.56: Average height of different plant species across three plantation years

Sl. No	Planted Species		Plantation Years		
	Local Name	Botanical Name	2019-20	2020-21	2021-22
1	Arjun	*Terminalia arjuna*	-	8.3	7.5
2	Bakain	*Melia azedarach*	18.6	11.2	9.6
3	Jamoa	*Eugenia cuspidata*	-	11.5	-

4	Jamun	*Syzygium cumini*	-	8.4	-
5	Lasora	*Cordia myxa*	-	7	5.2
6	Neem	*Azadirachta indica*	-	11.2	7.8
7	Papri	*Holoptelea integrifolia*	10.8	8.4	7.1
8	Sahtoot	*Morus alba*	-	-	9.4
9	Shisham	*Dalbergia sissoo*	16.5	10.4	7.8
10	Siras	*Albizia procera*	-	11.5	7.8

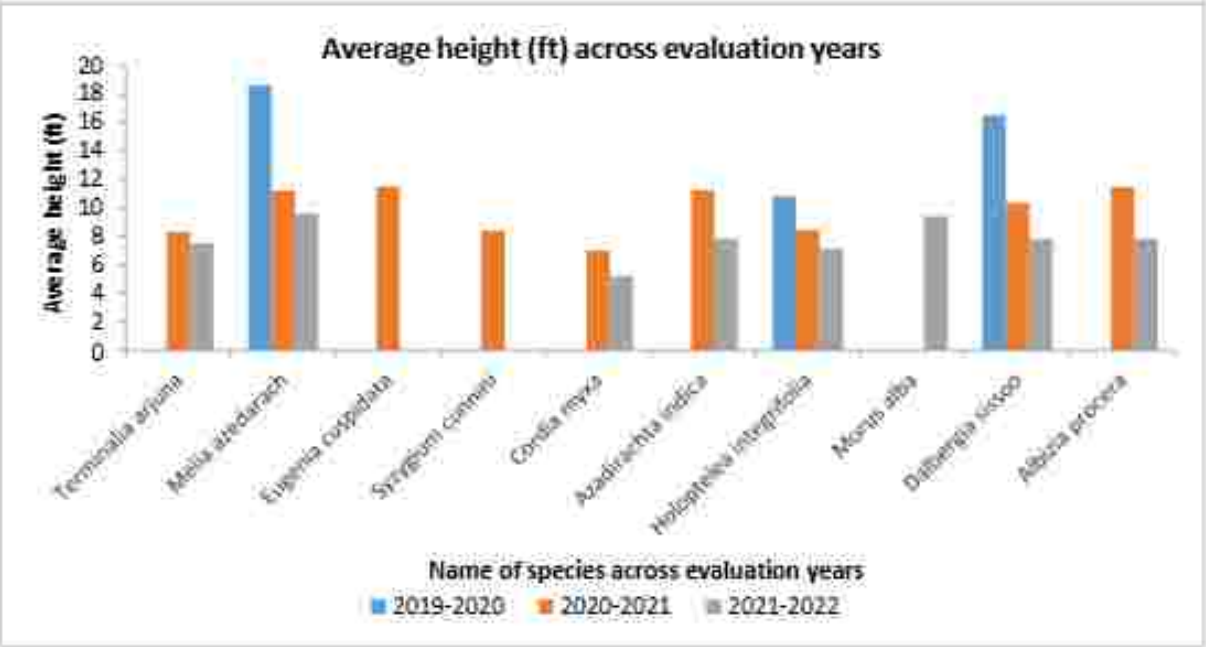


Figure 7.50: Average height of different plant species across three evaluation years

7.6.3. Sustainability

7.6.3.1 Protection

Most of the plantation sites are without proper protection measures such as fencing, tree guards, cowproof trenches, etc., making these plantation sites prone to damage inflicted-proofing and b, browsing animals. Appropriate protection measures should be taken before conducting plantation activities to avoid damage to the plantation by grazing animals, trespassers, and unauthorized harvesting.

7.6.3.2 Maintenance

The written information/evidence/records for maintenance/replacement of plants such as Measurement books, plantation journals, APOs, plantation maps, etc., have not been maintained in any forest range. This is one of the major shortcomings seen across the ranges of the Bhiwani division.

7.6.3.3 Monitoring

Regular monitoring of the plantations is observed in all the plantation sites of the division. Chowkidaar/Watcher has been appointed in all the forest ranges to take care of plantation sites.

7.6.4. Scoring of the plantation works

The plantations carried out under the CAMPA scheme in the year 2019-20, 2020-21 and 2021-22 scored an average of 109.2, out of 250 (Table 7.57). Overall, the score obtained was satisfactory, considering the water-scarce rocky terrain in the Aravalli region, grazing pressure, and severe anthropogenic disturbances observed in most of the plantation sites.

Table 7.57: Score obtained by the plantations in Bhiwani division

	Components	Full score	Obtained Score
1	Survival	100	33
2	Growth	20	12.4
3	Species suitability	10	6.3
4	Site suitability	10	5.5
5	Protection	20	2.5
6	Extent	20	18.0
7	Plantation Journal	20	0.0
8	Plantation Map	10	0.0
9	Invasive Species	10	7.0
10	Species composition	10	8.5
11	Weeding and hoeing	10	6.0
12	Watch and ward	10	10.0
		250	109.2

7.6.5. Non- Plantation Activities

7.6.5.1. Fencing

Fencing was evaluated in two sites, Jui feeder RD 88 to 135 L&R and Siwani-Singhani road RD 36-42 L&R. The fencing in Jui feeder RD 88 to 135 L&R was found completely damaged, worn out barbed wire fence (Figure 7.51). It is quite evident that the fence is not intact and is not effectively serving its purpose. The fencing has not been done on Siwani-Singhani road RD 36-42 L&R.

Figure 7.51: Damaged Fencing Site in Jui Feeder RD 88-135 L&R

Table 7.58: Details of evaluated fencing sites of Bhiwani division

Barbed wire Fence Id/NO/Name	Length in measurement Book	Actual Length in field	% Variation (+/-)	Present status- intact/worn out	Effectiveness of the Fence (V. effective/Moderately effective/ non-effective
Jui feeder RD 88 to 135 L&R	11.16	6.5	4.7	Worn out	Non-effective
Siwani-Singhani road RD 36-42 L&R	NA	-	-	Fencing not done	-

7.6.5.2. Scoring of the non-plantation activities

Table 7.59: Score obtained by the fencing sites in Bhiwani division

	Scoring components	Full score	Obtained score
1	Working Status	20	0
2	Serving the purpose intended	20	0
3	Actual extent	20	11
4	Site suitability	10	10
5	Measurement book	10	0
6	Expenditure as per the APO	20	20
	TOTAL	**100**	**41**

8. Chapter 8: Wildlife and Development Wing

Although Haryana State is deficient in natural forests comparing to the other states, but it has rich bio-diversity, which makes it suitable for variety of wildlife particularly local and migratory bird species, and Blackbuck. The Development and Wildlife Wing Activities are spread across the state dedicated to conserving the biodiversity of the state.

These activities have been assessed based on the following criteria:

- 50% of value/sites have been assessed.
- 50% assessment of activities of Research, Seed, Training Division, and Publicity and Training Circle.

Table 8.1: Summary of Development Activities

Type	Expenditure covered	
	2020-21	2021-22
A. Research Division	41.23	7.1
B. Seed Division	257.73	10.5
C. Training Division	70.60	3.35

Table 8.2: Summary of Wildlife Activities

Divisions	2020-21		2021-22	
	Sampled Sites	Total	Sampled Sites	Total
Wildlife Division, Gurugram	14	24	16	30
Wildlife Division, Rohtak	2	6	4	7
Wildlife Division, Panchkula	2	3	3	5
Wildlife Division, Hisar	5	11	2	4

8.1 Assessment:

All the works evaluated under the Development and Wildlife Wing were found to be working adequately (Figure).

Table 8.3: Evaluated sample sites under Wildlife Wing

Sr No	Name of the Activity approved in APO 2021-22	Activities done during 2021-22	Proposed Amount	Expenditure	Balance	Effectiveness
1	Installation of Solar System at Rohtak & Bhindawas WLS	1. Installed Solar System at Bhindawas WLS. 2. Installed of Solar System at Rohtak in DWLO Office.	5.00	3.09	1.91	Effective
2	Installation of CC TV Cameras at Bhindawas WLS	CCTV installed at NIC, Rest House & Office of Inspector Wildlife	3.00	1.76	1.24	Effective
3	Construction of Inspector Wildlife Residence at Bhindawas	Due to heavy rain & water level in Bhindawas, the work was started late & could not be completed	20.00	11.06	8.94	Effective
4	Construction of Earthen bund to check entry hyacinth in pondage area 3.50 km at Bhindawas WLS	Due to heavy rain & water level in Bhindawas, the work could not be started	200.00	0.00	200.00	Effective
5	Construction of Mounds in Bhindawas WLS	Due to heavy rain & water level in Bhindawas, the work could not be started	25.00	0.00	25.00	
6	Construction of Water Pond-3 No @ 2.50 Lakh (WLS NAHAR) = 7.50 lacs	Construction of Water Pond- Part-1st-east-side, Part-1 B,Part1-A in WLS NAHAR	750000	740208	9792	Effective
7	Fixing of PVC Pipe Line for water supply approx 1500 mtr.(WLS NAHAR)= 3.00 Lacs	Fixing of PVC Pipe Line for water supply approx 1500 mtr.(WLS NAHAR)	300000	287794	12206	Effective
8	Preparation of Sandy Mound-6 No (WLS NAHAR) = 4.50 Lacs	Sandy Mound 7 No at WLS-Nahar	450000	442749	7251	Effective
9	Removal of mesquet (WLS NAHAR) = 6.00 Lacs	Removal of Musquite 125616 Sqm	600000	597933	2067	Effective
10	Development of Grass Land (WLS NAHAR) = 5.00 lacs	Development of Grass Land (WLS NAHAR)	500000	478240	21760	Effective

11	Construction of Store @ 10.00 Lakh = 10.00 lacs Construction of Garage at Gurugram side by DWLO Gurugram Office instead of WLS Nahar. Please give deviation (WLS NAHAR) = 10.00 lacs	Construction of Garage cum store (WLS-NAHAR) Rewari=1011506/- & Gurugram =982654/-	2000000	1994160	5840	Effective
12	Clearance of fire lines & maintenance (WLS NAHAR) = 5.00 lacs	Clearance of fire lines & maintenance (WLS NAHAR)	500000	484296	15704	Effective
13	Devlopment of Fooder Plot-2 No (WLS NAHAR) = 2.00 lacs	Devlopment of Fooder Plot-2 No (WLS NAHAR)	200000	199920	80	Effective
14	Fencing of Path Iron on Jali & Painting in Nahar WLS Nahar & SNP = 8.00 lacs	Providing & Fixing of M S Flate 9039 Kg	800000	807375	-7375	Effective
15	Creation of New Lawn in Campus (WLS NAHAR) = 2.00 lacs	Creation of New Lawn in Campus (WLS NAHAR)	200000	136630	63370	Effective
16	Interlocking tiles inspection path inside the fencing 2470 running meter (P&CBC Jhabua) = 30.00 lacs	Construction Of Inspection Path at P&CBC Jhabua 2837.5 Sqm,28 Mtr Const. of Path at WLS-Nahar	3000000	2996677	3323	Effective
17	Weed removal (Congress grass) from Protection center in 10 Acre (WLS NAHAR) = 5.00 lacs	Weed removal (Congress grass) from Protection center in 10 Acre (WLS NAHAR)	500000	495022	4978	Effective
18	Plantation of Fruit Plant Species (WLS NAHAR) = 15.00 lacs	Plantation of Fruit Plant Species (WLS NAHAR)	1500000	1491750	8250	Effective
19	Construction of Boundary Wall with fencing in 2nd part 3600 R mtr (WLS NAHAR) = 40.00 lacs	Construction of Boundary Wall with fencing in 2nd part 3600 R mtr (WLS NAHAR)	4000000	3999058	942	Effective
20	Interlocking tiles path main gate to SIWL office & Protection Center at WLS nahar = 3.00 lacs	Const. of Path at WLS-Nahar	300000	278620	21380	Effective
21	Construction of Boundary Wall (600 mtr. At WLS Nahar-Part-11)	Construction of Boundary Wall (600 mtr. At WLS Nahar-Part-11)	1876000.00	1876000.00		Effective
22	Extension of Protection Centre (23 Acre to 40 acre=17 acre) to provide proper space to the black bucks om WLS Nahar	Extension of Protection Centre (23 Acre to 40 acre=17 acre) to provide proper space to the black bucks om WLS Nahar	1291000.00	1291000.00		Effective

23	Constuction of IWL Office at Mahendergarh and Faridabad (instead of Nuh)	Constuction of IWL Office at Mahendergarh and Faridabad (instead of Nuh)	5956000.00	5956000.00		Effective
24	Constuction of IWL Residence at Mahendergarh	Constuction of IWL Residence at Mahendergarh	1402000.00	1402000.00		Effective
25	Constuction of Guard Hut at WLS Nahar and Gurugram Forest Complex (instead of Rewari)	Constuction of Guard Hut at WLS Nahar and Gurugram Forest Complex (instead of Rewari)	2077000.00	2077000.00		Effective
26	Procurement of Rescue Equipments for Rescue Team	Procurement of Rescue Equipments for Rescue Team	235000.00	235000.00		Effective
27	Procurement of Rescue vehicle with modification 2 No	Procurement of Rescue vehicle with modification 2 No	1518000.00	1518000.00		Effective







Figure: 8.1: 1) Water pond, 2) Lawn, 3) Inspection pathway, 4) Water pond, 5) Boundary wall, 6) Inspector residence, 7) CCTV, 8) Sandy mounds, 9) Plantation of fruit plants, 10) Garage cum store, 11) Shelter Home in Deer Park, 12) Feeding Platform

9. Chapter 9: Analysis of the design of the CAMPA Plantations in Haryana

'What to plant', 'where to plant' and 'how much to plant', are key decisions that need to be carefully evaluated based on ecological principles and needs of local communities rather than on survival percentage or growth potential. Planning an afforestation project must consider the key performance indicators to focus not only on survival and growth but also on the suitability of site for tree planting, species selection and active community involvement. Selecting deforested planting sites, adapting the plantation design by accounting for the threats, locality factors and preferring native species can significantly enhance ecosystem restoration and biodiversity conservation. Based on this global literature review and field experience gained from the field exercise in CAMPA plantations in Haryana, we discuss the aspects of the programme design that need to be strengthened and provide suggestions that we hope will be adopted in the next phase of this initiative.

9.1. Addressing the drivers of degradation before planting

In sites where the rate of biomass removal (grazing, harvesting, firewood collection etc.) is faster than primary production, it is imperative to address the livelihood needs of the local community before afforestation (or restoration) is attempted. Afforestation projects implemented in isolation without addressing the causes and drivers of deforestation in consultation with the local community will remain a 'band aid' approach to degradation and not provide a lasting cure (Blignaut 2009).

Figure 9.1: Drivers of degradation- Stubble burning and unsuitable edaphic conditions

The drivers of degradation such as over-grazing, tree felling, forest fires, the tragedy of the commons, infestation by invasive species, weak enforcement, etc. in the proposed restoration sites need to be identified and plantations should commence only when these have been effectively addressed. The most apt way would be to involve and consult with the local communities in site identification, species selection execution and protection leading to restoration so that they develop a sense of ownership.

In Samhalkha Range of Panipat division, the Range Officer Mr. Virender proactively approached the local communities and consulted with them regarding the species and site selection. He also asked the landowners adjacent to plantations to occasionally irrigate the plantations and explain to them the importance of the afforestation initiative. As a result, the damages to the plantation caused by grazing and agricultural burning have reduced significantly.

Figure 9.2: Drivers of degradation- Abundance of invasive species such as Lantana camara and Parthenium hysterophorus

Figure 9.3: Drivers of degradation- Cattle grazing is the main reason behind stunted saplings in many plantation sites

We suggest that the prescribed plantation models need to factor in the ground situation. The main causes of plantation failure are grazing, drought, frost, fire, floods, local disturbances etc. These threats existed even before the plantations were planned, and addressing these threats using mitigation and adaptation measures should be made a precondition before the plantation is taken up. In sites, where this is not possible, plantations should not be taken up as they will probably meet the same fate as the original forests that got degraded. The second option is to adopt a mitigation strategy wherein the design of the plantation model adequately takes into account these threats and risks such as mound plantations in water-logged areas, selecting species that can withstand water logging, effective fencing in grazed areas, community partnership and ownership, provision of watering during summer and winter etc. Freedom and flexibility need to be provided to the forest divisions to include these components in the existing plantation models based on site-specific threat perception and locality factors.

9.2. Deploying adequate protection measures

Proper protection measure is necessary to protect the plantation from various anthropogenic disturbances such as grazing, illegal cutting, littering etc. Perimeter fencing with barbed wire or Cattle Proof Trench (CPT) is mostly opted for, but with a fewer number of saplings, the tree-specific bamboo gabion is more effective and ecologically sound. In the 6 divisions of South Circle, very few sites were found with complete or even partial perimeter fencing. Only one site, in Faridabad division has tree specific fencing (bamboo gabion) in areas with higher disturbances.

From the Key Informant Interviews, we got the information that the fund allocated to fencing comes months, even in some cases years, after the plantation. In some ranges, no funds were

allocated to perimeter fencing, leaving the plantation unprotected and vulnerable to anthropogenic disturbances.

After observing the plantation sites, we suggest that in case of a roadside plantation, fewer number of plants should be planted with better protection measures to ensure the survival of the plantation. In case of a block plantation, Barbed Wire fencing in non-forested land and Cattle Proof Trench in forested land should be adopted.

9.3. Protecting natural open landscapes from afforestation

A deep misunderstanding exists about grass biomes, as well as their denigration and devaluation relative to forests (Veldman et al., 2015). Open natural ecosystems such as grasslands, wetlands, etc. must be excluded from tree plantations as it would lead to change in their fundamental character. Solely relying on remote sensing and GIS studies for identifying potential plantation sites without adequate ground truthing can be misleading. It is suggested that forest expansion should be strictly avoided in sites where historically they did not harbour forests and instead reforestation should be carried out by planting trees on deforested lands.

9.4. Plantation species mix should be reshuffled

In most of the sites, native species like Papdi, Sheesham, Arjun etc. were planted. But Focus Group Discussions and Key Informant Interviews revealed that instead of Papdi (*Holoptelea integrifolia*), hardy species like Lasoda (*Cordia myxa*), Kikar (*Acacia nilotica*), Khejdi (*Prosopis cineraria*), Reunjh (*Acacia leucophloea*) also can be added to the existing species mix. All these species can withstand frost, grazing, and extreme dry weather. These species are also likable to the local people. Instead of just increasing the green cover, we should focus on creating a balanced ecosystem where the local biodiversity can be restored and conserved.

9.5. An achievable target should be given to the forest ranges

Our data revealed that in many forest ranges, unrealistically large targets were given and the forest ranges were forced to carry out plantations in unsuitable areas. Due to the lack of suitable areas and huge targets, sites with an abundance of invasive species and severe anthropogenic disturbances were selected. As a result, 2-4-year-old saplings were found to be stunted due to intense grazing. The concerned range office should be consulted regarding the target area and species before the initiative. According to the key informants, fewer saplings in a suitable site with adequate protection measures will produce excellent growth and survival.

9.6. Record keeping needs to be strengthened

Record-keeping was found to be inadequate in almost all the sampled sites. The actual ownership of the sites was not verified due to the lack of proper documents. The number of replaced samplings were also could not be verified. Most of the divisions in all four circles do not have any plantation journal, measurement book or estimates. The plantation sites on the ground also lack any kind of demarcation (plantation board), which created difficulties to identify and verify the sites from the APO.

It is highly suggested that plantation journals in the prescribed format should be maintained and kept updated to enable effective monitoring and evaluation. The plantation journal needs to include a site map, soil details, plantation polygon points, pits dug, the species-wise breakup of plants planted, breakup of a site into sectors/patches, process photos etc. Internal inspection reports of supervising officers also need to be entered into these registers. Maintaining these journals should be made a mandatory requirement and their quality checked before final payments for the works are released. Also, the geo-referenced plantation polygon of the perimeter of the plantation as a KML file should be diligently recorded and stored with the division office for future reference. This will enable better monitoring and evaluation as

detailed documentation of the works is readily available. Proper plantation board with name, area, co-ordinates and species planted should be installed in every plantation site to avoid any unwanted complications in identifying the site.

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11. Annexure

Evaluation Formats

A. PLANTATION DETAIL FORM

Name of plantation site: Date:

Division		Forest Range	
Forest Block		Forest Beat	
Compartment No:		Legal status of site	
Location	Lat. – Long.-		
Name of Component		Physical Target/Numbers of plants planted per unit	
Year of Plantation/Activity		Whether plantation mapprepared	
Area of Plantation/Activity recorded		Actual area using GPS	
Name of Evaluator		Designation of Evaluator	
Dates of Evaluation			
Signature of the officials	Name: Designation:	Name: Designation:	Name: Designation:

B. PLANTATION EVALUATION FORM

Site Name: Component:

Date Range: Division:

Plot No.	GPS coordinates of the plot	Species	Spacing	Plants planted	Condition of plants		H (feet)	G (cm)
					Live	Dead		

Evaluator 1: Evaluator 2:

C. PHYSICAL VERIFICATION OF ACTIVITIES

Fencing (for each Plantation unit sampled)

	Barbed wire Fence					
Date	Name	Length in Measurement Book	Actual Length	variation (+/-)	Present status – Intact / Wornout	Effectiveness

Chain Link Fence					
Chain Link Fence Id / No./Name	Height x Length in Measurement Book	Actual Size (Height X Length) in field	% variation (+/-)	Present status – Intact / Worn out	Effectiveness of theFence (very effective/ moderately effective/not effective

D. SOIL AND MOISTURE CONSERVATION MEASURES (SMC)

DRSM/Crate/WHS				
Date	**Name**	**Size in Measurement Book**	**Actual Size (Width * Depth* Length) in field**	**Expenditure**

E. KEY INFORMANT INTERVIEW (KII) WITH FOREST STAFF

Name of Plantation:		
Year of plantation:	District:	Division:
Range:	Forest Beat:	Compartment:
Name of staff:		
Official Post:		
Interview date:		

A. PLANNING

1. What was the past natural vegetation of the plantation site?

a) Dense forests **b)** Open forests **c)** Degraded forests **d)** Grasslands **e)** Others (please give details)

2. What was the status of the plantation site before plantations were taken up?

a) Degraded land of not much use to the village **b)** Used for grazing of village cattle

c) Used for firewood collection **d)** Others (please give details)

3. What was the main reason for selecting this site for afforestation?

a) Degraded status **b)** Demand from the villagers/JFMC **c)** Good working relationship with the local community **d)** Good past experience in the locality **e)** Good site quality

f) Others

4. Was the site selection verified by senior officials? (yes/no)

5. How were the plantation species identified?

a) Demand from the villagers/JFMC **b)** Good past performance in the locality **c)** Departmental norms **d)** Naturally occurring in these forests **e)** Others (please give details)

6. What was the reason for selecting the plantation protection measures?

a) Demand from the villagers/JFMC **b)** Departmental norms **c)** Good past experience in the locality **d)** Others (please give details)

7. Was there a provision kept for irrigating the plantation during the dry season?

a) Yes, by using tankers b) No provision for irrigation c) Others (please give details)

If no, why?

8. What was the strategy to protect the plantation after planting?

a) Bagarh b) Live hedge c) Cattle proof trench d) Cattle proof dry stone wall e) Barbed wire fencing f) Chain link fencing g) Employing chowkidar h) Others (please give details)

9. What were the main challenges/ limitations you faced in the planning phase?

a) Less time for detailed field survey b) Limited staff for detailed field survey c) Limited funds for detailed field survey d) Lack of equipment and tools e) Others (please give details)

B. IMPLEMENTATION

10. Where were the seedlings for the plantation sourced from?

a) CAMPA nursery b) Private nursery c) Adjacent forest areas d) Others (please give details)

11. What were the type of seedlings used?

a) Bare root seedlings b) Polybag seedlings c) Root trainer seedlings d) Others (please give details)

12. What was the average height of the plants planted _____(feet)

13. What was the type of fencing used to protect the plantations?

a) Bagarh b) Live hedge c) Cattle proof trench d) Cattle proof dry stone wall e) Barbed wire fencing f) Chain link fencing g) Employing chowkidar h) Others (please give details)

14. What were the main challenges/ limitations you faced in the implementation phase?

a) Lack of adequate labour b) Limited staff for supervision c) Poor quality of seedlings d) Delay in planting e) Lack of adequate funds f) Others (please give details)

C. MAINTENANCE

15. Which plantation species were affected the most? _____

Give reasons why?

16. What is the status of natural regeneration in the plantation site?

a) Excellent **b)** Moderate **c)** Poor **d)** Absent

Give details of species and reason?

17. Was the fencing of _____ used effective? (yes/no) _____

Give reasons why?

18. What were the main challenges/limitations you faced in the maintenance phase?

a) Lack of adequate irrigation **b)** Limited staff for supervision **c)** Lack of adequate watch and ward **d)** Cattle grazing **e)** Lack of adequate funds **f)** Forest fire **g)** Others (please give details)

D. OVERALL PERCEPTION

19. What is your perception of the survival percentage? _____%

20. Which plantation species have performed well and which have not performed well?

Give reasons why?

21. Are you satisfied with the overall plantation activity?

a) Fully satisfied **b)** Largely satisfied **c)** Not satisfied **d)** Don't know

22. What is the perception on future perceived benefits to the local community from these plantations?

23. What was the most difficult part of this afforestation project?

24. What are your suggestions to improve the effectiveness of future plantations?

Name of the interviewer:

Signature: **Signature of the interviewee:**

F. FOCUS GROUP DISCUSSION

Plantation site: Date:

Range: Division:

1. Whether the dialog deliberations with the local communities took place before the plantation initiative

2. Did the FD arrange any awareness programs or community meetings during the plantation program?

3. Your opinion on the species chosen for the restoration/afforestation initiative

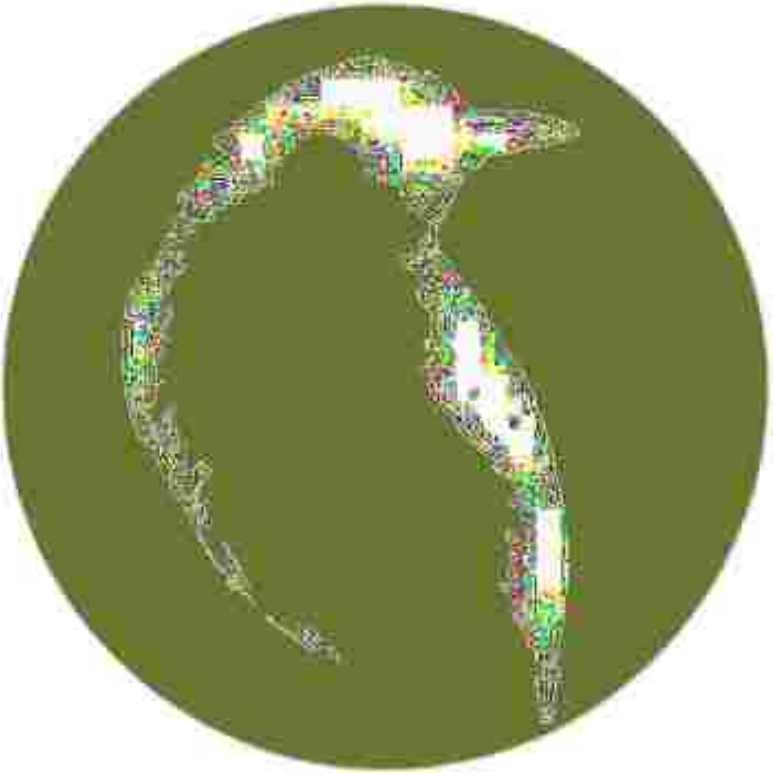
4. Your opinion on the sites chosen for the restoration/afforestation initiative

5. Drivers of degradation identified during the survey

6. In case of livestock grazing or stubble burning or any other drivers where the community is involved, what did FD do to protect the plantation?
7. What could be your possible contribution to secure the survival of the plantation?
8. Your suggestions for a future afforestation initiative:
   - In terms of species selection
   - In terms of site selection
   - In terms of monitoring

9. How the community involvement in forestry interventions could be better?

Name of the participants **Name of the officials**



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