सत्यमेव जयते

आज़ादी का अमृत महोत्सव

TRANSFORMING FORESTSCAPES

SUCCESS STORIES AND BEST PRACTICES FROM FIELD UNDER CAMPA

LiFE
Lifestyle for Environment

NATIONAL AUTHORITY, COMPENSATORY AFFORESTATION FUND MANAGEMENT AND PLANNING AUTHORITY (CAMPA)

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE
Government of India

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Ministry of Environment, Forest and Climate Change
Government of India

Photo Credit: BCC Division, ICFRE

मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन
और
श्रम एवं रोजगार
भारत सरकार

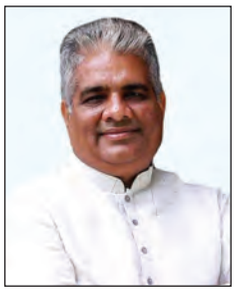
एक कदम स्वच्छता की ओर

सत्यमेव जयते

भूपेन्द्र यादव
BHUPENDER YADAV

MINISTER
ENVIRONMENT, FOREST AND CLIMATE CHANGE
AND
LABOUR AND EMPLOYMENT
GOVERNMENT OF INDIA

आज़ादी का अमृत महोत्सव



संदेश

प्रतिपूरक वनीकरण निधि अधिनियम, 2016 का अधिनियम के पारित करने से देश के वनों एवं प्राकृतिक संपदा के संरक्षण और संवर्धन के प्रति हमारी सरकार की गहरी प्रतिबद्धता को दर्शाता है। राष्ट्रीय प्राधिकरण, कैंपा वनों और जैव विविधता के पुनर्निर्माण और सवंर्धित करने के लिए समर्पित है। प्रतिपूरक वनीकरण, पुनः वनीकरण और अवनित (Degraded) भूमि के पुनर्स्थापन के माध्यम से जीवन सहायक पारिस्थितिकी सेवाओं को बढ़ाने के लिए समर्पित है।

मेरा मंत्रालय कैम्पा गतिविधियों के प्रभावी कार्यान्वयन के लिए विभिन्न राज्यों/केंद्र शासित प्रदेशों के सहयोग से कार्य कर रहा है। विगत चार वर्षों में, राष्ट्रीय प्राधिकरण ने राज्यों/केंद्र शासित प्रदेशों के कैम्पा अधिकारियों के साथ कैम्पा गतिविधियों के व्यवस्थित और प्रभावी कार्यान्वयन को सुव्यवस्थित किया है। राष्ट्रीय प्राधिकरण ने अब तक सभी राज्यों/केंद्र शासित प्रदेशों के संबंधित राज्य कैम्पा निधि में लगभग 51,768 करोड़ रुपये हस्तांतरित किये हैं जिससे प्रतिपूरक वनीकरण करने में अच्छी प्रगति हुई है। वर्ष 1980 से 2021–22 तक, गैर–वानिकी उद्देश्यों के लिए हस्तांतरण किए गए वन क्षेत्र की क्षतिपूर्ति के लिए 10.47 लाख हेक्टेयर के लक्ष्य के विरुद्ध 9.24 लाख हेक्टेयर क्षेत्र में वृक्षारोपण किया गया गया है। शेष 1.23 लाख हेक्टेयर क्षेत्र को अगले 2–3 वर्षों में वृक्षारोपण पूर्ण करने के लिए राज्य और केंद्र शासित प्रदेश कार्य कर रहे हैं। प्रतिपूरक वनरोपण के अतिरिक्त जलग्रहण क्षेत्र के उपचार, वनों की आग पर नियंत्रण, वन्यजीवों के आवास में सुधार, संरक्षित क्षेत्रों व गांवों के लिए स्थानांतरण सहित कैम्पा की गतिविधियां सम्मिलित हैं। मुझे कैम्पा गतिविधियों के प्रभावी कार्यान्वयन के कुछ सफल परिणामों को साझा करते हुए राज्यों/केंद्र शासित प्रदेशों द्वारा अपनाई गई विभिन्न अच्छी कार्यप्रणाली को साझा करते हुए प्रसन्नता हो रही है। इससे राज्यों/केंद्र शासित प्रदेशों को एक–दूसरे के अनुभवों से सीखने में मदद मिलेगी।

दिनांक : 20.09.2022

(**भूपेन्द्र यादव**)

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Photo Credit: BCC Division, ICFRE

आज़ादी का अमृत महोत्सव

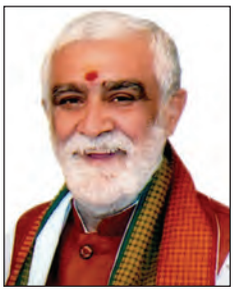
अश्विनी कुमार चौबे
Ashwini Kumar Choubey

सत्यमेव जयते
आहारशुद्धौ सत्त्वशुद्धिः

स्वच्छ भारत
एक कदम स्वच्छता की ओर

राज्य मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन
उपभोक्ता मामले, खाद्य और सार्वजनिक वितरण
भारत सरकार

MINISTER OF STATE
ENVIRONMENT, FOREST AND CLIMATE CHANGE
CONSUMER AFFAIRS, FOOD & PUBLIC DISTRIBUTION
GOVERNMENT OF INDIA



संदेश

राष्ट्रीय प्रतिपूरक वनरोपण प्रबंधन एवं योजना प्राधिकरण, कैम्पा वन संरक्षण अधिनियम, 1980 के अन्तर्गत वन भूमि के हस्तांतरण के फलस्वरूप वन एवं वृक्ष आवरण की क्षतिपूर्ति के लिए कार्य कर रहा है। यह आवश्यक है कि कैम्पा निधि का उचित और पारदर्शी तरीके से उपयोग किया जाए और स्थानीय लोगों की भागीदारी से वनरोपण और वन संरक्षण गतिविधियों को अंजाम दिया जाए। इससे स्थानीय समुदायों को रोजगार के साथ–साथ वनीकरण और वनों एवं जैव विविधता के सुधार में बेहतर सफलता मिलेगी।

राष्ट्रीय प्राधिकरण द्वारा प्रकाशित किये जा रहे प्रकाशन में राज्यों में कैम्पा गतिविधियों के कार्यान्वयन की सफलता की कहानियों को सामने लाया जा रहा है। कैम्पा गतिविधियों से राज्यों को वन संरक्षण, वन्यजीव आवास में सुधार, मानव–वन्यजीव संघर्ष को कम करने और वनो में कार्यरत क्षेत्रीय कर्मचारी की कार्य दक्षता को बढाने के लिए आवश्यक बुनियादी ढांचे को मजबूत करने में सहायक है। नदी के जलग्रहण क्षेत्रों में मिट्टी और जल संरक्षण के कई अच्छे उदाहरण हैं। इसके अतिरिक्त, कैम्पा गतिविधियों ने वानिकी और वन्यजीव प्रबंधन में उन्नत तकनीकों एवं नए विचारों को कार्यान्वयन करने के अवसर प्रदान किये है।

मुझे विश्वास है कि यह प्रकाशन राज्यों और अन्य संस्थानों के लिए कैम्पा गतिविधियों के कार्यान्वयन में देश के विभिन्न हिस्सों में अपनाई गई अच्छी तकनीकों से सीखने के लिए उपयोगी सिद्ध होगा।

(**अश्विनी कुमार चौबे**)

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लीना नन्दन
LEENA NANDAN

सत्यमेव जयते

सचिव
भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
SECRETARY
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST AND
CLIMATE CHANGE

MESSAGE

The National Compensatory Afforestation Fund Management and Planning Authority, NCAMPA has played a pivotal role in managing and conducting the CAMPA activities in States/UTs.

Diverse CAMPA works are being carried out across the country, with focus on assisted natural regeneration, artificial regeneration and silvicultural operations in forests. Apart from rejuvention of forest cover on non-forest land, especially in wildlife corridors, the operation and maintenance of animal rescue centre and veterinary treatment facilities for wild animals are also being supported through CAMPA funds.

I congratulate the National CAMPA Authority for highlighting good works done by various State/UTs in the field of compensatory afforestation, catchment area treatment, assisted natural regeneration, forest fire prevention and control, improvement of wildlife habitat and management of biological diversity. I am certain that sharing of best practices will go a long way in mainstreaming such innovations.

(Leena Nandan)

New Delhi, September 20, 2022

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चन्द्र प्रकाश गोयल
CHANDRA PRAKASH GOYAL

सत्यमेव जयते

वन महानिदेशक एवं विशेष सचिव
भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
DIRECTOR GENERAL OF FOREST & SPL. SECY.
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST AND
CLIMATE CHANGE

MESSAGE

Compensatory Afforestation Fund Management and Planning Authority, CAMPA is a tool for achieving climate resilient growth and it is achieved through the collaborative efforts of the States/UTs. CAMPA has been successful in generating employment through afforestation and plantation works promoting the Green India Mission and AtmaNirbhar Bharat objectives.

CAMPA aims to promote afforestation and regeneration activities as a means of compensating for forest lands that has been taken over for non-forest use due to the development needs of an area and covers a wide range of activities including compensatory afforestation, catchment area treatment, assisted natural regeneration, forest fire prevention, establishment, upgradation and maintenance of modern nurseries and other planting stock production facilities for production of quality planting materials. The States/UTs have whole heartedly performed and conducted these CAMPA activities and this has been brought together in this publication.

This publication is an attempt to highlight the good works being carried out under CAMPA in the States/ UTs and help in better implementation of the afforestation and other CAMPA activities to compensate the impact of diversion of forest land. It will also facilitate sharing of ideas for scientific and technological application for accelerating forest and tree cover, improving the of quality of forests and wildlife habitat and enhancement of ecosystem services.

(Chandra Prakash Goyal)
14.09.2022

Place: New Delhi
Date: 14th September, 2022

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आज़ादी का अमृत महोत्सव

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सुभाष चन्द्र
SUBHASH CHANDRA

सत्यमेव जयते

मुख्य कार्यकारी अधिकारी
राष्ट्रीय प्राधिकरण, कैम्पा
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
भारत सरकार
CHIEF EXECUTIVE OFFICER
NATIONAL AUTHORITY CAMPA,
MINISTRY OF ENVIRONMENT, FOREST AND
CLIMATE CHANGE
GOVERNMENT OF INDIA

PREFACE

The Compensatory Afforestation Fund Act, 2016 was enacted on 3rd August 2016 and the rules were notified on 10th August 2018. The CAF Act and rules came into effect on 30th September 2018 enabling the creation of the compensatory afforestation fund as a special fund under the Public Account of India. The monies deposited in the National fund are non-lapsable and interest-bearing fund. The CAF Act, 2016 provides for State Compensatory Afforestation Fund under the Public account of the respective State/UT.

The 90% of the monies realised by the user agencies are transferred to the respective State/UT CAMPA fund and the remaining 10% of the realised amount is deposited in the National CAMPA Fund. CAMPA Funds are utilized as per provision of Compensatory Afforestation Fund Act, 2016 (CAF Act, 2016) and Compensatory Afforestation Fund Rules, 2018 for carrying out Afforestation, protection and conservation related activities including control of forest fire, soil and moisture conservation activities, protection and improvement of forest and wildlife habitat.

The monitoring and evaluation of CAMPA activities throughout India ensures accountability and is one of the pivotal tasks by National Authority. It supports upgradation of technologies used for assessment of green cover through e-Greenwatch, internal and Third party monitoring as well as monitoring and evaluation by Integrated Regional Offices of the Ministry. This publication shares “Success Stories and Best Practices” carried out by various States/UTs from state/ UT CAMPA Funds. These include some success stories received from State/ UT CAMPA Authorities on various CAMPA activities such as compensatory afforestation, assisted natural regeneration, fire management and forest protection, improvement of wildlife habitat, relocation of villages from national park and tiger reserves, soil and moisture conservation works, strengthening of infrastructure and capacity building for forest frontline staff, which will be useful for other states and organisations.

Date: 14th Sept, 2022

(Subhash Chandra)

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आज़ादी का अमृत महोत्सव

Photo Credit: BCC Division, ICFRE

Vision

Rebuilding and enriching forests and biodivesity through compensatory afforestation, re-afforestation and restoration for enhancing life sustaining ecosystem services

Photo Credit: BCC Division, ICFRE

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COMPENSATORY AFFORESTATION FUND MANAGEMENT AND PLANNING AUTHORITY, CAMPA

INTRODUCTION

Compensatory Afforestation Fund Management and Planning Authority (CAMPA) is a unique initiative where the Government of India has committed to compensate loss of forest cover by rebuilding and enriching forests and biodiversity through compensatory afforestation, re-afforestation and restoration for enhancing life sustaining ecosystem services under the aegis of the Compensatory Afforestation Fund (CAF) Act, 2016 that was enacted on 3rd August, 2016. The Compensatory Afforestation Fund Rules, 2018 were notified on 10th August 2018 and the CAF act and rules came into effect on 30th September 2018.

The CAF Act, 2016 and Rules, 2018, provide for the establishment of the funds under the Public Account of India and the Public Accounts of each State and crediting thereto the monies received from the user agencies towards Compensatory Afforestation (CA), Penal Compensatory Afforestation (PCA), any Additional Compensatory Afforestation (ACA), Net Present Value (NPV) and all other amounts recovered from such agencies under the Forest (Conservation) Act, 1980. The Act provides for constitution of an authority at national level and at each State and Union Territory Administration for administration of the funds and to utilise the monies so collected for undertaking compensatory afforestation, artificial regeneration, assisted natural regeneration, protection of forests, forest related infrastructure development, Green India Programme, Wildlife Protection and other related activities. The CAF Act also provides for utilsation of National and State Funds under section- 5 and section 6 respectively of CAF Act, 2016. Out of the total funds collected, 90% are transferred to State Fund for carrying out the Activities provided in the Act. The balance 10% of all monies collected by the States and UTs is placed in the National Fund.

The Annual Plan of Operations (APOs) of States are approved as per provisions contained in the Compensatory Afforestation Fund Act, 2016 (CAF Act, 2016) and CAF Rules, 2018. The Executive Committee of National Authority while approving the APOs examines the proposed CAMPA.

(i) Site Specific Activities - All monies collected towards Compensatory Afforestation (CA), penal CA additional CA, CAT Plan and any other site-specific scheme are to be used as per site specific schemes submitted by the State along with the approved proposals for diversion of Forest land under Forest (Conservation) Act,1980.

(ii) Activities from NPV funds - All monies collected towards NPV and penal NPV are to be utilized for artificial regeneration, assisted natural regeneration, forest management, forest protection, forest and wildlife related infrastructure development, wildlife protection and management, supply of wood and other forest produce devices and other allied Activities in the manner as may be prescribed.

(iii) Wildlife Activities-Monies realized in accordance with the decisions of National Board for Wildlife or the orders of the Supreme Court involving cases of diversion of forest land in protected areas form the corpus are to be used exclusively for under taking protection and conservation Activities in protected areas of the State.

(iv) Activities permitted from Interest earned on the State Fund- Recurring and non-recurring expenditure of the State Authorities including salaries and allowances of its officers and employees are met from the interest accrued in the State Fund.

In accordance with the provisions contained in the CAF Act, 2016 an amount of Rs. 72,112.84 crores were collected towards compensatory levies has been transferred from the state-specific bank accounts to the National Fund under “Major Head 8336- Civil Deposits” as per the CAF Act, 2016. Out of Rs. 72,112.84 crores**,** an amount of Rs 51,786.76 crores **(**Compensatory Afforestation (CA)- Rs. 11,686.56 crore, Catchment Treatment Plan (CAT)- Rs. 1,580.61crore, Integrated Wildlife Management Plan (IWMP)- Rs. 2,206.03 crore, Net present Value (NPV)-Rs. 29,812.14 crore, Interest-Rs. 3,182.45 crore and Others- Rs. 3,300.97 Crore) has been disbursed to 33 States/UTs till 31.06.2022 who have established their State Funds and completed reconciliation of the fund head-wise and component-wise.

Thereafter, the National Authority has approved Annual Plan of Operations (APOs) of States/UTs with amount of Rs.27,093.92 crore from 2018-19 to 2021-22, out of which an amount of Rs. 16,753.48 crore have been utilized by the State/UTs Authorities for implementation of CAMPA activities. Year wise details of APOs sanctioned and achievement by State Authority during financial year 2018-19 to 2021-22 as on 31.03.2022 is as under:

Sl No.	Financial year	Financial targets and achievement (Amount in Rs. crore)	
		Target	Achievement
1	2018-19	3777.08	2657.18
2	2019-20	5310.69	3531.72
3	2020-21	7906.16	4613.26
4	2021-22	10099.99	5951.32

The National Authority has given highest priority for completion of committed CA and is pursuing with States/UTs CAMPA to complete all pending CA in the next two years. The total of 9,58,360.85 ha. (88.39%) of Compensatory Afforestation (CA) has been completed till 30.06.2022 against the target of 10,84,220.90 ha**.** This has been stressed while granting approvals of APOs.

Status of Compensatory Afforestation (CA) and Penal Compensatory Afforestation (PCA) and other works taken up under CAMPA funds from 1980 to 2022.

Sl. No.	State /UT	Target of CA/PCA under FC Act, 1980 Ha.	Achievement of CA/PCA under FC Act, 1980 Ha.	%	Total Balance of CA/PCA Ha.
1	Andaman & Nicobar	2,302.17	347.77	15.11	1,954.40
2	Andhra Pradesh	40,111.00	36,548.00	91.12	3,562.86
3	Arunachal Pradesh	38,307.21	19,397.28	50.64	18,909.93
4	Assam	9,391.70	8,289.45	88.26	1,102.25
5	Bihar	5,202.55	4,403.00	84.63	799.55
6	Chandigarh	110.80	109.88	99.17	0.92
7	Chhattisgarh	39,066.45	34,010.34	87.06	5,056.12
8	Delhi	165.40	165.40	100.00	-
9	Goa	3,541.10	2,143.61	60.54	1,430.48
10	Gujarat	92,216.38	86,269.00	93.55	5,947.38
11	Haryana	13,625.00	9,718.00	71.32	3,907.00
12	Himachal Pradesh	27,926.37	26,080.80	93.39	1,845.57
13	Jammu & Kashmir	30,172.00	26,822.00	88.90	3,350.00
14	Jharkhand	55,656.60	36,767.79	66.06	18,888.82
15	Karnataka	27,169.97	26,335.19	96.93	834.78
16	Kerala	59,486.25	58,652.53	98.60	833.72
17	Madhya Pradesh	2,43,776.59	2,34,552.28	96.22	9,224.31
18	Maharashtra	1,07,833.00	1,00,958.00	93.62	6,875.00
19	Manipur	6,722.73	6,710.14	99.81	12.59
20	Meghalaya	1,317.64	922.56	70.02	395.08
21	Mizoram	11508.25	9275.47	84.51	1,782.78
22	Odisha	78,120.00	67,645.00	86.59	10,475.00
23	Punjab	18,717.96	17,015.92	90.91	1,702.04
24	Rajasthan	43996.08	37,862.20	86.06	6,133.88
25	Sikkim	5,536.72	5,192.08	93.78	344.64
26	Tamil Nadu	3,797.42	3,306.60	87.07	490.82
27	Telangana	33,168.53	25,739.56	77.60	7,428.97
28	Tripura	7703.73	7703.73	100.00	-
29	Uttar Pradesh	27,412.37	23,223.37	84.72	4,189.00
30	Uttarakhand	56,824.23	51598.34	90.80	5225.89
31	West Bengal	3,501.76	2,697.31	77.03	804.45
	Total	**10,94,387.96**	**9,70,462.60**	**88.68**	**1,23,508.23**

The publication is dedicated to all the States/UTs highlighting their impressive work on CAMPA activities in their respective States/UTs. The States have displayed remarkable progress in carrying out compensatory afforestation activities along with restoring the ecological balance by improvement of wildlife and infrastructure adopting innovative technologies and practices.

ARUNACHAL PRADESH

DIPA FOREST BEAT NURSERY ESTABLISHMENT

In order to meet the requirement of casualty replacement in Compensatory Afforestation plantations, and also for free distribution of saplings to public on the occasion like Republic Day, Independence Day, Van Mahotsava etc. the nursery at the Dipa Forest Beat has been established during the year 2021-22 through CAMPA fund over an area of 0.72 ha. The nursery has 115 numbers of beds of timber species viz Teak (*Tectona grandis*), Bohera (*Terminalia belirica)*, Hilika (*Terminalia chebula*), Bogi Poma (*Chukrasia tabularis*), Tita sopa (*Magnolia champaca*), Koroi (*Albizia procera*), Sissoo (*Dalbergia sissoo*) and other with the total stock of 485300 numbers of seedlings.

The nursery under Dipa Forest Beat is one of the important nurseries under Likabali Forest Division, the seedlings raised under this nursery are very healthy and are in good condition due to employment of proper technique and dedication put by the field staff of the Department.

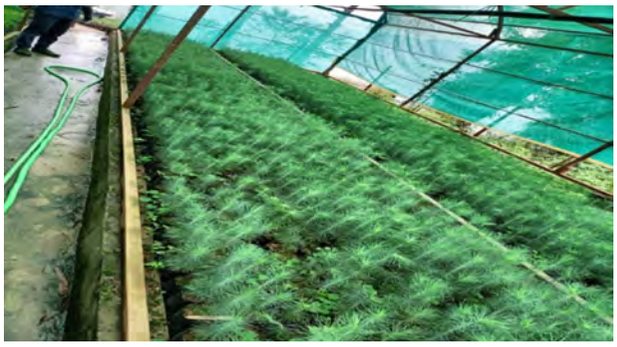
Glimpses of Dipa Forest Beat Nursery

2. PLANTATION AND NURSERY UNDER KHONSA FOREST DIVISION

Creation of artificial plantations were taken up under NPV component of State CAMPA Scheme during the year 2020-21 and 2021-22 in Khonsa and Lazu Forest Ranges under Khonsa Forest Division. There is absence of notified Reserved Forests under the Khonsa Forest Division and the land is mostly community land where the villagers practice Jhum or shifting cultivation.

Thus, creation of artificial plantations was taken up with the active participation of the villagers in the community to restore the jhumland, to conserve the soil and moisture on degraded land and to meet the requirement of the villagers. The species planted were Tita sopa (*Magnolia champaka*), Agarwood, etc. with spacing of 3m X 3m. The soil and climatic factors are quite suitable for the growth of these tree crops.

Creation of Artificial Plantation at Senu-2020-21 under Khonsa Forest Division GPS Coordinates: N26°52'51.89", E95°32'06.36"



Raising of Seedlings at Lazu Range for Plantation under Khonsa Forest Division GPS Coordinates: N26°53'44.77", E95°34'41.76"

Artificial Plantation at Lazu 2021-22 – under Khonsa Forest Division GPS Coordinates: N26°54'52.13", E95°34'59.70"

Creation of Artificial Plantation at Kheti-2021-22 under Khonsa Forest Division GPS Coordinates: N26° 57' 34.61", E 95°30' 51.86"

Creation of Artificial Plantation at Raho-2021-22 under Khonsa Forest Division GPS Coordinates: N26° 51' 27.80", E 95°30' 42.10"

Creation of Artificial Plantation at Lazu-2020-21 under Khonsa Forest Division GPS Coordinates: N26° 53' 26.26", E 95°34' 18.20"

Contribution: CEO, CAMPA, Arunachal Pradesh

ASSAM

1. SAHITYA MANISHI UPABON (BIODIVERSITY PARK)

The state of Assam is located in the north-eastern region of India, has an area of 78,438 Sq. Km., 2.39% of the total geographical area of the country, and has sub-tropical climate. The state can be divided into three physiographic regions, *viz.* Brahmaputra valley, Central Assam Hills and Barak valley.

- ***Brahmaputra River Valley*** is the northern part of Assam (Covering the north eastern end, central Assam and the western end). The floodplains of the Brahmaputra river covers nearly 72% of the State, bestowing the land with immensely fertile land. Spreading its rich alluvial plains across the length and breadth of Assam, the river makes the State ideal for agriculture as well as forest growth.

- South of the approximate centre of the State lie the ***Dima Hasao and Karbi Anglong*** **districts** which are separated from the upper valley by a range of hills. The two districts have autonomous councils and are administratively structured to be relatively more independent of the State and central machinery. Earlier known as the North Cachar Hills, they separate the Brahmaputra river valley of the State from the Barak Valley.
- Named after the Barak River, the ***Barak Valley*** comprises the three southern most districts of Assam. The geography of the valley lends itself to annual flooding, making it both fertile as well presenting a significant risk to life.

Assam is one of the biodiversity-rich areas in the world consisting of tropical rainforests, deciduous forests, riverine grasslands, bamboo orchards and numerous wetland eco systems. Forest Survey of India has mapped forest types/sub types in the country with reference to Champion and Seth classification using satellite data. As per this assessment, Assam has 18 forest sub-types belonging to five forest type groups:

Tropical Wet Evergreen.

- Tropical Semi Evergreen.
- Tropical Moist Deciduous.
- Tropical Dry Deciduous.
- Sub-Tropical Pine Forests.

The state has recorded forest area of 28,327 sq. km, which is 36.11% of its geographical area. Within the forest area, the reserved forest and unclassed forests are 66.58% and 33.42% respectively. As per the State of Forest Report (FSI, 2021), the total forest cover in the state is 28,312 sq. km. (36.11% of Geographical area), comprising 3017 sq. km very dense forest, 9991 sq. km moderately dense forest and 15,304 sq. km open forest.

The funds under State CAMPA, Assam received from the Government of India are being utilized as per the guidelines of CAMPA. But, after notification of Compensatory Afforestation Fund Act, 2016 and Compensatory Afforestation Fund Rules, 2018, the Annual Plan of Operations are prepared as per the Rules. State CAMPA, Assam has conducted some of the best practices in plantation, nurseries, soil moisture conservation, infrastructure developmental works etc. which can be considered as special achievements. One of these is development of Sahitya Manishi Upobon.

In the year 2020-21 under the provision of "Management of biological diversity and biological reContributions" under Rule 5 (2) m of Compensatory Afforestation Fund Rules, 2018, Government of Assam has planned to develop 24 numbers of Biodiversity Parks in the name of "*Sahitya Manishi Upabon*" in 24 different districts of the state under CAMPA scheme for conservation and propagation of rare and endangered indigenous species. This is a unique initiative to conserve the Plant Biodiversity of the State wherein above 1000 different Trees, Shrubs, Herbs, Ferns, Orchids, Bamboo, Creepers, Climbers, Medicinal Plants, Aquatic plants species were targeted to be planted and maintained in each *Sahitya Manishi Upabon*. It was also decided that each park would be named after an eminent litterateur of Assam so that people will remember their names and their contributions to the society. First Sahitya Manishi Upabon was inaugurated by the Hon'ble Chief Minister on 11th June, 2020 at Dharikati, Charduar in

Sonitpur District.

Raising of all 24 Biodiversity Parks (Sahitya Manishi Upabon) in Sonitpur, Biswanath, Lakhimpur, Dhemaji, Sivsagar, Charaideo, Dibrugarh, Digboi, Jorhat, Majuli, Golaghat, Morigaon, Nagaon, Kamrup, Goalpara, Mangaldoi, Bongaigaon, Cachar, Karimganj, Hailakandi, Hojai, Dhubri, Barpeta and Mancachar districts have been completed.

Benefits and Outcome of *Sahitya Manishi Upabon*

- This will ensure Conservation of rare, endangered and indigenous plant diversity.
- It will act as a centre for learning and education to upcoming generations.
- It will help in understanding and appreciating the contribution of the legendary intellectuals, scholars & their passion for conserving the environment.
- It will act as a Research hub for the young scientists, scholars, Researchers and students of colleges, universities in the fields of Botany.
- It will act as a germplasm bank.

Each Bio-diversity Park not only has the diverse species planted in the field but it also has orchidarium, green house, cactus house, camp hut, resting shed, water bodies, culverts, walking trail and other amenities existing within its boundary which attracts the visitors to move around comfortably. Besides, there are name plates and signboards throughout which help visitors in understanding the importance of diversity of saplings planted. It has been proposed in the APO to maintain the park for five years under CAMPA fund.

Contribution: Chief Executive Officer, State CAMPA, Arunachal Pradesh

2. GRASSLAND MANAGEMENT AT MANAS TIGER RESERVE

Grassland habitat of Manas has been home to number of important indicator species including Greater one-horned rhinoceros (*Rhinoceros unicornis*), hispid hare (*Caprolagus hispidus*), pygmy hog (*Porcula salvania*), and Bengal florican (*Houbaropsis bengalensis*). However, in the last few decades both grassland as well as wood land habitat of the park has been degrading gradually because of both anthropogenic as well as natural drivers. Invasion by alien species, natural succession of grassland into woodlands and degradation of water bodies are some of the emerging concerns for the park management. Annual controlled burning has been the main tool for managing grassland so far.

Grassland management is an important component of habitat intervention at the Manas Tiger Reserve. Ensuring sufficient and quality grasslands safeguard an adequate prey base for apex predators like the tiger and leopard. However, due to an increasing interface with humans and livestock, grasslands are impacted with weed invasion besides successional changes such as woodland encroachment, which need to be arrested prior to climax so that area under grasslands does not get diminished.

It may be noted, that any intervention for grassland management needs to be an ongoing exercise in order to prevent invasive species as well as woodlands from taking over. This is because of the fact that there are several agents of dispersal like wind, livestock and even tires of vehicles traversing the protected area which can spread these invasives.

As of now, invasives have been cut, uprooted and ploughed altogether as a management intervention apart from the annual grassland burning which is carried out to propagate a new flush of grass. Woodland encroachment is largely accomplished by uprooting trees as well as by girdling them, the latter resulting in death of the tree in a period of three to four years.

BD Camp Area, 150 ha.

Mahal Camp Area, 16 Ha.

However, with funding assistance being tied to the financial years, it sometimes becomes difficult to sustain year to year interventions thereby making the intervention redundant.

Under CAMPA grassland management interventions have taken place at Manas Tiger Reserve which have yielded some dividends. Manual uprooting of invasive alien species has been carried out wherein labour from surrounding eco development committees has been used. However, the scale of interventions is currently small and needs to be increased significantly to impact faunal species dependent on grasslands.

Contribution: Chief Executive Officer, State CAMPA, Assam

BIHAR

STATUS REPORT OF PLANTATION

Bihar is one of the most important states in the Hindi heartland of India. It is situated on the banks of the river Ganges. The river Ganges flows through the state and passes through districts of Buxar, Bhojpur, Chapra, Patna, Vaishali, Begusarai and Bhagalpur. In the north, the Bihar state has common borders with the Nepal. In the east, it is bound by West Bengal and in the west by Uttar Pradesh. In the south, it borders Jharkhand state, which was created after bifurcation of Bihar. The state of Bihar has got very fertile land in the Ganges river catchments but the areas in Southern Bihar is murramy and not very fertile. The Important rivers of the state are Ganga, Son, Koshi and Gandak.

Distribution of the Forests: The state has got natural sal forests in the district of West Champaran in the terai region of shivaliks. Besides, Sal forests are abundant in the southern Bihar in the districts of Kaimur, Rohatas, Aurangabad, Gaya, Jamui, Munger and Banka. The West Champaran district has moist deciduous Sal forest while south Bihar has dry deciduous Sal Forests. Most of the Natural Forests are notified as protected Forests. The Distribution of Forests in the Bihar State is as follows:

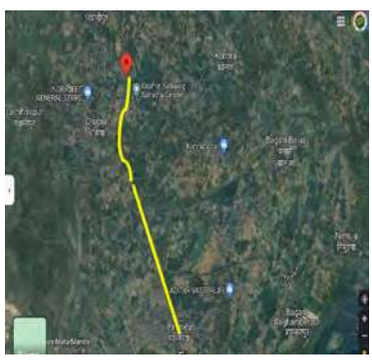
The state of Bihar presently has 6845 sq km notified natural forest area which is 7.27% of the geographical area of the state. These natural forests are spread in the districts of West Champaran, Kaimur, Rohtas, Aurangabad, Gaya, Jahanabad, Nawada, Nalanda, Munger, Banka and Jamui. The north Bihar except West Champaran is devoid of Natural Forests.

The Plant Species Composition: The important Tree species of Bihar are Sal (*Shorea robusta*), Shisham, Teak, Gamhar, Kadamb, Semal, Neem Peepal Bargad, Arjun, Asan, Haldu, Mahua and Kend etc.

Important wildlife species of Bihar: The State of Bihar is rich in wild animals. The important Terrestrial species are Tiger, Leopard, Bear, Hyena, Bison, Chital, Barking Deer etc. Besides there are many varieties of Crocodile, Magars and Fishes, Gangetic turtles in River systems. Bihar has got the privilege of having the National Aquetic animal, Fresh water Dolphin in the River Ganges, Kosi, Gandak, Mahanada and Paimar rivers of the state etc. Vikramshila Gangetic Dolphin Sanctuary has been notified at Bhagalpur portion of the River Ganges. Bihar is also famous for different wetlands and many varieties of local bird species as well as migratory birds. Different Natural wetlands like Kanwar lake, Baraila lake, Kusheshwar nath Lake, Udaypur lake and man made lakes Nagi Dam & Nakti Dam have been declared as Bird Sanctuary. The Bihar has breeding population of greater adjutants in Naugachia area of Bhagalpur district. The state has constructed a Rescue and Rehabilitation centre at Bhagalpur.

Name of the Division: Bettiah Forest Division, Bettiah

Basic Details:

Name of the Scheme	CAMPA/ NPV Road purak- Spring plantation	Map of the Plantaion	Photographs (Baghmabarpur Matkotwa pool To jhunjar Sikta Gram)
Year of Plantation	2020-21		 
Name of Range	Bettiah Range		
Site	Baghmabarpur Matkotwa pool To jhunjar Sikta Gram (Road side)		
Total length (Km.)	14 K.M		
No. of. Mound	8000		
No. of plants planted	8000		
Major Species	Kadam, Kachnar, Shiris etc		
Average height (ft)	8 to 12’		
Average girth	4-7” (Collar)i		
Survival (as per April 2022)	4760 plants		
GPS location	Lat- 26.825862^0 Long- 84.396145^0		

1. Survival per cent of the Last three Counts

Year of Count	Per cent (%)
April 2021	96.51
Oct 2021	80
April 2022	59.5

2. Expenditure on Plantation

Year	Amount Sanctioned	Expenditure	Remarks (Activities)
2020-21	1436840.00	1436840.00	Soil work, plantation etc
2021-22	Nil	Nil	Protection, watering, weeding etc.
2022-23	Nil	Nil	Protection

Name of the Division: Bettiah Forest Division, Bettiah

Basic Details:

Name of the Scheme	CAMPA/ NPV Road purak-Spring plantation	Map of the Plantation	Photographs (Hardiya Chouk To Judi Miya Tola)
Year of Plantation	2020-21		 
Name of Range	Ramnager Range		
Site	Hardiya Chouk To Judi Miya Tola		
Total area (ha.)	9		
No. of . mound	3000		
No. of plants planted	3000		
Species	Sagwan, Mahogni, Arjun, Bakayan,Safeda		
Average height (ft)	7-11’		
Average girth	4- 6” (Collar)		
Survival (as per April 2022)	2487 plants		
GPS location	27°2'51.108"N 84°26'28.908"E 27°3'14.568 N 84°26'39.876 E		

1. Survival per cent of the last three Count

Year of Count	Per cent (%)
Year of Count	100
April 2021	94
Oct 2021	82.9

2. Expenditure on Plantation

Year	Amount Sanctioned	Expenditure	Remarks (Activities)
2020-21	586600.00	586600.00	Soil work, plantation
2021-22	Nil	Nil	Protection, watering, weeding etc.
2022-23	Nil	Nil	Protection

Name of the Division: Rohtas Forest Division, Sasaram

Name of the Scheme	2020 -21	Map of the Plantation	Photographs
Name of the Range	Sasaram		 
Site	Baradih pul to Mokal Pul Nahar		
Total Area (Km.)	5		
No. of Pit	10000		
No. of Plants Planted	10000		
Species	Green Semal, Siris, Shisham, Ber, Awala, Mahogani, Maleshiya sal, Bottle Brush, Arjun, Amrud.		
Average height (ft)	2 fit to 5 fit		
Average girth	2 inch to 5 inch		
Survival 16th June 2022)	6759 (67.59%)		
G.P.S. location	(1) N-24⁰59'2.30"E-83⁰59'5.31" (2) N-25⁰00'6.63"E-84⁰ 01'9.33"		

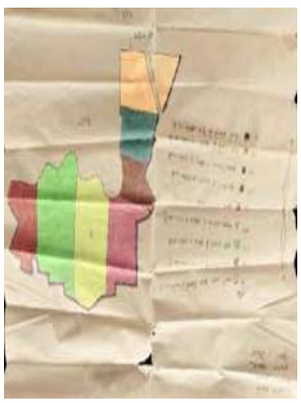
1. Survival per cent of the last three Count

1	2020-21	-
2	2021-22	9764 (97.25%) Oct 2021
3	2022-23	8817 (88.17%) April 2022

2. Expenditure on plantation

2020-21	99280	99280
2021-22	0	0
2022-23	0	0

Basic Detail :

Name of the Scheme	2020 -21	Map of the Plantation	Photographs
Name of the Range	Chenari		
Site	Sighanpura & Lutru		
Total Area (Ha)	100		
No. of Pit	110000		
No. of Plants Planted	110000		
Species	Shisham, Ekessia, Sirish, Mhogani, Nim,Awala, Sagwan, Khair, Baken, Bans.		
Average height (ft)	4' to 5 ft.		
Average girth	1 to 1.5 inch		
Survival 1(6th June 2022)	60852 (55.32%)		
G.P.S. location	(1) N-24^{0}50'16.25" E-83^{0}52'19.2" (2) N-24^{0}50'13.42" E-83^{0}52'21.34" (3) N-24^{0}49'59.80" E-83^{0}53'33.88" (4) N-24^{0}49'53.08" E83^{0}53'28.89"		

1. Survival per cent of the last three count

1	2020-21	-
2	2021-22	99550 (90.50%) October 2021
3	2022-23	96800 (88%) (April 2022)

2. Expenditure on plantation

Year	Amount sanctioned	Expenditure
2020-21	3102963	3102963
2021-22	0	0
2022-23	0	0

Name of the Division: Kaimur Forest Division, Bhabua

Basic Details:

Name of the Scheme	2020-21	Map of the Plantation	Photographs
Name of Range	Adhaura Range		
Site	Sikari		
Total area (ha.)	64		
No. of pit	70400		
No. of Plants Planted	70400		
Species	Shisham, Sagwan, Bakain, Platoform, Bamboo, Others		
Average height (ft)	5- 7		
Average girth	1-2 inch		
Survival	86%		
GPS Location	N 24° 42'23" , E 83° 30'34"		

1. Survival Per cent of the last three year count

Year (count)	Per cent (%)
2022-23 (April, 2022)	86

2. Expenditure on Plantation

Year	Amount Sanctioned	Expenditure	Remarks (Achievement)
2020-21	Rs 1971089	Rs 1971089	Advanced work 64 ha completed

Basic Details:

Name of the Scheme	2020-21	Map of Plantation	Photographs
Name of Range	Adhaura Range		
Site	Sikarwar		
Total area (ha.)	32		
No. of pit	35200		
No. of Plants Planted	35200		
Species	Shisham, Sagwan, Bakain, Platoform, Bamboo, Others		
Average height (ft)	5- 7		
Average girth	1-2 inch		
Survival	86.01%		
GPS Location	N 24° 43'50" , E 83° 30'13"		

1. Survival Percentage of the last three year count

Year (count)	Per cent
2022-23 (April, 2022)	86.01

2. Expenditure on Plantation

Year	Amount Sanctioned	Expenditure	Remarks (Achievement)
2020-21	Rs 1471169	Rs 1471169	Advanced work 32 ha completed

Basic Details:

Name of the Scheme	2020-21	Map of Plantation	Photographs
Name of Range	Adhaura Range		 
Site	Garha Chainpura		
Total area (ha.)	50		
No. of pit	55000		
No. of Plants Planted	55000		
Species	Shisham, Sagwan, Bakain, Platoform, Bamboo, Others		
Average height (ft)	5- 7		
Average girth	1-1.5 inch		
Survival	84.74%		
GPS Location	N 24° 39'56" , E 83° 34'36"		

1. Survival Per cent of the last three year count

Year (count)	Per cent (%)
2022-23 (April, 2022)	84.74

2. Expenditure on Plantation

Year	Amount Sanctioned	Expenditure	Remarks (Achievement done)
2020-21	Rs 1839715	Rs 1839715	Advanced work 50 ha completed

Basic Details:

Name of the Scheme	2020-21	Map of the Plantation	Photographs
Name of Range	Adhaura Range		
Site	Bandha		
Total area (ha.)	65		
No. of pit	71500		
No. of Plants Planted	71500		
Species	Shisham, Sagwan, Bakain, Platoform, Bamboo, Others		
Average height (ft)	5- 6		
Average girth	1-1.5 inch		
Survival	84%		
GPS Location	N 24° 35'31" , E 83° 39'58"		

1. Survival Percentage of the last three year count

Year (count)	Percent (%)
2022-23 (April, 2022)	84

2. Expenditure on Plantation

Year	Amount Sanctioned	Expenditure	Remarks (Achievement)
2020-21	Rs 2227987	Rs 2227987	Advanced work 65 ha completed

Basic Details:

Name of the Scheme	2020-21	Map of the plantation	Photographs
Name of Range	Adhaura Range		
Site	Sarodag Bahera		
Total area (ha.)	61		
No. of pit	67100		
No. of Plants Planted	67100		
Species	Shisham,Sagwan, Bakain, Platoform, Bamboo, Others		
Average height (ft)	5- 7		
Average girth	1-1.5 inch		
Survival	83.99%		
GPS Location	N 24° 35'31" , E 83° 39'58"		

1. Survival Per cent of the last three year count

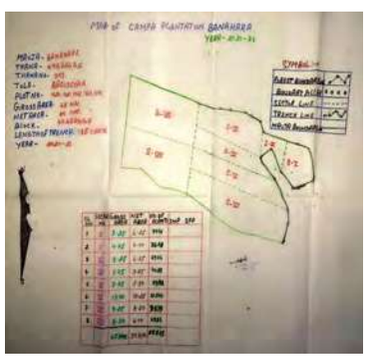
Year (count)	Percent (%)
2022-23 (April, 2022)	83.99

2. Expenditure on Plantation

Year	Amount Sanctioned	Expenditure	Remarks (Achievement done)
2020-21	Rs 2109631	Rs 2109631	Advanced work 61 Ha completed

Name of the Division: Munger Forest Division, Munger

Basic Details:

Name of the scheme	2020-21	Map of the plantation	Photographs
Name of Range	Kharagpur		
Site	Banhara		
Total area (ha.)	50		
No. of pit	55000		
No. of Plants planted	55000		
Species	Shisham,nim, Arjun, kushum,kat sagwan, Bakain,Green simal, karanj, Plotoform,khair etc		
Average height (ft)	3 to 6		
Average girth	2.5 to 4 inch		
Survival	80.65		
GPS location	N 25.055787 E 86.493383		

1. Survival Per cent of the last three counts

Year	Per cent (%)	
Oct-21	98	
Apr-22	80.65	

2. Expenditure on Plantation

Year	Plantation Name	Amount Sanction	Expenditure	Remarks (Activities)
2020-21	Banahara	2006728.00	2006728.00	Advance andcompletion work
2021-22		1522054.00	0.00	1st year maintenance work

Contribution: Chief Executive Officer, State CAMPA. Bihar

CHANDIGARH

GOOD PRACTICES ON VARIOUS THEMES OF CAMPA

Introduction

Chandigarh the "City Beautiful" is situated in the foothills of Shivaliks, Chandigarh lies between 76 47'14E and 30 44'14N. It is recognized all over the country for its greenery and various green initiatives taken by the Administration. Total geographical area of Chandigarh is 114 sq.km, while another 25.98 Sq.km hilly area of Sukhna Wildlife Sanctuary is also vested with Chandigarh which was acquired for soil conservation work.

Forest Survey of India (FSI), in this recent report of India State of Forest Report (ISFR, 2021) showed that the Green Cover of UT Chandigarh has increased from 46.25% in 2019 to 50.05% in the year 2021. As per the report released by the Ministry of Environment, Forest & Climate Change, Govt. of India, there is a jump in the Forest Cover in Chandigarh by 85 hectares. It also mentions that the Open Forest area has also increased by 158 hectares that signifies more non forest area has been brought under Green Cover.

Department of Forests & Wildlife, UT Chandigarh is making sustained efforts in improvement of the quality of the forest by planting indigenous species such as Shisham, Shahtoot, Khair and Babul etc.

Background of CAMPA

In compliance of the Compensatory Afforestation Fund Act, 2016 and in pursuance of the Ministry of Environment and Forest, Government of India, letter no. 1-58/09/MOS/I/C-E&F dated 15th July, 2009 and dated 21st July, 2009 and in supersession of the Chandigarh Administration, Forest Department, Notification bearing no. 75 dated 16th Sept., 2015, UT, Chandigarh reconstituted the Governing Body, Steering Committee and Executive Committee of the State Compensatory Afforesation Fund Management and Planning Authority (CAMPA), for Union Territory, Chandigarh.

Further, 3rd Party inspection/monitoring of CAMPA works has carried out in UT Chandigarh in the year 2015 by the Dr. YS Parmar University of Horticulture & Forestry Nauni-Solan, Himachal Pradesh. The team inspected the afforestation CAMPA site at Village- Maloya and Khuda Lahora of UT Chandigarh. The teams recorded and confirm the GPS location of the Afforestation sites. The afforestation works were comprised of Plantation and Fencing work.The various species were planted at Maloya and Khudda Lahora, Chandigarh

Under CAMPA i.e. *Syzygium cumini* (Jamun), *Mangifera indica* (Aam), *Psidium guajava* (Amrood), *Punica*

granatum (Anaar), *Terminalia bellirica* (Bahera),*T. arjuna* (Arjun),*Tamarindus indica* (Imli), *Azadirachta indica* (Neem), *Aegle marmelos* (Bael), *Morus alba* (Shahtoot), *Ficus racemosa* (Gular), *Emblica officinalis* (Amla), *Nerium indicum* (Kaner), *Koelreuteria paniculata* (Koelreuteria), *Thuja occidentalis* (Morpankhi) etc.

Compensatory Afforestation work in UT Chandigarh

There has been diversion of 64.599 ha of Forest Land under FC Act 1980 so far, for which various CA schemes were devised and executed on ground from time to time on area of 111.09 ha. At present, there are CA Plantation works at 25 locations (some are new plantation and some under maintenance) of which the average survival per cent is more than 90 and many of the sites have nearly 100 % survival with almost zero mortality. Pictures taken from these sites from time to time are hereby placed for the reference.

The species planted at this site area i.e., *Psidium guajava* (Amrood), *Emblica officinalis* (Amla), *Terminalia bellirica* (Bahera), *Syzygium cumini* (Jamun), *Bauhinia variegata* (Kachnar), *Morus alba* (Shahtoot), *Delonix regia* (Gulmohar), *Ficus religiosa* (Peepal), *Azadirachta indica* (Neem), *Ficus Infectoria* (Pilkhan), *Cassia fistula* (Amaltas) etc.

Why Chandigarh boasts of survival percentage nearly 100?

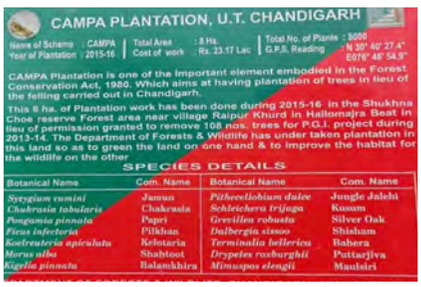
The first advantage lies in the basic fact that UT Chandigarh is very land locked UT with geographical area of just 114 sq km and a Sanctuary at the periphery with area 26 sq. km. Usually, the diversion proposal are of very small nature where every block of plantation is fenced with chain link in order to provide complete protection from any kind of biotic interference and concentrated effort is put for all the CA plantation in order to make them exemplary in the country. Nature is also kind and it hardly has any tough or inaccessible terrain. Each plant gets its due attention and there is almost nil biotic or abiotic pressure.

In fact, during harsh winters thatched roofs were provided to each plant to protect it from frostbite which also ensured a better growth and survival.

During any physical inspection, one may notice a detailed board is placed stating year of plantation, number of plants, list of different species along with geo-coordinates

which greatly helps in effective monitoring of all these CA sites.

Removal of weeds such as Parthenium, Leucenia and Lantana were timely done to protect these species from various invasive alien species which ensures a better growth of these young saplings. Apart from these protection measures, adequate watering facility is also ensured during lean season to protect these plants from drying up. Each plant was supplied water from the nearby water bodies or through water tankers. The CA sites were properly protected or fenced wherever and whenever need was felt, which also added to its pressure free growth and that's how nearly 100 % survival was ensured.



Contribution: Department of Forests and Wildlife, UT Administration of Chandigarh

CHHATTISGARH

1. SOIL AND MOISTURE CONSERVATION WORKS FOR STREAM REJUVENATION IN FOREST AREAS

Brief Overview of Forestry Scenario in Chhattisgarh

As per the Champion and Seth Classification of Forest Types (1968), the forests in Chhattisgarh belong to two Type Groups i.e., Tropical Moist Deciduous Forests and Tropical Dry Deciduous Forests which are further divided into 12 Forest Types. The State's two main tree species are Sal (*Shorea robusta*) and Teak (*Tectona grandis*). Other major species are Bija (*Pterocarpus marsupium*), Saja (*Terminalia tomentosa*), Dhavdha (*Anogeissus latifolia*), Mahua (*Madhuca indica*), Tendu (*Diospyros melanoxylon*) and bamboo (*Dendrocalamus strictus*) etc. The State is rich in mineral reContributions like, coal, iron, bauxite, limestone, corundum, tin etc which are mainly found in forest areas. About 50% of the villages in the State are located inside five kilometers radius of forests. The inhabitants are mainly tribal, economically backward, non-tribal and landless people who depend significantly on the forests for livelihood and other needs. Thus, the pressure on forests is high in the State. Joint Forest Management (JFM) began in the State in 1991 and as per the latest available report, there are 7,887 JFMCs covering an area of 33,19,000 hectares & involving 11,17,000 families.

Recorded Forest Area (RFA) in the State is 59,772 sq km of which 25,786 sq km is Reserved Forest, 24,034 sq km is Protected Forest and 9,952 sq km is Unclassed Forest. In Chhattisgarh, during the period 1st January 2015 to 5th February 2019, a total of 3,793.05 hectares of forest land was diverted for various non-forestry purposes under the Forest Conservation Act, 1980 (MoEF&CC, 2019).

Three National Parks and 11 Wildlife Sanctuaries constitute the Protected Area network of the State covering 4.93% of its geographical area. As per the state of Forest Report 2021, the Forest Cover in the State is 55,716.60 sq km which is 41.21 % of the State's geographical area. In terms of forest canopy density classes, the State has 7,068 sq km under Very Dense Forest (VDF), 32,279 sq km under Moderately Dense Forest (MDF) and 16,370 sq km under Open Forest (OF).

Chhattisgarh CAMPA

The Chhattisgarh State CAMPA is an authority to be known as the "State Compensatory Afforestation Fund Management and Planning Authority." It is intended as an instrument to accelerate activities for Conservation of natural forests, management of wildlife, infrastructure development in the Forestry sector and other allied works. The Chhattisgarh State CAMPA has been constituted as per the order dated 10/07/2009 issued by Hon'ble supreme court of India in IA No. 2143 in WP (C) 2002/1995. The State CAMPA receives monies 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.

As per the order dated 10/07/2009 by Hon'ble Supreme Court of India, the Chhattisgarh state CAMPA has been constituted as a Government body under State Forest Department, vide State Govt. notification dated 24/07/2009. State CAMPA works under the Administrative control of PCCF and is managed by an officer of the rank of APCCF. The aims and the objectives of the state CAMPA fund are as follows:

1. Conservation, Protection, regeneration and management of existing natural forests.
2. Conservation, Protection and management of wildlife and its habitats within and outside Protected Areas.
3. Compensatory afforestation.
4. Promote environmental services
5. Research, Training and capacity buildings.

The CAMPA fund in the state is being utilized as per the Annual Plan of Operations (APOs) approved by the state Steering Committee based on the provisions laid down in the guideline issued by Government of India, Ministry of Environment & Forests dated 02/07/2009.

Rivers of Chhattisgarh

In Chhattisgarh, there are about 36000 streams, which are spread almost evenly in the entire landscape. They make a network of water bodies and increase the travel time of surface water in the state and hence slow the down run off and increase the ground water recharge. Due to degradation of forests, change in land use pattern and other development activities, this network of streams has been disturbed, discontinued and degraded. Therefore, water runs speedily, enhance soil erosion and finally

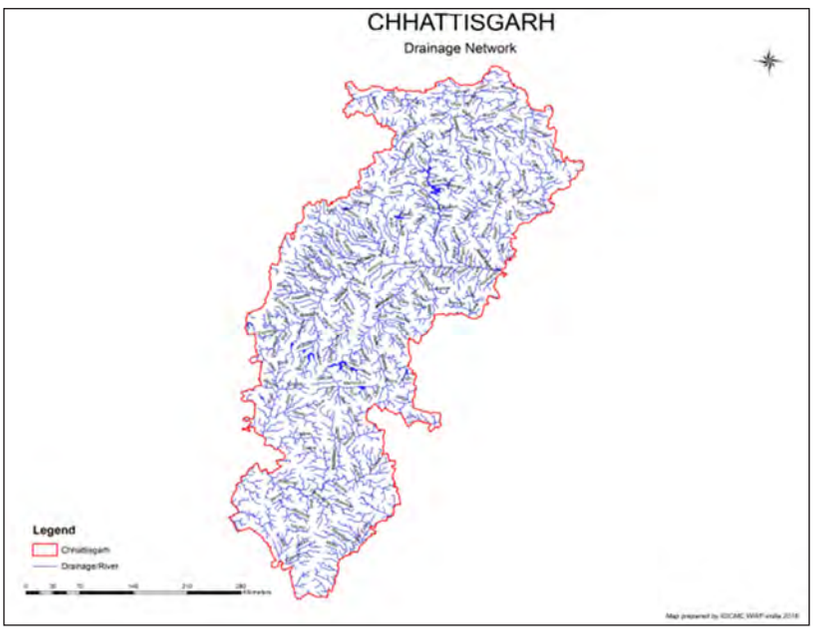
reduce the productivity of land. Revival and rejuvenation of stream / river networks is essential for protection of fertile soil of land and maintain the ground water level by ensuring the stream perennial.

The State has 80% of households dependent on Agriculture from which 76% are small and marginal farmers. It has only 43% arable land under cultivation of which 55% land has less water retention capacity. The Net Irrigated Area (NIA) in Chhattisgarh is 31% of which 65% is rain fed comprising Canal supply (61%), Ponds 2.90% and dug wells 1.37%. The other major Contribution of irrigation is obviously the tube wells and other ground water reContributions amounting to 34.73%. At present only 33.15% of gross sown area are under secured irrigation facility.

Presence of dense river system in the state has huge potential to address the issue of irrigation. The state 1,35,191 sq. km of area is divided into five river basins (Mahanadi, Godavari, Ganga, Brahmini and Narmada). Mahanadi is the major river of the state draining 56% of the geographical area. Hasdeo (a tributary of Mahanadi), Rihand (a tributary of the Ganges), Indravati (draining into Godavari river basin), Jonk and Arpa are other major rivers of the State. Godavari river basin drains 29% of the geographical area of the state followed by Upper Ganges river basin (14%).

Chhattisgarh region is characterized by non-perennial streams, which actually are rain-fed rivers. During the dry season either they may cease to flow entirely, or there is hardly any water in most of the drainage channels. Although presence of dense network of rivulets and streams provides scope for in-situ conservation and harvesting of water, it is estimated that about 75% of the gross sown area of the state can be irrigated with proper use and management of available water recontributions.

Chhattisgarh comes under the dendritic kind of the drainage system of watershed and after the Himalayan region the second most complex drain revolving system which creates the best opportunity to hold the water network system for the maximum time and recharge its geographical area as possible. Chhattisgarh has average annual rainfall of more than 1200 mm which is comparatively good as compared to its neighboring states. There is a great scope for management and conservation of huge quantity of the soil and water reContributions resulting in the improvement of Forest health, wildlife, Agriculture and other dependent sector. It will also boost the production of Non wood forest products supporting rural economy.



(Contribution:https://sandrp.in/2017/06/03/chhattisgarh-rivers-profile)

Soil Moisture Conservation Works

Ministry of Environment, Forests and Climate Change (MoEF& CC), Government of India, New Delhi has given directions for rejuvenation of rivers in the Chhattisgarh state. Forest department has been identified as key actor to revive, revitalize and rejuvenate rivulets / streams in the forest areas of Chhattisgarh. In rivulet / stream management, Government is focusing on enhancing the ground water percolation, Forest regeneration, water retention and storage capacity of rivulet /stream, so that

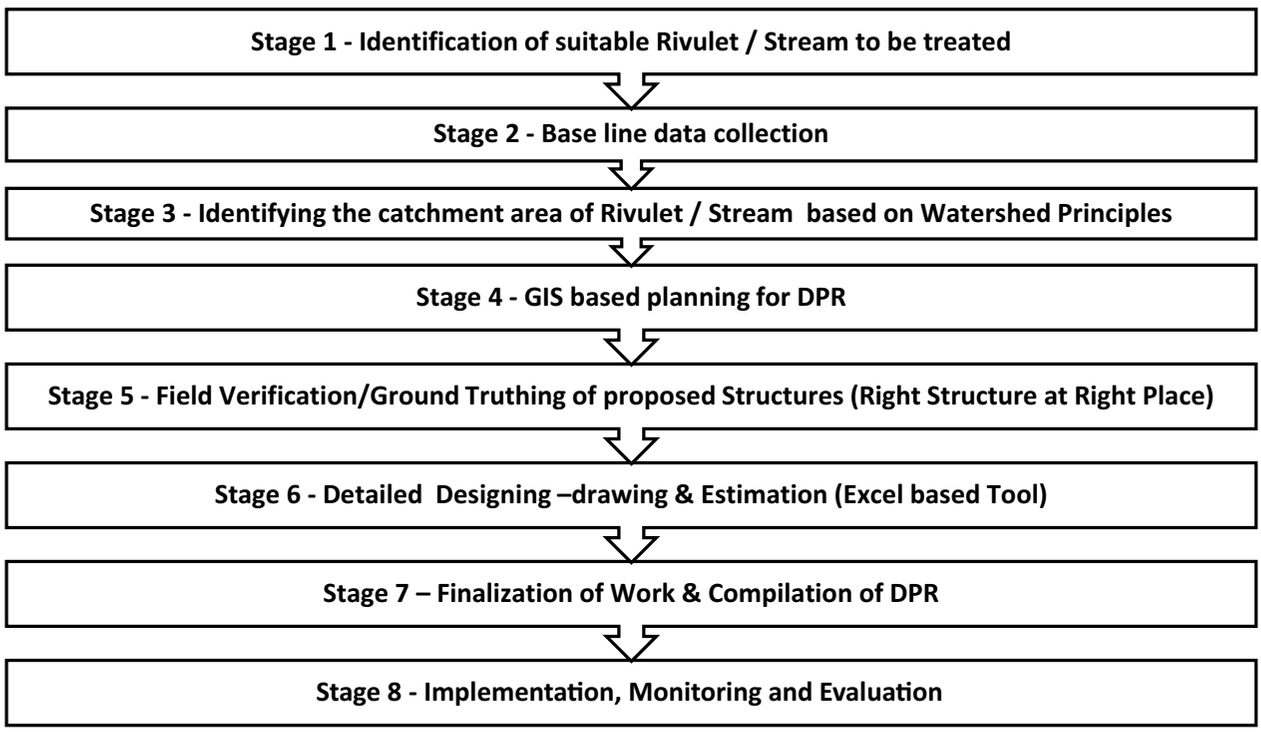
water availability for wildlife, agriculture, animals and domestic can be ensured for longer period of the year. In long run, this initiative will also increase the adaptive capacity of households to cope up from climate change extremes like dry spell, drought and flood situation.

Forest department under the Chhattisgarh CAMPA is the nodal department for implementation of soil moisture conservation works in the forest areas. Forest department under Chhattisgarh CAMPA has prepared technically sound Detailed Project Reports with the help and support of technical team from ICRG and has included in the CAMPA-Annual plan of operations (APO 2019-20) and started its work form December 2019. Now the Forest department is implementing the Third phase of the project. The Soil Moisture Conservation projects are being implemented in 31 territorial forest division, 3 National parks, 2 Tiger reserves and 1 Elephant reserve in Chhattisgarh.

To implement Soil Moisture Conservation works, site specific catchment area treatment plan (Detailed project Report) was prepared to construct a series of watershed drainage line treatment structures (like Brushwood check dam, Earthen dam, loose boulder check dam, Percolation tank, 30-40 model, Contour bund, Contour trench, Gabion structure, Water Absorption trench, Stop dam, Check dam, Anicut, Underground Dykes, plantations etc) to reduce run off, soil erosion and enhance the ground water table.

Uniqueness of Soil Moisture Conservation works in Chhattisgarh context:

Using the concept of landscape approach (Ridge to valley) which covers a stream with all the orders (primary, secondary, tertiary units), rivulet for treatment were identified and prioritized on the basis of soil erosion. Technical team comprising NRM engineers, GIS expert, senior forest officers and field staff was made for preparing technical Detailed Project Report (DPR). Village communities, Joint Forest Management Committee members, People representatives were involved in the planning process, survey and selection of rivulet / stream for treatment. Geographical information system (GIS) based data are used for decision making which includes several GIS layers / thematic maps for selection of site as well as drainage line treatment structures. Various training modules were conducted for the forest frontline staff including mobile applications, GPS and GIS based survey, regular monitoring by Natural ReContribution Management (NRM) Engineers, ground truthing on the basis of watershed principles, baseline survey to assess current status of forest / river ecosystem, soil erosion, soil moisture, ground water level, and technically sound Detailed Project Report (DPR) preparation with the help of well trained technical team, regular coordination and tracking using mobile apps, monitoring and evaluation make this project unique. Various stages of Planning and implementation of Soil Moisture Works are depicted in the chart given below.



Tools and process adopted for collection of Bio-physical information:

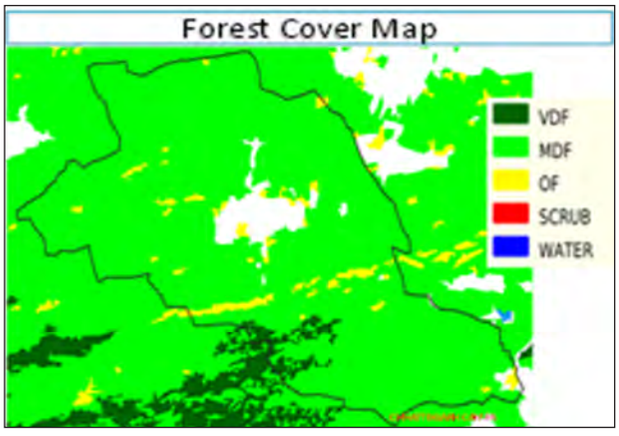
GIS based analysis – User friendly with

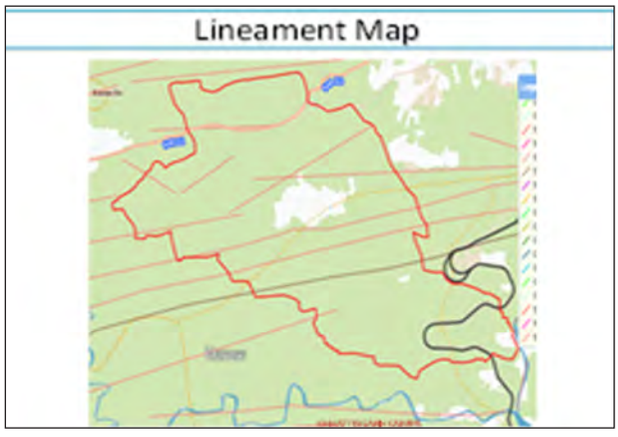
- o Google Earth Pro
- o Bhuvan portal
- o Global Mapper
- o CLART
- o QGIS
- o NoteCAM

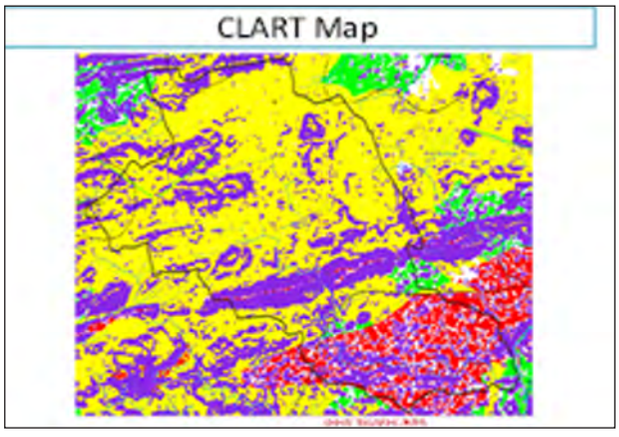
Spatial Information collection:

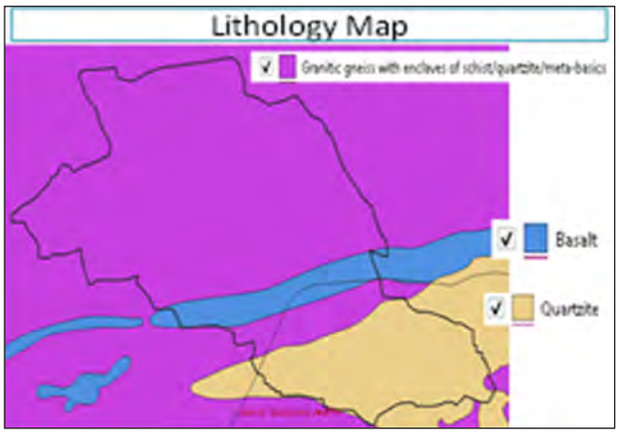
Thematic Maps Interpretation for Soil Moisture Conservation works from Bhuvan and other Portal:

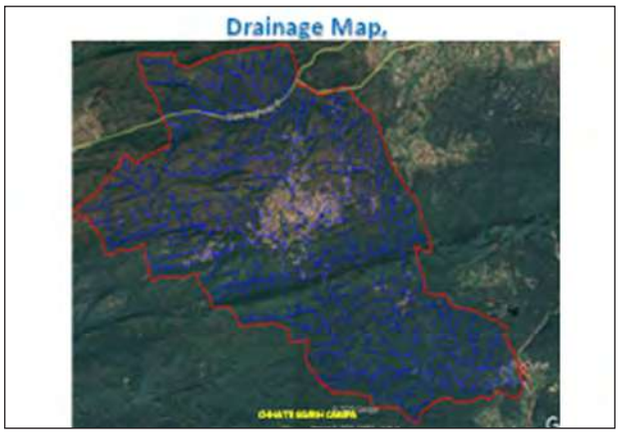
1. Drainage Map/Water bodies Map/Canal Map etc- BhuvanPMKSY
2. Land use land cover map - Bhuvan state portal
3. Wastelands Map - Bhuvan state portal
4. Soil Erosion Map - Bhuvan state portal
5. Structural Geology map (lineaments Map) - Bhuvan state portal
6. Lithology- Forest Management Information System (FMIS) cell
7. Groundwater Prospects - Bhuvan state portal
8. Soil Texture- Forest MIS cell
9. Contour Map - Global Mapper Ver 18, *Operating system – 64 bit
10. CLART layer- Q GIS app
11. Forest Cover Map- FSI

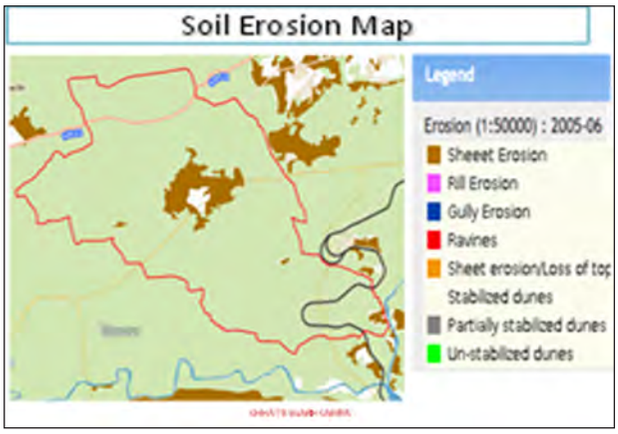


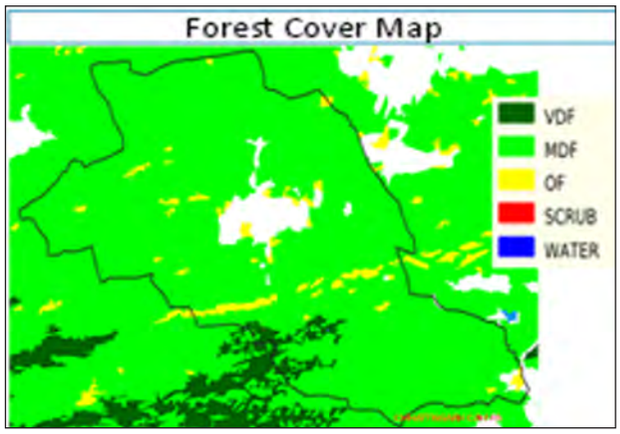


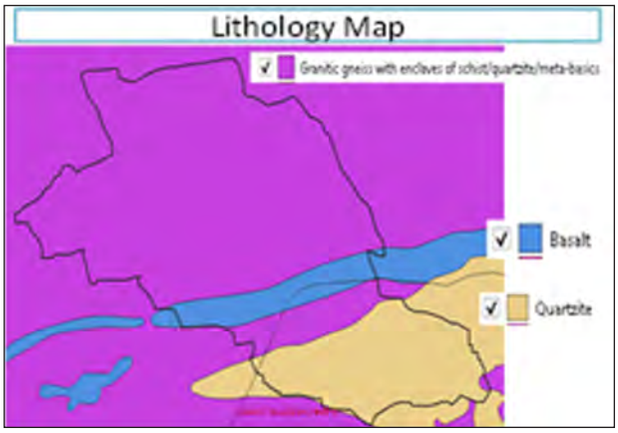




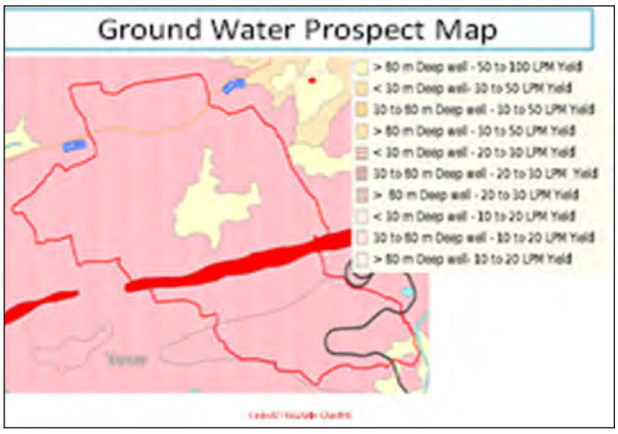


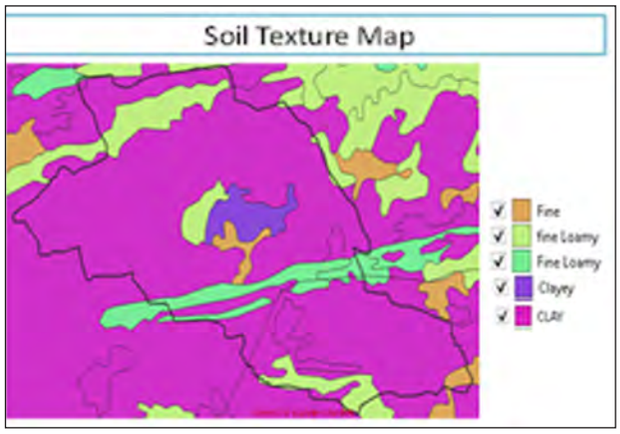

Soil Erosion Map
Legend
Erosion (1:50000) : 2005-06
Sheeet Erosion
Rill Erosion
Gully Erosion
Ravines
Sheet erosion/Loss of top
Stabilized dunes
Partially stabilized dunes
Un-stabilized dunes

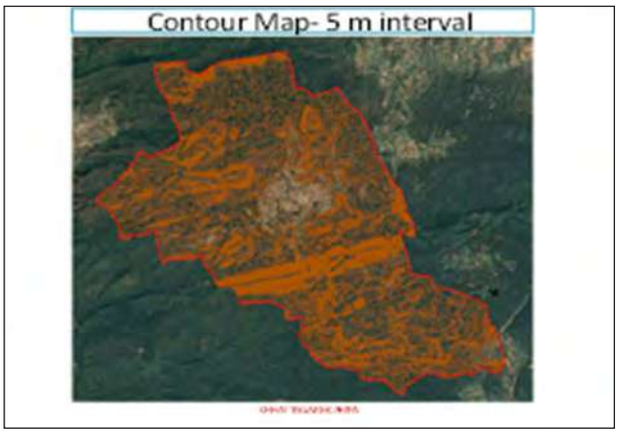

Forest Cover Map
VDF
MDF
OF
SCRUB
WATER


Lithology Map
Granitic gneiss with enclaves of schist/quartzite/meta-basics
Basalt
Quartzite


Wasteland Map


Ground Water Prospect Map
> 80 m Deep well - 50 to 100 LPM Yield
< 10 m Deep well- 30 to 50 LPM Yield
10 to 80 m Deep well - 30 to 50 LPM Yield
> 80 m Deep well - 30 to 50 LPM Yield
< 10 m Deep well - 20 to 30 LPM Yield
10 to 80 m Deep well - 20 to 30 LPM Yield
> 80 m Deep well - 20 to 30 LPM Yield
< 10 m Deep well - 10 to 20 LPM Yield
10 to 80 m Deep well - 10 to 20 LPM Yield
> 80 m Deep well- 10 to 20 LPM Yield


Soil Texture Map
Fine
fine Loamy
Fine Loamy
Clayey
CLAY


Contour Map- 5 m interval


Slope profile

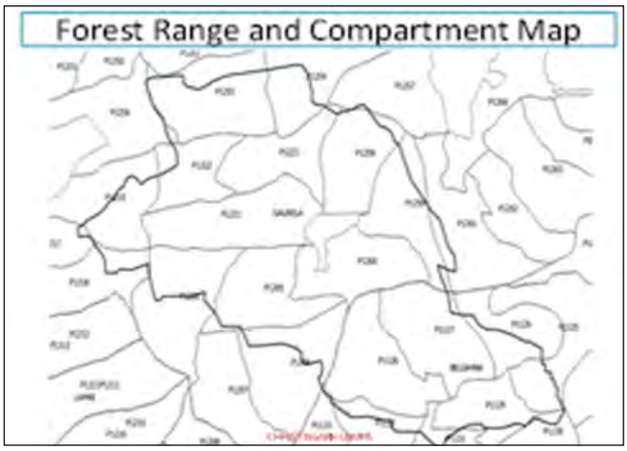


Table-1: Possible intervention for Ridge area, Middle area & Valley area

Ridge area- (sloping areas> 25%)	Ridge area- (25-10 % sloping areas)	Middle and Low area-(<10% sloping areas)
Plantation - Block Plantation – As per local biodiversity and forestry plants	Plantation- Block Plantation – As per local biodiversity and forestry plants (Silvi-Pasture)	Block Plantation – As per local biodiversity and forestry plants (Silvi-Pasture)
	Staggered Trenches – grazing land development	Contour Bunds
	Continuous Contour Trenches (CCT)	Recharge Pit (min 3 m in depth of pit)
	30-40 Model	Field Bunding / WAT
	Percolation tank	Pond/ Percolation tank
		Bund Plantation

Table-2: Drainage line treatment

1st Order Stream	2nd Order Stream	3rd Order Stream	4th Order and greater
Brushwood Check	Earthen Gully Plug	Gabion	Underground Dyke- Sub-Surface dyke
Earthen Gully Plug	Loose Boulder Check	Underground Dyke- Sub-Surface dyke	Earthen dam
Loose Boulder Check Dam	Gabion	Earthen dam	Check dam
		Check dam	Stop Dam
		Stop Dam	Anicut
		Stream Bank Plantation – 3-5 rows	Stream –Bank Plantation 3-5 Rows

Outcomes of Soil and Moisture Conservation Work

As this is the kind of the work which gives results in the long term but there were several set examples which reflect the impact of soil moisture conservation till date and the positive change is visible. In the first phase of the soil moisture conservation project, under Chhattisgarh CAMPA- Annual plan of operations 2019-20, more than 863 rivulet / streams were treated which covers 4.87 lakhs hectares of forest area and nearly 12.08 lakhs structures have been constructed so far. While in 2020-21, 2055 streams are being treated which will cover 6.08 lakhs hectares of forest area and nearly 40.53 lakhs structures are being constructed for soil and moisture conservation. In 2021-22, 1974 streams are being treated which will cover 5.70 lakhs hectares of forest area and nearly 44.91 lakhs structures are being constructed. Forest department is implementing this work as a mega environmental project to restore health of the forest and rivers, improve its ecological functions and sustain the ecosystem services. Forest Department of Chhattisgarh is setting the target to complete all the possible catchment area treatment on priority basis.

Forest Department of Chhattisgarh is enthusiastic and active in implementation of Soil Moisture Conservation works for the sustainable management of the natural reContributions through holistic approach and use of modern technologies like remote sensing and GIS based planning.

Table-3: Details of Soil and Moisture Conservation works-APO year wise

S.No.	CAMPA APO Year	Proposed		No. of Nala	Catchment Area ha. (in Lakh)	Achievement	
		No of Structures	Amounts (Rs. in Crore)			No. of Structure	Amount (Rs. in Crore)
1	2	3	4	5	6	7	8
1	2019-20	1225186	160.95	863	4.87	1208662	144.29
2	2020-21	4621917	421.11	2055	6.08	4053294	239.33
3	2021-22	7320332	407.27	1974	5.70	4491800	136.36
4	2022-23	2910527	300.52	1503	6.26	Yet to Start.	
	Total	16077962	1289.85	6395	22.91	9753756	519.98

Table-4: Details of Soil Moisture Conservation structures (APO-2019-20 to 2021-22)

S.No.	Structure name	No. of Structure Proposed			No. of Structure Completed		
		Total	No.	ha.	Total	No.	ha.
1	BWCD (Brush Wood Check Dam)	116948	116948	0.00	82070	80070	0.00
2	LBCD (Loose Boulder Check Dam)	218978	218978	0.00	164843	162843	0.00
3	Gabion Structure	8908	8908	0.00	4282	4082	0.00
4	ECD (Earthen Dam)	678	678	0.00	430	405	0.00
5	WAT (Water Absorption Trench)	421669	0	4216.69	350425	0	3504.25
6	SCT (Staggered Contour Trench)	12095537	0	40343.02	8954625	0	29848.75
7	EGP (Earthen Gully Plug)	41175	41175	0.00	31877	28932	0.00
8	CD (Check Dam)	364	364	0.00	176	176	0.00
9	SD (Stop Dam)	264	264	0.00	150	150	0.00
10	PT (Percolation tank)	1518	1518	0.00	1095	1095	0.00
11	MPT (Mini Percolation Tank)	3159	3159	0.00	1943	1943	0.00
12	Pond / Dabri / Waterhole	879	879	0.00	616	616	0.00
13	Concrete Dyke	411	411	0.00	230	230	0.00
14	Underground Dyke	309	309	0.00	194	194	0.00
15	30-40 Model With Plantation	166930	0	2384.72	123079	0	1758.27
16	Contour Bund	84777	0	847.77	32852	0	328.32
17	Desiltation of Nala / Pond	107	107	0.00	64	64	0.00
18	Anicut	39	39	0.00	20	20	0.00
	Other	4785	4785	0.00	4785	4785	0.00
	Total	13167435	398522	47792.20	9753756	285605	35439.59

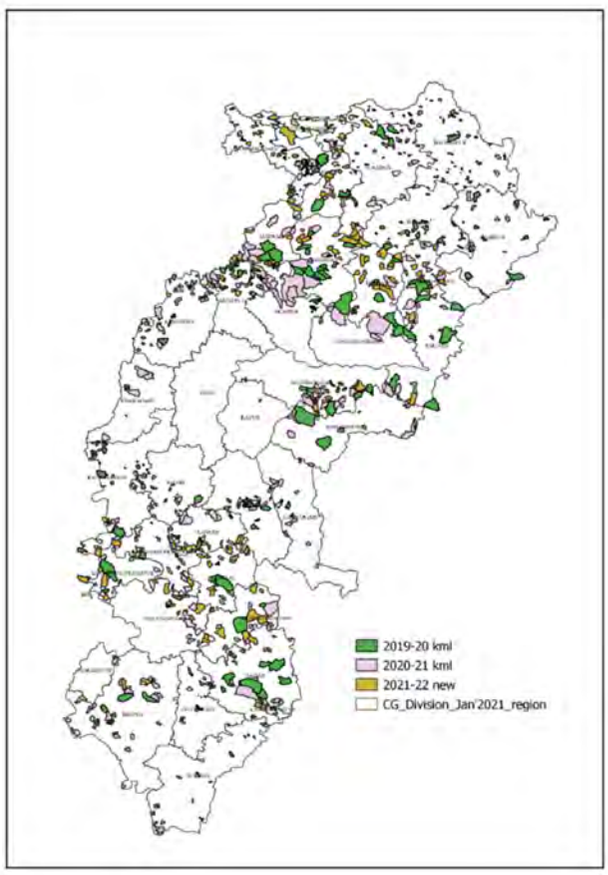
Table-5: Chhattisgarh-River Basin wise Catchment Area Treatment details

S.No.	CAMPA APO Year	Basin Name	Catchment Area for treatment (in Lakh ha.)	Amount (in Crore Rs)
1.	2019-20	Godavari	0.95	33.82
2.		Mahanadi	2.31	71.11
3.		Lower Ganges & Mahanadi	1.38	40.78
4.		Mahanadi & Godavari	0.22	15.25
Total APO 2019-20			4.87	160.95
1.	2020-21	Godavari	1.46	102.96
2.		Mahanadi	2.74	175.69
3.		Lower Ganges & Mahanadi	0.84	86.36
4.		Mahanadi & Godavari	1.04	56.10
Total APO 2020-21			6.08	421.11
1.	2021-22	Godavari	1.07	86.58
2.		Mahanadi	2.30	125.73
3.		Lower Ganges & Mahanadi	1.28	135.82
4.		Mahanadi & Godavari	1.05	59.13
Total APO 2021-22			5.70	407.27
1.	2022-23	Godavari	1.64	78.61
2.		Mahanadi	2.23	106.80
3.		Lower Ganges & Mahanadi	1.60	76.73
4.		Mahanadi & Godavari	0.80	38.38
Total APO 2022-23			6.26	300.52

S.No	Name of the River Basin	Catchment Area for Treatment (in Lakh ha.)	Amount (in Crore Rs)
1	Godavari	5.11	301.97
2	Mahanadi	9.58	479.33
3	Lower Ganges & Mahanadi	5.10	339.70
4	Mahanadi & Godavari	3.11	168.85
Grand Total		22.91	1289.85

Soil Moisture Conservation Works impact Assessment

Chhattisgarh CAMPA has made a Memorandum of Understanding (MOU) with National Remote Sensing Centre (NRSC-ISRO), Hyderabad and Chhattisgarh Council for Science and Technology (CCOST) for assessing the impact of Soil Moisture Conservation Works in Chhattisgarh. Also baseline survey has been conducted in the treatment sites to evaluate the impact of the works.

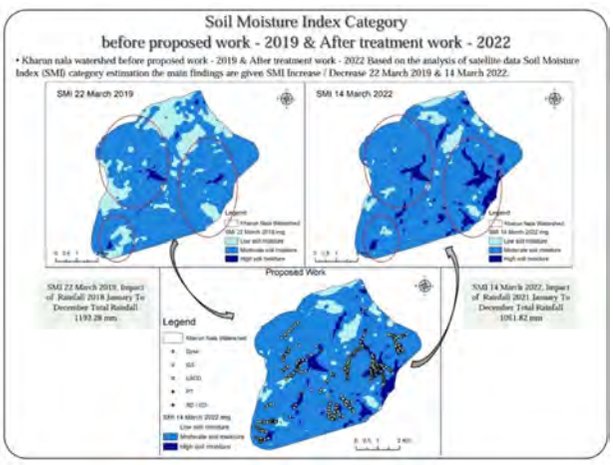


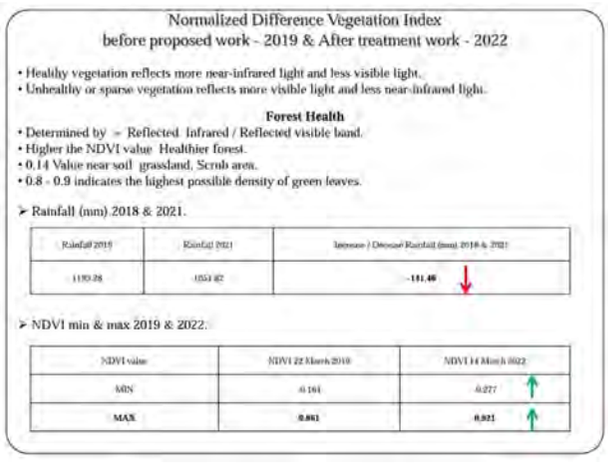
Map showing Areas of Soil Moisture conservation works Areas in Chhattisgarh

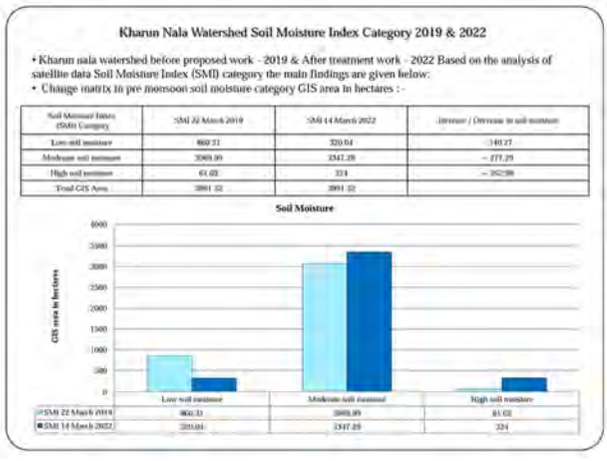
The impact of soil and moisture conservation works in the Kharun Nala of Balod Forest Division has been assessed using Remote sensing and GIS tools and the positive impact of the project is presented below.

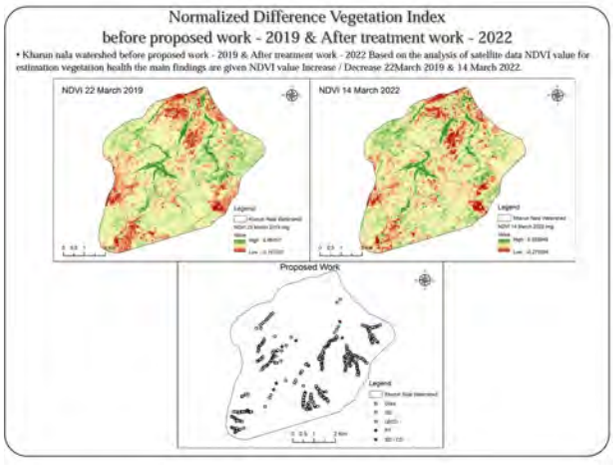
Table: Details of Soil Moisture Conservation Structures in Kharun Nala-Balod Forest Division

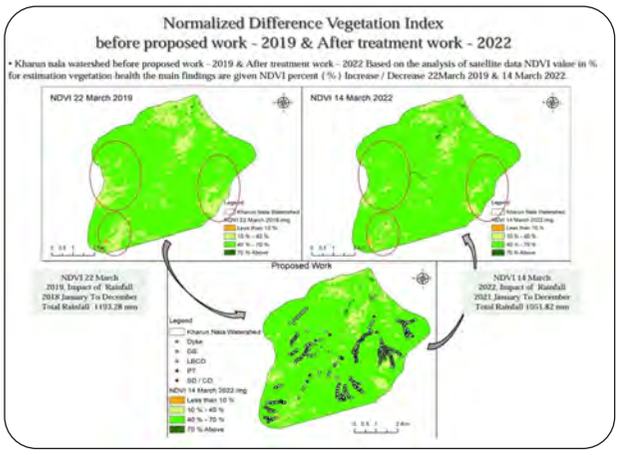
Sr. No	Proposed Work Code	Proposed Work Name	Total
1	LBCD	Loose Boulder Check Dam	382
2	GS	Gabion Structures	16
3	PT	PercolationTank	3
4	CD	Earthen Dam	4
5	Dyke	Dyke	1
Total			406

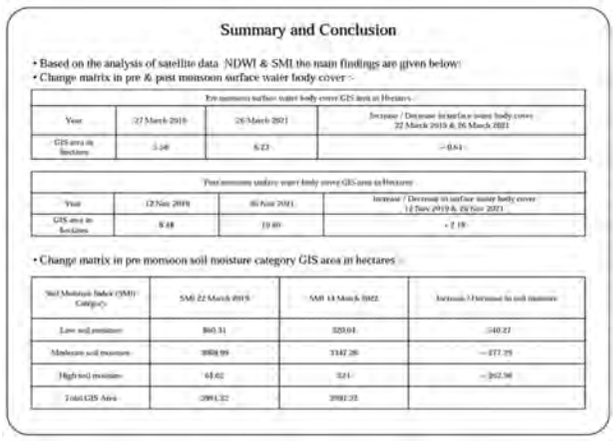










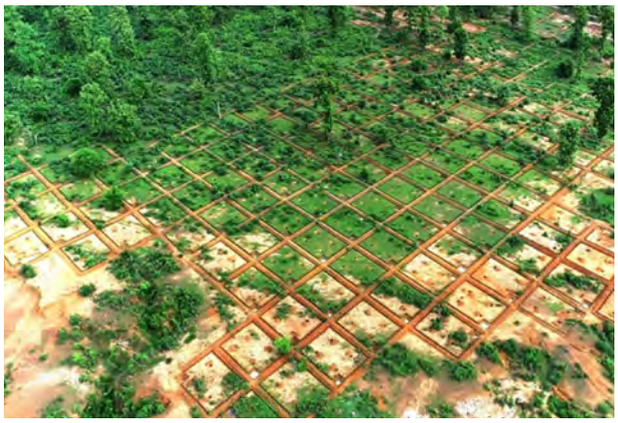


Brush Wood Check Dam

Loose Boulder Check Dam

Staggered Contour Trench

Gabion Structure



30 – 40 Model

Check Dam

Earthen Dam

Tank Construction

2. COMPENSATORY AFFORESTATION WORKS

Compensatory Afforestation:

"Compensatory afforestation" means afforestation done in lieu of the diversion of forest land for non-forestry use under the Forest (Conservation) Act, 1980.

The Compensatory Afforestation Fund Act, 2016:

The Compensatory Afforestation Fund Act, 2016 has been enacted by the Parliament of India. An Act to provide for the establishment of funds under the public accounts of India and the public accounts of each State and crediting thereto the monies received from the user agencies towards compensatory afforestation, additional compensatory afforestation, penal compensatory afforestation, net present value and all other amounts recovered from such agencies under the Forest (Conservation) Act, 1980; constitution of an authority at national level and at each of the State and Union territory Administration for administration of the funds and to utilize the monies so collected for undertaking artificial regeneration (plantations), assisted natural regeneration, protection of forests, forest related infrastructure development, Green India Programme, wildlife protection and other related activities and for matters connected therewith or incidental thereto.

Chhattisgarh CAMPA:

The Chhattisgarh State CAMPA is an authority to be known as the "State Compensatory Afforestation Fund Management and Planning Authority." As per the Compensatory Afforestation Act, 2016 and the Compensatory afforerstation Fund Rules-2018, the Chhattisgarh state CAMPA has been constituted as a Government body under the State Forest Department.

The CAMPA fund in the Chhattisgarh state is being utilized as per the Annual Plan of Operations (APOs) approved by the state Steering Committee based on the provisions laid down in the guideline issued by Government of India, Ministry of Environment & Forests.

Selection of Land for Compensatory afforestation:

The selection of land for Compensatory Afforestation works in Chhattisgarh is done as per the guidelines issued by the Ministry of Environment, Forests and Climate Change (MoEF&CC), Government of India.

The following conditions were adopted for the selection of land for Compensatory Afforestation:

1. Compensatory Afforestation shall be done over equivalent area of non forest land.
2. As far as possible, the non-forest land for Compensatory Afforestation should be identified contiguous to or in the proximity of Reserved forest or Protected forest to enable the Forest Department to effectively manage the newly planted area.
3. In the event that non forest land for Compensatory Afforestation is not available in the same district, non forest land for Compensatory Afforestation may be identified anywhere else in the state / UT as near as possible to the site of diversion, so as to minimize adverse impact on the micro-ecology of the area.
4. Where non forest lands are not available or non forest land is available in less extent to the forest area being diverted, Compensatory Afforestation may be carried out over degraded forest twice in extent to the area being diverted or to the difference between forest land being diverted and available non forest land, as the case may be.
5. The non availability of suitable non forest land for Compensatory Afforestation in the entire state/UT would be accepted by the Central Government only on the certificate from the Chief Secretary to the state/ UT Government to that effect.

Compensatory Afforestation work in Chhattisgarh state:

Compensatory Afforestation work are being done using CAMPA fund in Chhattisgarh since 2009. To implement the Compensatory Afforestation works, site specific detailed project report is prepared as per the norms approved by the State Government and included in the CAMPA Annual Plan of operations (APO) which is finally approved by the National Authority, Government of India, New Delhi. Forests having density less than 40 percent (open forests category) are chosen for the implementation of Compensatory Afforestation works.

To prepare the site specific detailed project, survey is carried out in the forest areas to assess the area availability, forest density, forest type, crop composition, soil erosion status, root stock status, wildlife, water availability for irrigation, invasive species status etc. and sufficient data is collected

by the forest staff for preparation of treatment map. Various maps such as stock map, revised stock map, treatment map, Soil water conservation –drainage line treatment map are prepared and included in the project report. At circle level, Forest Geographic Information System (GIS) centre are functional for providing the technical assistance and GIS layers/data for map preparation.

The Compensatory Afforestation works project is prepared for a period of ten years. As per the site requirements, the Compensatory Afforestation plantations are done with irrigation or without irrigated conditions. For protection of the Compensatory Afforestation plantations, chain link / Barbed wire fencing with RCC cement poles are being done and maintained till completion of the project.

The species for the Compensatory Afforestation works are selected based on the forest type and original Forest crop composition of the plantation site. The species that are commonly planted in Compensatory Afforestation include *Pterocarpus marsupium, Tectona grandis, Terminalia arjuna, Terminalia bellerica, Terminalia chebula, Syzyzium cumini, Mangifera indica, Artocarpus heterophyllus Sterculia urens, Madhuca longifolia, Azadirachta indica, Agele marmelos, Dalbergia sissoo, Ficus bengalensis, Ficus religiosa, Zizyphus sp., Dendrocalamus strictus etc.*

Seedlings are prepared in the Forest Nursery in the respective Forest Division, one year advance to the planting so that tall and healthy plants with adequate collar girth are ready for the plantation works. Generally 6 to 8 feet height seedlings are preferred for planting. Planting is carried out during the month of June-July immediately after the onset of monsoon.

Provision for seedlings casualty replacement is included in the project i.e., during planting year followed by the next year and it is done during July-August. Cultural operations such as weeding, mulching, thinning, cut back operations, fire protection, soil moisture conservation works are carried out as per the provisions given in the project. In case of irrigated plantations, borewell is dug out prior to planting and irrigation pipe lines are laid out in the site. Seedlings are irrigated during the summer season i.e., from February 15th to June 15th.

Fertilizer application is done during monsoon to ensure the growth of the seedlings. To assess the nutrition status of the soil, soil testing is carried out to assess the status of soil organic carbon, Nitrogen, Phosphorus and Potash content and accordingly fertilizer application is done.

Fire lines are created in the Compensatory Afforestation works site and fire watchers are engaged during summer for protection. Also Fire blowers are given to the staff for timely suppression of fire during summer in the Compensatory Afforestation sites.

The villagers and Joint Forest Management Committee members are involved during Compensatory Afforestation works project planning, preparation, execution, protection and maintenance of the plantations. For taking proper care and maintenance of Compensatory Afforestation plantations, Forest staff in the rank of Beat Forest officer, Circle Forest officer is allotted as plantation in-charge. Compensatory Afforestation Plantation Journal is prepared and all the data pertaining to growth parameters, cultural operation information are recorded in the Journal.

Internal as well as external monitoring and evaluation of Compensatory Afforestation works is regularly done by the Forest and Climate Change department staff and third party to assess the status of plantation health. As per the status report given by the monitoring team, the success / failure of the Compensatory Afforestation plantation is evaluated based on the success rate prescribed for each region of the state. Chhattisgarh CAMPA has made Memorandum of Understanding (MoU) agreement with the Tropical Forest Research Institute (TFRI-ICFRE), Jabalpur for external monitoring and evaluation of Compensatory Afforestation works in Chhattisgarh. The external monitoring and evaluation has been completed till the APO year 2014-15 and the work is under progress.

Information/Data pertaining to all the Compensatory Afforestation plantation works that are sanctioned and implemented in the field are entered in the e-green watch portal along with the kml file, site photograph as per the instructions given by the Government of India.

Difficulties in implementation of Compensatory Afforestation works:

1. In many forest land diversion cases, due to long time taken between the in-principle approval and the final sanction for diversion of forest land, many sites which were earlier selected for the Compensatory Afforestation works has resulted in increased forest density, so there is little or no sufficient area for the planting.
2. Under Forest Rights Act (FRA), forest land has been given to the eligible people which were earlier earmarked for the Compensatory Afforestation purpose.

   Hence there is delay in implementation of the Compensatory Afforestation project as new planting site selection takes time for approval by the competent authority.

The details pertaining to the Compensatory Afforestation works in Chhattisgarh are given in the table 1 & 2.

Table-1: Norms prescribed for Compensatory Afforestation in Chhattisgarh (Project period-10 Years)

S.No	Year	Rate per Hectare For Un-irrigated Plantation (in Rupees)	Rate per Hectare For Irrigated Plantation (in Rupees)
1	2009-10	72435.00	254551.00
2	2010-11	79680.00	280006.00
3	2011-12	87648.00	308007.00
4	2012-13	96413.00	338808.00
5	2013-14	106054.00	372690.00
6	2014-15	116659.00	409959.00
7	2015-16	128326.00	450955.00
8	2016-17	155213.00	496051.00
9	2017-18	170735.00	545656.00
10	2018-19	187810.00	600222.00
11	2019-20	206591.00	660244.00
12	2020-21	227250.00	726268.00
13	2021-22	249975.00	798895.00
14	2022-23	274973.00	878785.00

Table-2: Details of Compensatory Afforestation works in Non Forest Land and Degraded Forest Land in Chhattisgarh

Year	Physical Target (ha.)	Achievement for Compensatory Afforestation			
		Non Forest Land (ha.)	Degraded Forest Land (ha.)	Total Area (ha.)	No. of Plants planted
2009-10	7913.319	177.52	4120.332	4297.852	4727637
2010-11	1479.360	86.848	2178.178	2265.026	2491528
2011-12	2086.171	66.196	1902.184	1968.380	2165218
2012-13	5910.145	164.146	4041.060	4205.206	4625726
2013-14	4716.805	10.000	3194.851	3204.851	3140754
2014-15	1626.272	657.799	3227.360	3885.159	3593772
2015-16	6202.484	83.000	3174.299	3257.299	3221468
2016-17	3716.046	0.000	3082.466	3082.466	2432065
2017-18	3674.387	0.000	2326.558	2326.558	2326558
2018-19	967.745	429.179	2263.522	2692.701	2638846
2019-20	180.000	243.660	2572.587	2816.247	2436053
2020-21	593.719	25.600	813.023	838.623	775726
2021-22	1264.488	14.900	450.300	465.200	478868
Total	40330.941	1958.848	33346.72	35305.568	35054219

Seedlings in Forest Nursery for Compensatory Afforestation

Compensatory Afforestation Plantations in Chhattisgarh

Compensatory Afforestation Plantation in Chhattisgarh

3. PINGLA ELEPHANT RESCUE AND REHABILITATION CENTRE RAMKOLA SURAJPUR, CHHATTISGARH

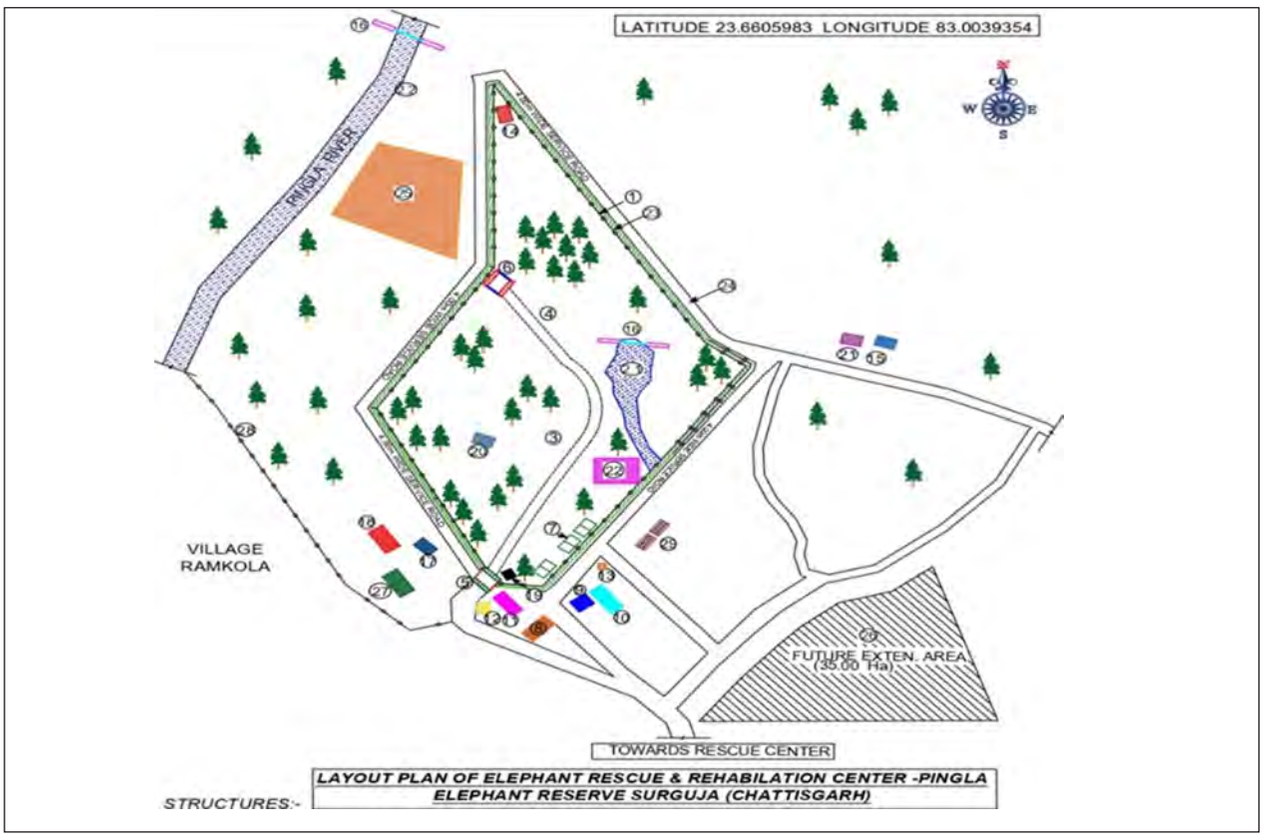
The elephant population in Chhattisgarh has been steadily rising over the years. An increasing number of wild elephants, their long-ranging habits, and fluidic distribution have increased human-elephant conflicts in many districts. Elephants are also getting injured and killed, accidentally or intentionally during these interactions in human habitat areas.

FINANCIAL OUTLAY

Amount (Rs. Lakh)

APO Year	Allotted	Utilized
2017-18	300.00	280.03
2018-19	96.57	88.31
2019-20	118.20	108.97
Total	**514.77**	**477.31**

Chhattisgarh did not have any elephant camp or rescue center. Ministry of Environment, Forests & Climate Change, GoI, in its guidelines for the management of Human.



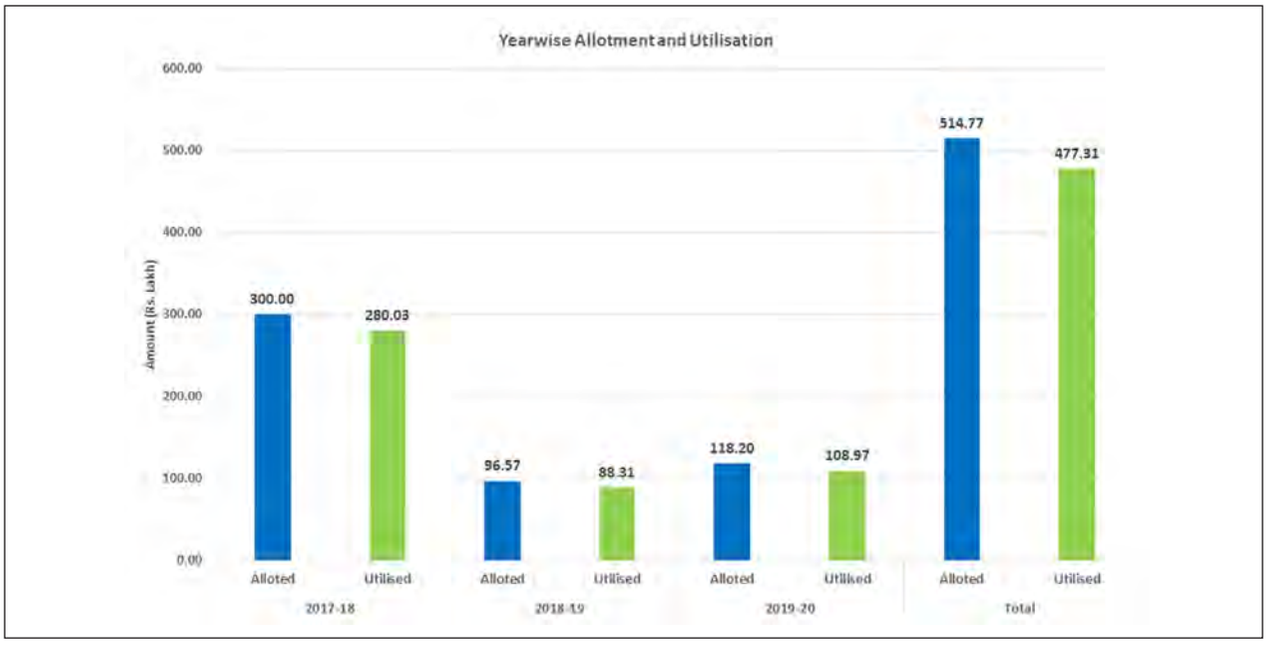
Elephant Conflicts (6th October 2017), had specifically recommended setting up of Elephant Rescue & Rehabilitation Centre in states which have the presence of elephants; while also highlighting the use of Kunki elephants in unmanageable situations as a last resort. Forest department, in anticipation of future requirements there was an urgent need for a dedicated elephant rescue and rehabilitation center, where elephants captured for

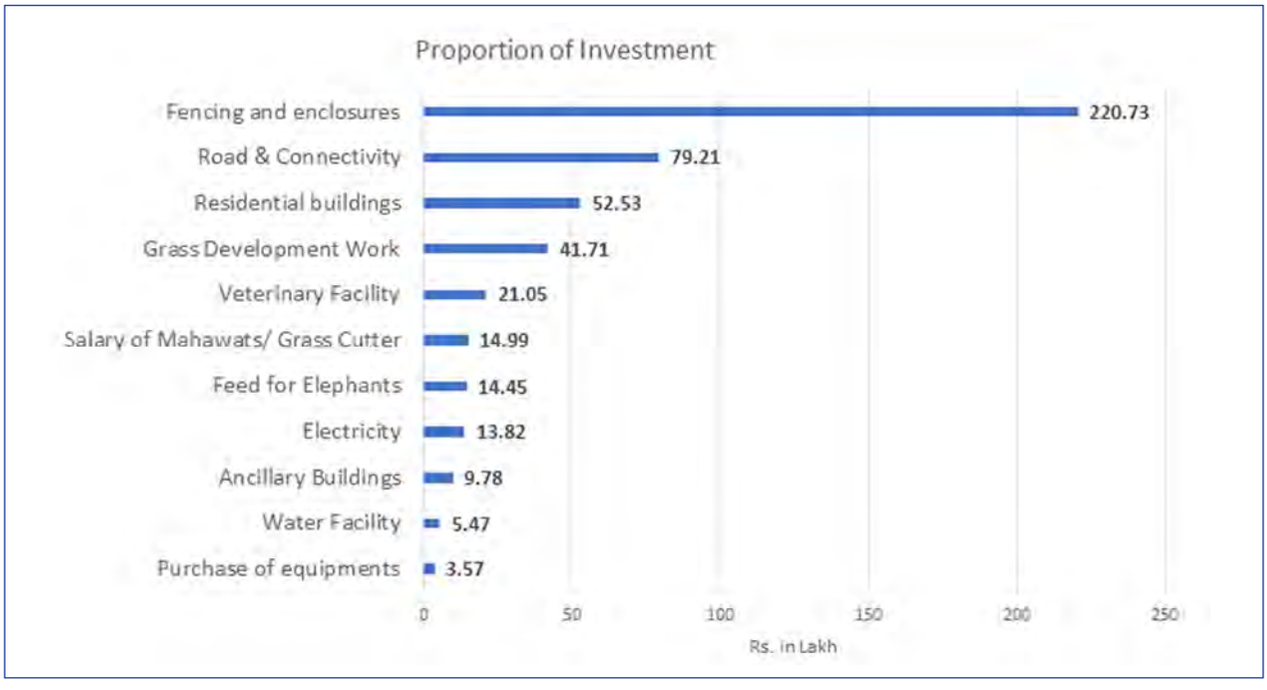
various reasons including injury, orphanhood, etc., can be kept and cared for as per established guidelines. Pingla Elephant Rescue & Rehabilitation Centre is a greenfield project which was initiated in the year 2017-18.

Pingla Elephant Rescue and Rehabilitation Centre, Ramkola has been successfully established through capital investment from CAMPA and is successfully meeting its objectives.

Cost of Investment:

In three APO years i.e. 2017-18, 2018-19, and 2019-20, a total investment of Rs. 514.77 Lakh was made out of which Rs. 477.31 Lakh was utilized (93% Utilisation).





The proportion of Investments in Various Sectors of Work

Investment in Capital & Recurring Expenditure

Investment on capital expenditure was 94% (Rs. 447.87 lakh)

Investment on recurring expenditure was 6%. (Rs. 29.44 lakh)

Detailed Financial Statement

Amount in (Rs. Lakh)

APO Year		2017-18		2018-19		2019-20		Total	
Sl. No.	Work Particulars	Allotted	Utilized	Allotted	Utilized	Allotted	Utilized	Allotted	Utilized
1	Fencing (I-Beam Steel) of campus and enclosures	208.00	200.30	6.70	6.70	6.70	6.70	221.40	213.70
2	Veterinary Unit Building	15.00	14.70					15.00	14.70
3	Residence for Mahawat	20.00	19.56			20.80	20.78	40.80	40.34
4	Residence for Forester			8.05	7.85			8.05	7.85
5	Residence for Forest Guard	10.00	4.34					10.00	4.34
6	Approach Road (Earthen)	42.00	36.60			26.00	22.73	68.00	59.33
7	Storeroom	5.00	4.53					5.00	4.53
8	Basic amenities like bathroom			3.37	2.88			3.37	2.88
9	Grass Development Work			12.30	11.02	34.62	30.69	46.92	41.71
10	Purchase of Generator 82.5 KV			10.00	5.88			10.00	5.88
11	Installation of Solar Street Light			8.00	7.94			8.00	7.94
12	Veterinary Equipment, Deep Freezer			6.45	6.35			6.45	6.35
13	Solar Fencing			8.00	7.03			8.00	7.03
14	CCTV Installation			0.85	0.85			0.85	0.85
15	Construction of Kitchen Shed			2.85	2.37			2.85	2.37
16	Construction of Water Tank					4.08	2.48	4.08	2.48
17	Construction of Causeway					20.00	19.88	20.00	19.88
18	Purchase of equipment					3.00	2.72	3.00	2.72
19	Silt removal in stop dam					3.00	2.99	3.00	2.99
22	Salary of Mahawats/ assistants			15.00	14.99			15.00	14.99
23	Feed for Elephants			15.00	14.45			15.00	14.45
Total		**300.00**	**280.03**	**96.57**	**88.31**	**118.20**	**108.97**	**514.77**	**477.31**

Present Operational Status:

Pingla Elephant Rehabilitation Centre, Ramkola spreads over an area of 56 hectares and at present has 2 male elephants which have been rescued from the wild.

The details of rescued elephants are as in the table below:

Sl.No.	Name of Elephant	Gender	Age	Contribution
1	Civil Bahadur	Male	About 60 years	Captured from wild
2	Sonu	Male	About 15 years	Captured from wild

In addition, the center also houses 2 female and 3 male Kunki elephants that were brought from Karnataka.

The details of **Kunki elephants** are as in the table below:

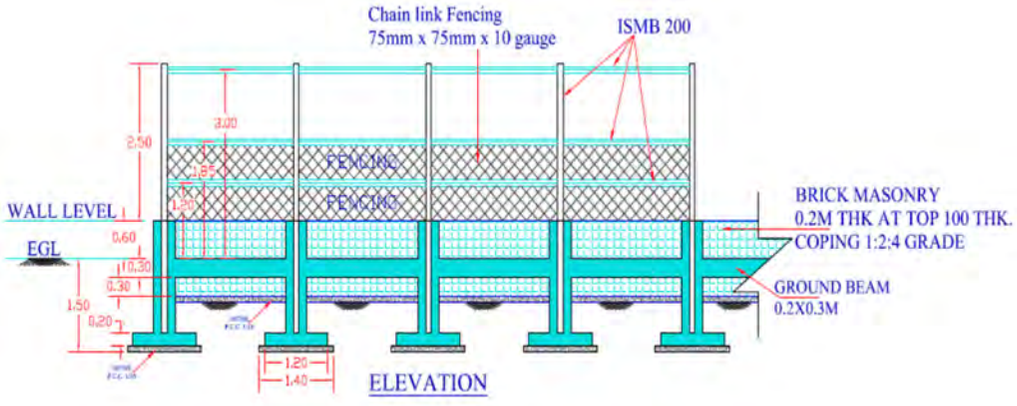
Sl.No.	Name of Elephant	Gender	Age
1	YogLakshmi	Female	About 20 years
2	Ganga	Female	About 27 years
3	Tirathram	Male	About 40 years
4	Parshuram	Male	About 20 Years
5	Duryodhan	Male	About 37 Years

Kunki elephants are deployed in various operations such as

1. Radio-collaring exercises
2. Rescue
3. Human-elephant conflict management
4. Training & capacity building
5. Patrolling

ASSETS CREATED:

1. **I-Beam Steel Structure Security Fencing:** All the elephants are maintained on a campus which is fenced by I-beam steel structure; fortified by solar fencing (distract wild elephants) and wire net fencing (prevent entry of small animals/ Snake). The total fenced area is about 4.80 hectares. Sufficient space is available in the fenced campus where the elephants are kept when the weather conditions are pleasant. At least 20 elephants can be accommodated in the centre.



2. Elephant Sheds: Within the fenced campus, three double-cabin large I-Beam enclosures have been constructed with roofing for housing the elephants. Sufficient space is available in the fenced campus where the elephants are kept when the weather conditions are pleasant. Around 10 elephants can be accommodated in the roofed enclosure.

- No. of Shed : 3
- No. of Cells per Shed : 2
- Cells : 6.00 m X 8.00 m
- Height : 5.50 m

3. Veterinary Section: The Rescue Centre caters to the need for health care management of elephants in captivity. There are basic facilities in the center. Veterinary medicine, which includes emergency supplements, medicines, antibiotics, analgesics, antihistamines, anthelmintics, dressing materials, and nutritional supplements is kept in the Rescue Centre. Surgical, diagnostic, and other equipment are available in the centre.

4. Fodder plot: All 7 elephants (rescued & Kunki) are taken to the nearby forests in the morning for exercise and foraging. Irrigated Fodder Plots & Unirrigated Fodder Plots have been developed in areas outside the enclosure. In irrigated fodder plots, high-yielding variety grass is cultivated and rotational cutting is practiced for feeding elephants in the evening.

5. Water Supply Section: There are 5 bore wells in the center. The center has 24hrs water supply through the overhead reservoir and a network of the pipe system. The existing water body has been renovated to cater to the water needs of elephants and also for the irrigation of fodder plots.

6. Ancillary Buildings, Security & Electrification: Storeroom, kitchen shed, and utility amenities have been constructed. High mast solar lights and CCTV have been installed for 24 hours security monitoring. One security watch tower and CC Road on the residential campus have also been constructed.

Residential Buildings:

Residential facility has been developed for Forester, Forest Guard, 16 Mahawats/ Assistant Mahawats, and other staff who are on 24 hrs duty in the center.

7. Road & Connectivity: All weather road (Mitti-Muroom) with causeway/Rapta has been constructed in and around the area for accessibility purposes as it requires movement of both heavy and light vehicles.

BENEFITS & CONTRIBUTION OF PINGLA ELEPHANT RESCUE & REHABILITATION CENTRE, CHHATTISGARH

1. Care & Management of Rescued Elephants: Two male elephants that have been rescued from different parts of Chhattisgarh is been cared for and managed in the centre.


2. ReContribution Centre for Operations: The center has become the logistic center for rescue operations, scientific research, and human-elephant conflict management.

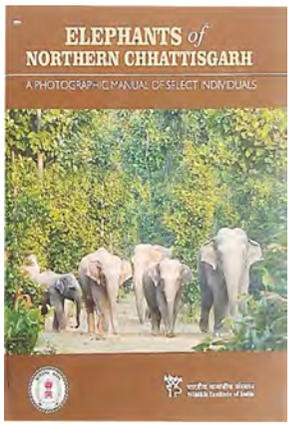
3. Radio-Collaring Exercises: Earlier, trained elephants and human personnel had to be Contributiond from other states for any major operation. Since the establishment of the center, that dependency has decreased significantly and about 90 % of personnel actively involved in such operations are from Chhattisgarh.

4. Management of Human-Elephant Conflict Situations: Active Management of a herd of about 30 elephants to prevent it from entering Ambikapur City: The herd of the elephant has reached the vicinity of Ambikapur City limits. It required active close management of wild elephants to prevent untoward incidents for both humans and elephants.





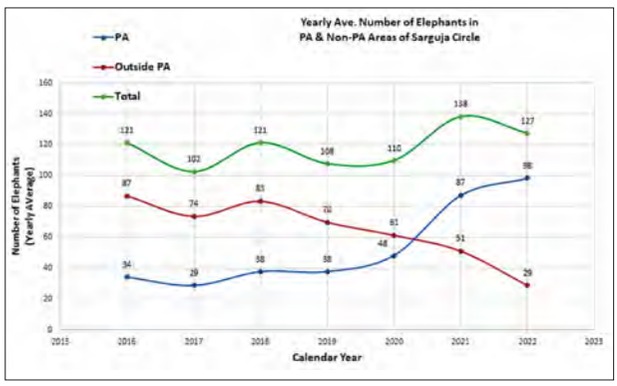
5. Research & Documentation: The reContributions of the center have been instrumental in research and documentation carried out by the department in collaboration with the Wildlife Institute of India. About 37 elephants have been identified, their images captured and morphological characteristics defined. Radio-Collar data of 10 elephants have been obtained between 2018-22 to study and monitor wild elephants.

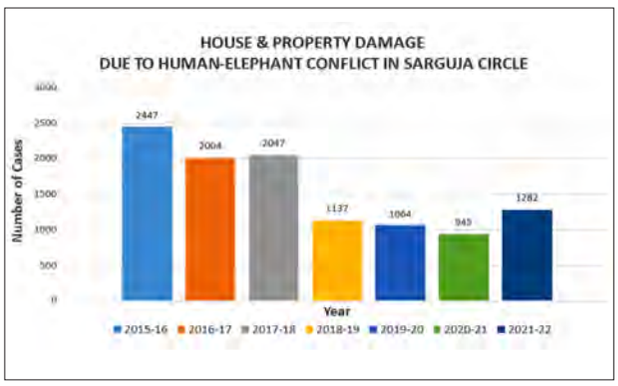


6. Rescue Operation of Elephants in Suspected Poisoning Case: In 2021, a distress call was received on suspected poisoning by Organo-Phosphate pesticides. Prompt action by the personnel of the centre, followed by medication helped in the recovery of two wild elephants.

7. Capacity Building: Developing good trackers is key to human-elephant conflict management. They are the people who track elephants, approach the elephants, and are the first ones to encounter elephants before any further action is taken. The center is being developed as the nodal institute for trackers, hathi-Mitra dal members, and forest officials. In Sarguja, we presently have more than 50 good trackers at present and the goal is to increase that number to about 100 in the next few months.

8. Human–Elephant Conflict Management: The establishment of the center has enabled the department to change the approach of human-elephant conflict management from active to pro-active management. Daily monitoring of wild elephant herds and availability of human reContributions, technical know-how, and having a dedicated center has greatly helped in the day-to-day management and crisis response. The center is the most important center for short and long-term management of wild elephants, especially in Northern Chhattisgarh. Knowledge acquired from the center has also helped in management planning. Strategic intervention in habitat improvement in some areas has been able to attract wild elephants into protected areas, resulting in decreased instances of elephants venturing into non-protected areas. This has also probably decreased number of cases related to house damage over the past few years.





Conclusion: Chhattisgarh forms part of the Chhota-Nagpur Plateau, which is home to about 3000 wild elephants. Conservation of elephants will require effective management of human-elephant conflict. Chhattisgarh State CAMPA has made a maximum of capital investment and also bore recurring costs in the first year of establishment. Without the support from Chhattisgarh State CAMPA, it would not have been possible to establish such a center; and in such a short time. Pingla Elephant Rescue & Rehabilitation Centre has become an important reContribution hub not only in our strive to achieve conservation goals, but also in formulating strategies and plans. It has duly established itself as an important part of the ecosystem of elephant conservation. In its success, we hope to see new possibilities; its continued pursuit of success will be critical in the conservation and management of elephants, especially in Northern Chhattisgarh.

4. REMOVAL OF INVASIVE SPECIES FOR FOREST QUALITY IMPROVEMENT, PRODUCTIVITY ENHANCEMENT

Invasive species is a species that is non-native to the ecosystem under consideration and may cause environmental damage to the ecosystem.

The invasive alien species has high dispersal rate, wider adaptability and prolific growth. Due to its invasion many native/indigenous plants / palatable grasses has become locally extinct. As a result the grazing lands area has been reduced drastically as well as the quantity and quality of the fodder reContributions is reduced. The encroachment of the landscape by invasive alien species is causing decline in the productivity of forests, wildlife, agriculture, livestock and fish, leads to loss of biodiversity. It also causes local migration of the wildlife, cattle population, thus creating competition and pressure on the natural reContributions. Due to overgrazing in the available grazing lands, the native palatable grasses are unable to complete its reproductive phase and hence replaced by non palatable grasses / weeds.

Restoration of the Invasive alien species infested landscape is of utmost importance to sustain the ecological processes and functions so that the ecosystem services are maintained for perpetuity.

There is need to assess the extent of various Invasive alien species infestation in various landscape of Chhattisgarh. Appropriate restoration project in the affected landscape need to be prepared and implemented involving technical experts and scientific institutions in this field. The restoration project will be helpful to create a resilient landscape.

Invasive species in Chhattisgarh:

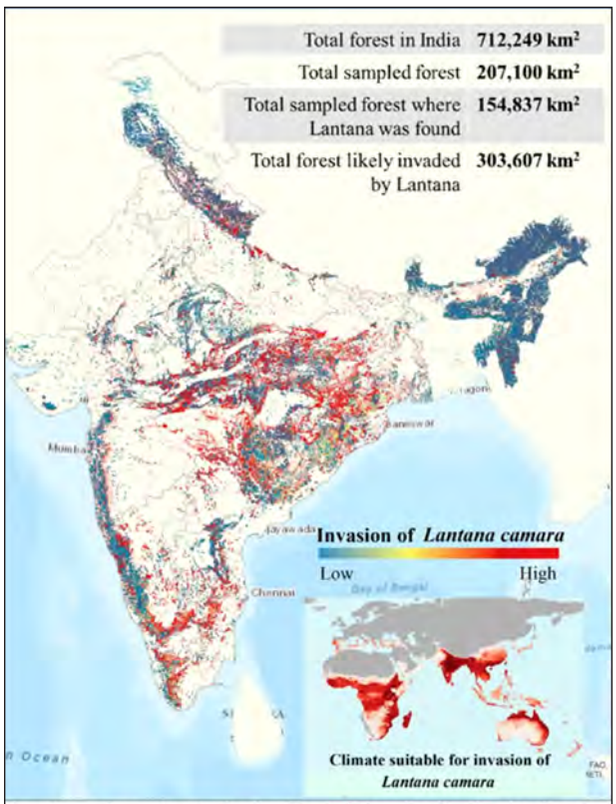
Invasive alien species are fast invading in various forest and agricultural landscape in the state of Chhattisgarh. Invasive alien species include *Lantana camara*, *Parthenium* sp., *Eupatorium* sp., *Ageratum* sp, *cassia* sp., Water hyacinth etc. These plants are commonly known as “weeds”. The Invasive alien species has infested terrestrial landscape as well as various wetlands in the Chhattisgarh.

Assessment of major invasive species inside the forest areas in the state of Chhattisgarh and their extent of area has been done by the Forest survey of India (FSI) (State of Forest Report 2021) and the details are given in the table 1.

Table-1: Major Invasive Species in Chhattisgarh

S.No.	Name of the species	Estimated extent (in sq.km)
1	*Lantana camara*	728
2	*Ageratum conyzoides*	495
3	*Cassia tora*	333
4	*Triumfetta rhomboidea*	200
5	*Chromolaena odorata*	183

*Recorded Forest Area (RFA) in the Chhattisgarh State is 59,772 sq. km.



Lantana invasion in India. Red dots signify the highest density of lantana and blue signifies the least density. The world map on the bottom right shows the suitable area for lantana invasion, based on Mungi et al 2020. Image courtesy Ninad Mungi.

Lantana camara:

Lantana camara belongs to the family Verbenaceae and it is a light demanding species which easily invades the open areas. Among the various invasive plant species, Lantana camara has highest infestation in the forest areas of Chhattisgarh. The invasion of Lantana camara

in Chhattisgarh forest areas has severely affected the regeneration of native plant species. Ministry of Environment, Forests and Climate Change (MoEF&CC), Government of India has included the removal of Lantana camara invasive species in the priority list to improve the forest density in forest areas and to conserve the Biological Diversity.

Problems due to invasive species in forest areas Chhattisgarh

- Decline in the forest productivity
- Low regeneration of indigenous tree species due to non availability of space and light
- Increase in forest fire hazard
- Reduced grazing land and habitat for wildlife / local migration of wildlife
- Local extinction of plant species

Approach

To assess the extent of *Lantana camara* and other invasive species infestation in Forest areas in Chhattisgarh, Baseline survey has been carried out where grids were laid out to enumerate the population density of *Lantana camara* and other weeds. Based on the information / data collected from the field survey, as well as respective territorial Forest division working plan data / Wildlife management plan of Protected Areas and Forest Survey of India Report on major invasive species in Chhattisgarh, the area under infestation by *Lantana camara* and other weeds has been assessed for preparation of Detailed Project Report.

Preparation of Detailed Project Report (DPR)

For removal of *Lantana camara*, the DPR is prepared for a period of three years. As per the norms approved for the removal of *Lantana camara* in the forest areas, site specific projects are prepared and sanctioned by the competent authority and the works are being carried out in the field.

Table-2: Norms prescribed for removal of *Lantana camara* in Chhattisgarh

Working Year	Dense Area (More than 2500 *Lantana camara* plants per hectare)	Moderately Dense Area (1001 to 2500 *Lantana camara* plants per hectare)	Open Area (Less than 1000 *Lantana camara* plants per hectare)
First Year	32 Man Days per hectare	22 Man Days per hectare	14 Man Days per hectare
Second Year	10 Man Days per hectare	4 Man Days per hectare	2 Man Days per hectare
Third Year	3 Man Days per hectare	2 Man Days per hectare	-
Total	45 Man Days per hectare	28 Man Days per hectare	16 Man Days per hectare

Lantana camara removal method:

Manual uprooting and Cut Root Stock methods are being adopted for removal of *Lantana camara* in Chhattisgarh forest areas. After uprooting / lifting, the *Lantana camara* is removed from the original site and placed upside down to prevent contact of roots to the ground and prevent further invasion.

The removal of *Lantana camara* is carried out based on the ridge to valley approach i.e. the *Lantana camara* uprooting starts from the ridge areas (Hill side) of the forest and then proceed towards the valley side (plain area). This is done to prevent the seed dispersal and germination of *Lantana camara* from ridge to valley area due to gravity, wind, water.

As per the provisions in Chhattisgarh CAMPA Annual plan of operations 2018-2019 to 2020-2021, *Lantana camara* has been removed in 440814 hectares of territorial forest division & Protected Areas (National Parks, Sanctuaries) of Chhattisgarh. Removal of *Lantana camara* in these areas has resulted in adequate Forest regeneration and improvement in forest quality. Also grasslands / Pastures have been developed in the *Lantana camara* removed areas. The details of *Lantana camara* and other invasive species removal in Chhattisgarh Forest areas are given in the table 3 &4.

Chhattisgarh CAMPA has signed Memorandum of Understanding (MOU) with Tropical Forest Research Institute (TFRI –ICFRE), Jabalpur and Directorate of weed Research (DoWR) for impact assessment of *Lantana camara* removal works in Forest areas of Chhattisgarh and the evaluation is under progress.

Outcome of the Invasive species removal project:

The area treated during APO year 2018-19 and 2019-20 amounting to 113675 hectares in now ready for plantation, fodder / pasture development, medicinal plants plantation, assisted natural regeneration and other habitat development works. In the protected areas (National park, Sanctuaries), grasslands /pastures have been established as a result, the herbivores density has been increased significantly. Also adequate regeneration of indigenous species has been observed in the invasive species eradication areas.

Table-3: Invasive species-*Lantana camara* eradication work in Chhattisgarh

S.No.	APO Year	Proposed		Sanctioned		Achievement	
		Physical (in ha)	Financial outlay-Amount (in lakh)	Physical (in ha)	Financial outlay-Amount (in lakh)	Physical (in ha)	Expenditure Amount (in lakh)
1	2018-19	52936.54	2913.56	35900.10	2690.17	35900.10	2664.80
2	2019-20	79448.97	6864.39	77775.73	6642.68	77775.73	6245.57
3	2020-21	126468.40	10604.30	148091.44	9806.07	148091.44	9669.58
4	2021-22	185375.84	14760.89	179047.05	14349.00	179047.05	13656.00
	Total	**444229.75**	**35143.14**	**440814.32**	**33487.92**	**440814.32**	**32235.95**

Table-4: Invasive species-*Eupatorium* eradication works in Chhattisgarh

S.No.	APO Year	Proposed		Sanctioned		Expenditure Amount (in lakh)
		Physical (in ha)	Financial outlay-Amount (in lakh)	Physical (in ha)	Financial outlay-Amount (in lakh)	
1	2021-22	97884.35	5160.46	93636.36	5007.25	4614.07

Lantana camara eradication work

Contribution: Chief Executive Officer, Compensatory Afforestation Fund Management and Planning Authority, Chhattisgarh, AMPA Government of Chhattisgarh Forest & Climate Change Department

NCT OF DELHI

MAJOR ACTIVITIES

Introduction

Compensatory Afforestation Fund Management and Planning Authority (CAMPA) funds are meant to promote afforestation and regeneration activities as a way of compensating for forest land diverted to non-forest uses. Funds received from the user agencies towards compensatory afforestation, additional compensatory afforestation, penal compensatory afforestation, net present value and all other amounts recovered from such agencies under the Forest (Conservation) Act, 1980 are deposited in the CAMPA fund.

These funds are then utilised for creation and maintenance of Compensatory Afforestation, improvement of wildlife habitat, creation of infrastructure for wildlife rescue, carrying out soil moisture conservation works, undertaking forest protection activities etc.

The Delhi state CAMPA has over the years undertaken many activities as per approved Annual Plan of Operations (APOs) under the CAMPA fund for improvement and enhancement of forest areas along with mandatory compensatory afforestation. Brief photographic representation is as below:

Compensatory Afforestation Activities

Compensatory Afforestation is undertaken by the State CAMPA over land provided by the User Agencies against diverted forest land as per provisions of Forest (Conservation) Act, 1980. The plantations are preferably undertaken during monsoon season to ensure their optimal growth and survival. The maintenance of the plantations is done for 10 years as per the guidelines of MoEF&CC, GoI.

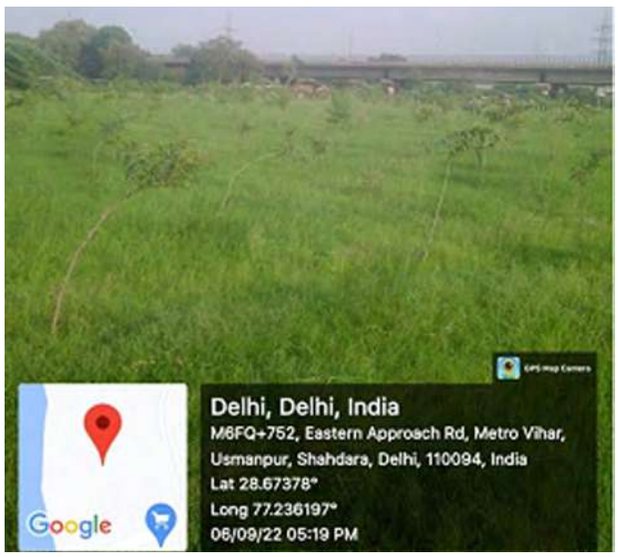
The Department makes efforts to ensure that plantations of species native to the Delhi ridge area are taken up and monoculture is avoided. Proper post-plantation care measures like timely watering, weed removal etc. are taken up to ensure survival of maximum number of plants.

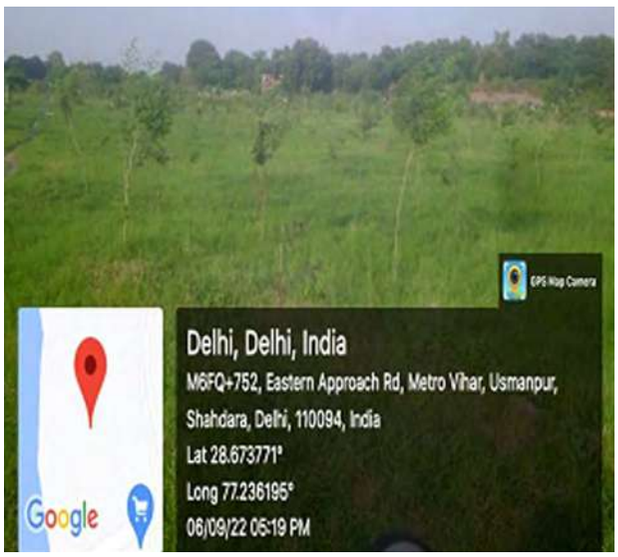
1. Compensatory Afforestation undertaken in area – 8.354 ha in the year 2015-16

2. Compensatory Afforestation undertaken in area – 1.81 ha in the year 2020-21

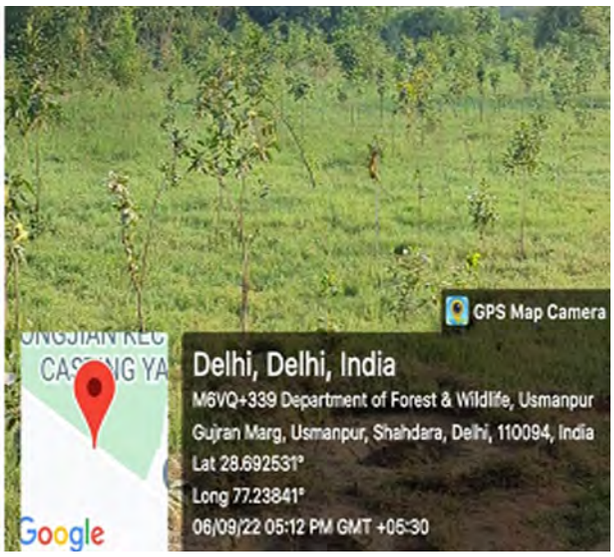
3. Compensatory Afforestation undertaken in area - 4.85 ha in the year 2021-22

4. Compensatory Afforestation undertaken in area – 4.3 ha in the year 2021-22



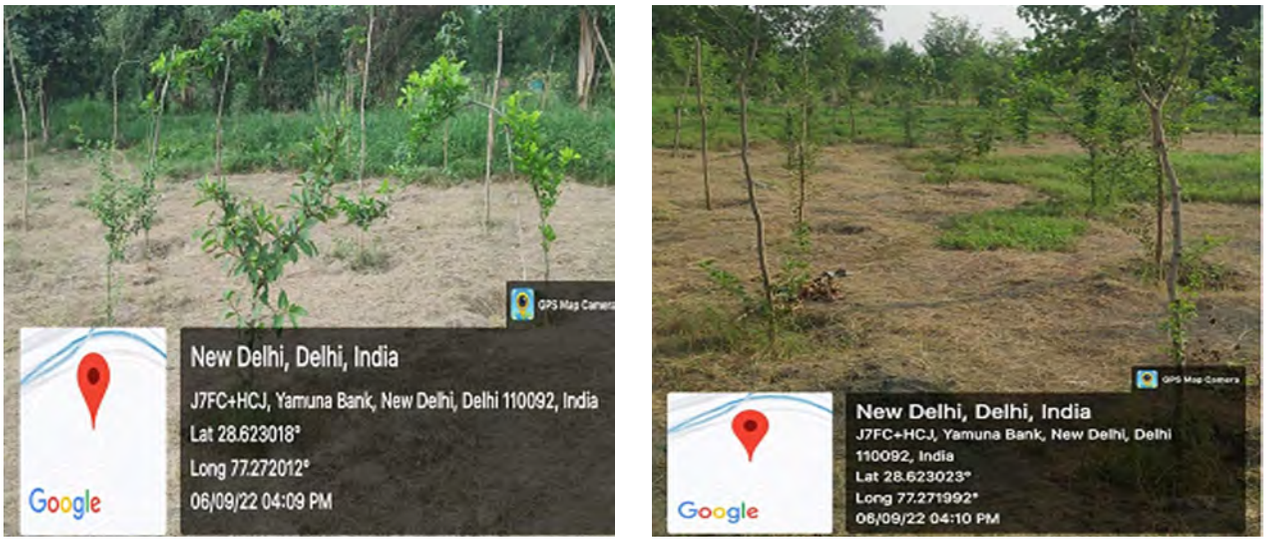


5. Compensatory Afforestation undertaken in area – 5.3 ha in the year 2021-22



6. Compensatory Afforestation undertaken in area – 6.13 ha in the year 2021-22

7. Compensatory Afforestation undertaken in area – 35.73 ha in the year 2020-21



8. Compensatory Afforestation undertaken in area 22.51 ha in the year 2022-23

9. Removal of weeds (*Lantana* sp.)

Soil Moisture Conservation Work

The main objective of soil moisture conservation is to minimize the amount of water lost from the soil. Preserving soil moisture is an important means to maintain the necessary water for adequate growth of plants. The department has undertaken works like creation and rejuvenation of water bodies, plantation of grasses on banks of water bodies, construction of check dams etc. for soil moisture conservation. Some of the works have been completed and some are under process.

1. Creation and rejuvenation of water bodies

2. Plantation of grasses (Lemon grass, Rat tail grass, Indian doab, Needle grass, Grader grass etc.) undertaken on the banks of water bodies

Modernisation of Forest Nurseries

Nurseries form an important part of Forest management. Saplings of native species indegenous to the Ridge such as *Butea monosperma, Arjuna terminalis, Aegle marmelos, Acacia catechu, Cassia fistula,* are grown by the Department in these Forest Nurseries. These saplings are then supplied for departmental plantation and also distributed free of cost to citizens.

Modernisation of forest nurseries has been undertaken through CAMPA fund by development of polyhouse, green house, pucca mother bed, sprinkled irrigation system and vermicomposting unit.

1. Brar Square Nursery

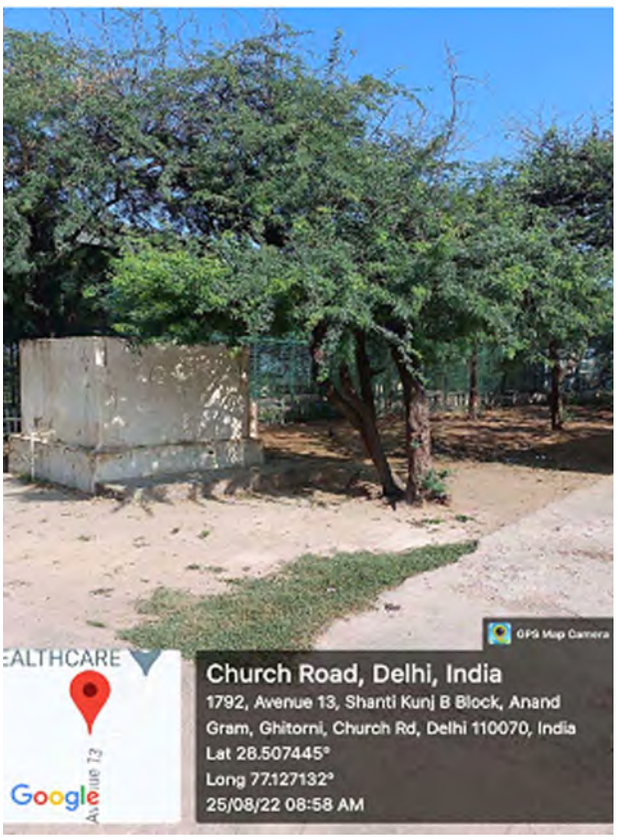
Wildlife Conservation and Management

Continuous efforts are being taken by the Department for improvement of wildlife habitat and conservation of wildlife. This is important in view of the large number of animals who are injured due to electric shocks, road accidents and straying into human habitations. Major initiatives include development and management of transit rescue centre, engagement of animal handlers, purchase of animal ambulances etc. In order to enhance the wildlife conservation and management it is also proposed to undertake research in the ASola Bhatti Wildlife Sanctuary for documentation of biodiversity richness and species inventorisation

1. Development and management of transit rescue centre

CAGE 1

CAGE 2



2. Animal Ambulances

Contribution: Chief executive Officer, Government of NCT of Delhi, Department of Forest and Wildlife

GOA

1. DEVELOPMENT OF BIODIVERSITY PARK AT MOLLEM

1. Goa is small state with about 68 % of its geographical area [GA] under Green Cover as per India State of Forests Report -2021 of Forests Survey of India, MoEF&CC, Government of India. About 20% GA of the state, entire eastern boundary with Karnataka and Maharashtra have been notified as Protected area including six wildlife sanctuaries and one National Park. Government is committed for the protection and conservation of its biological reContribution and diversity.

2. Goa Forests Department is carrying out scientific and sustainable management of its forests and wildlife. In this series for Biodiversity conservation their protection, education, research and awareness generation amongst masses a project for setting up of a Biodiversity Park in the state was initiated in year 2019.

3. Biodiversity is the variety and variability among living organisms including terrestrial, marine and aquatic ecosystems and the ecological complexes. This includes diversity within species, between species and of ecosystem. It forms the foundation of the vast array of ecosystem services that critically contribute to all human beings. Biodiversity is important in human managed as well as natural ecosystems. It is the foundation of ecosystem services to which mankind is intimately linked.

4. Due to various climatic and anthropogenic factors, there is always a constant threat to biodiversity. Loss of biodiversity not only reduces the availability of ecosystem services but also decreases the ability of species, communities, and ecosystems to adapt to changing environmental conditions. Therefore, in order to conserve biodiversity, various conservation measures are undertaken. One of the important biodiversity conservation measures is establishment of a Biodiversity Park.

5. Biodiversity Park is a unique landscape of wilderness that harbour natural heritage of area and have conservation, educational and cultural values and enhance the quality of environment in urban & rural centres. The underlying principle of the Biodiversity Park is to recreate self-sustaining ecosystems with native flora and fauna characteristic of the area for enhancing the quality of urban environment.

6. Objectives of Biodiversity Park:

   a. To conserve the genetic stock available at the existing site of the park.

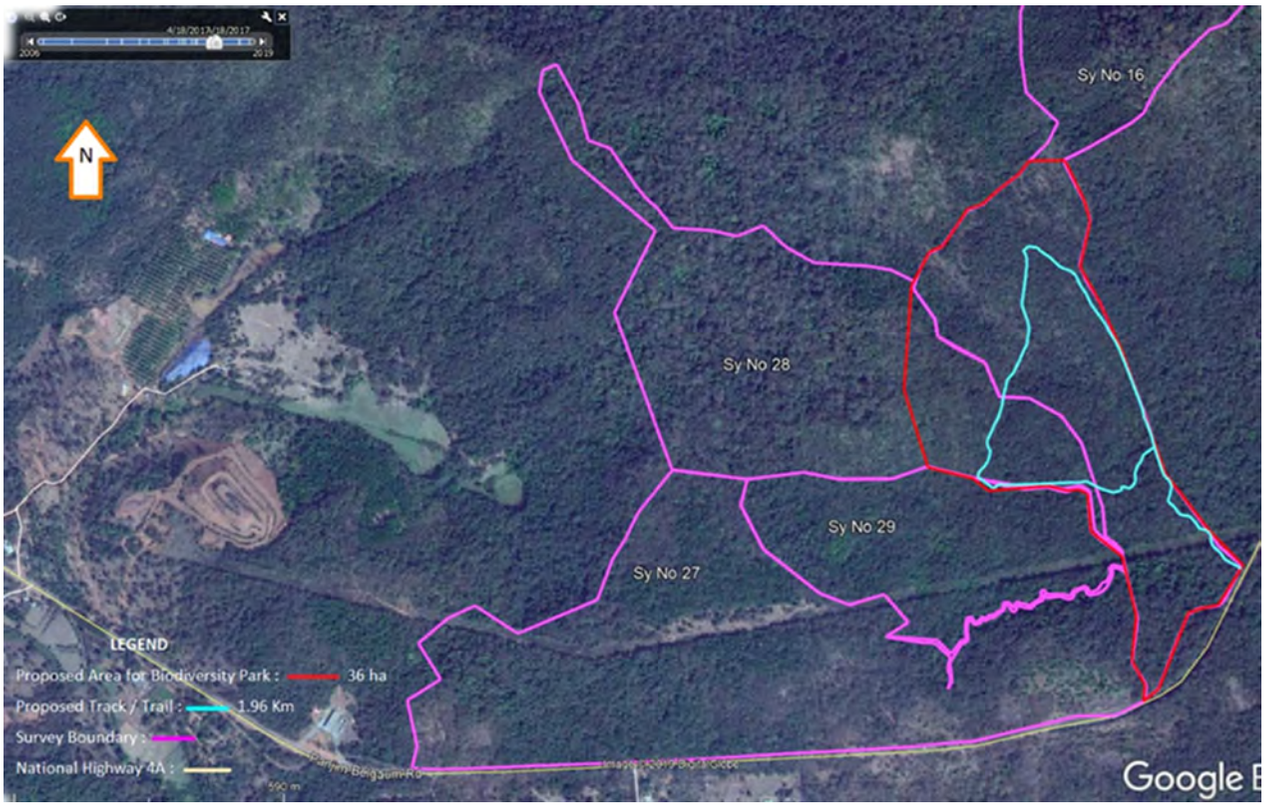
   b. To plant rare, threatened and endangered plant species of Western Ghats.

   c. To act as a research area for students and researchers in order to understand the biodiversity of Goa and the local ecosystem.

   d. To establish an area for public awareness and environmental education.

   e. Livelihood and gainful employment opportunities to local people.

7. The provision of fund for the Biodiversity Park project have been made from the State Government fund as well as under CAMPA. As per Section (6) (b) of Compensatory Afforestation Fund Act, 2016 “the monies 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”. Further, as per Rule 5 (2) (m) of Compensatory Afforestation Fund Rules 2018 monies received towards Net Present Value [NPV] and penal NPV deposited in State Fund will be used for certain permissible activities for forest and wildlife management in the State including “**Management of Biological Diversity and Biological ReContributions”** under Rule (5) (2) (m) various works approved in CAMPA APO of the FY 2020-21 & 2021-22 have been taken up for development of Biodiversity Park at Mollen in Goa.

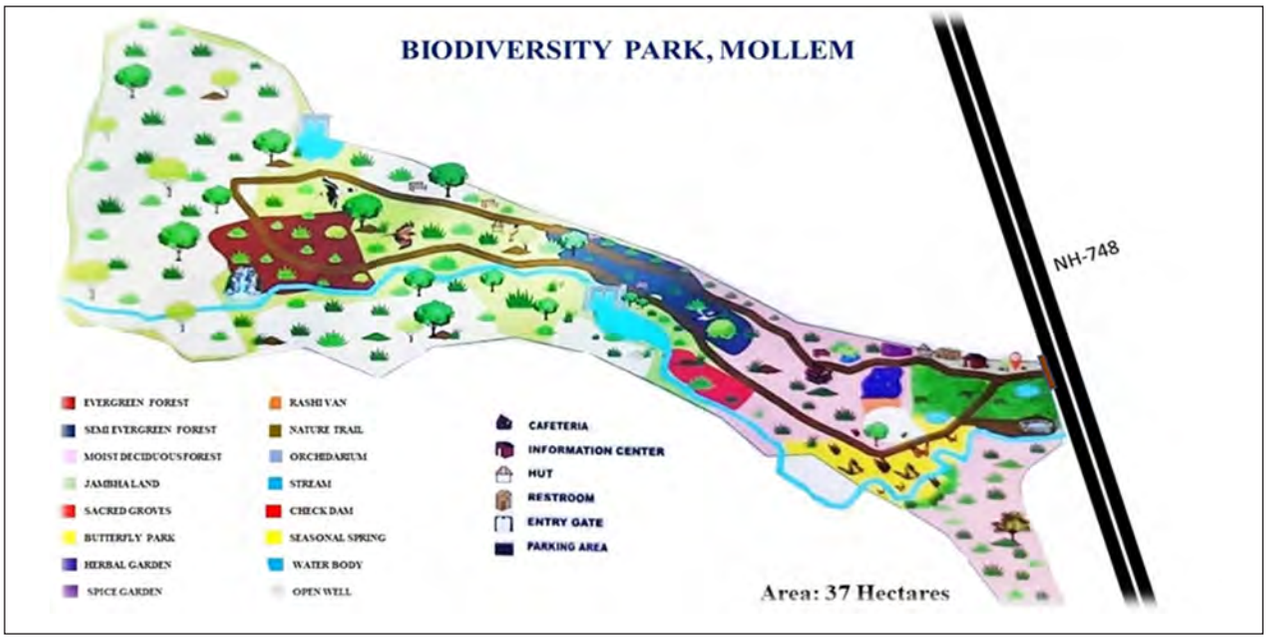


8. **Location:** GPS Coordinates
Latitude: 15°21'50.27"N: Longitude: 74°12'0.53"E

9. An area of about 37 ha in Mollem village, Dharbandora Taluka of South Goa District (falls in jurisdiction of North Goa Forests Division) was identified as a potential and suitable site for being developed as Biodiversity Park. Nestled in the foothills of the Western Ghats. The site is just adjacent to National Highway 4A. The Biodiversity Park, site at Mollem abounds with the natural beauty in the form of distinct flora and fauna. Park site has diverse varieties of flora in various forest types including -Evergreen Forests, Semi-Evergreen Forests, Tropical Moist Deciduous Forests. According to Botanical survey carried out by Goa University researchers around 100 floral species including trees, shrubs, ferns, grass, climbers, herbs and bamboos are found. *Xylia xylocarpa (*Jambha), *Tectona grandis* (Teak), *Terminalia* spp., *Dillenia pentagyna* (Karmal), are the main tree species of the park. Apart from these parks beholds many other tree species like *Lagerstroemia lanceolata* (Nano), *Tamarindus indica* (Chinch), *Garcinia indica* (Kokum), *Ficus* spp., *Mangifera indica* (Mango), *Syzigium cumini* (Jambal), *Alstonia scholaris*, *Dalbergia sissoo* (Sissoo), *Careya arborea* (Kumbh), *Butea monosperma* (Palas), *Mimusops elengi* (Aovala), *Diospyros* spp., *Mallotus* spp., *Ziziphus* spp., *Pongamia pinnata* (Karanj), *Strychnos nux-vomica* (Karo) etc. The *Strobilanthes* (Karvi) a widespread shrub that constitutes the undergrowth of vast stretches of the park here; this abundant shrub, while visible all through, even as dry stalks during summer, is most flamboyant when it blooms once after every seven years. Floral inventory of Biodiversity Park is at **Annexure A**

10. **Layout Plan:** In order to showcase the diverse varieties of flora native to the Western ghats the entire park area have been divided and developed as separate sections as per suitability of site. Following sections including public amenities and eco- tourism have been developed in the park:

a. Moist mixed deciduous forests section
b. Semi-evergreen forests section
c. Evergreen forests section
d. Medicinal Garden
e. Spice Garden
f. Rashivan
g. Orchidarium
h. Butterfly Park
i. Bambusetum
j. Fernarium
k. Cactus section
l. Water bodies
m. Eco Tourism
n. Public Amenities



(a) Moist Mixed deciduous forests section [3B/C2]: This is the main forest type, found in Goa. Predominant species to represent this forests type is planted like -Terminalia crenulata, *T. belerica, T. paniculata, Lagerstroemia parviflora, Adina cordifolia, Albizia lebbeck, A. procera, Mitragyna parvifolia, Holoptelia integrifolia, Trewia nudiflora, Dillenia pentagyna, Semicarpus anacardium, Mallotus philippensis* and *Stereospermum colais* etc.

(b) Semi-evergreen forests section [2A/C2]: This section is being developed by plating related species like *Artocarpus hirsutus, A. gomezianus, Calophyllum sp., Sterculia guttata, Kydia calycina, Lagerstroemia microcarpa, Pterospermum diversifolium, Garcinia indica, Diospyros montana* and *Macranga peltata* etc.

(c) Evergreen forests section [1A/C4]: This type of forests occurs in deep gorges and depressions and also along the nallahs and streams in various parts of Goa. This section is also being developed by plating related species like *Calophyllum calaba, Garcinia gummigutta, Canarium strictum, Lophopetalum wightianum, Myristica* sp., *Knemaat tenuata, Chroisophyllum acuminata, Palaquium ellipticum, Artocarpus gomezians, Diospyrus ebenum, Mangifera indica, Persea macrantha, Mimusops elengi, Hopea ponga, Olea dioica, Hydnocarpus pentendra, Syzygium cumini, Holigarna arnotiana, Litsea coriacea, Mallotus philippensis, Ficus* sp. *Osmunda regilis* etc

(d) Medicinal Plan Garden: Goa is home to diverse varieties of medicinal plants. About 100 beds of Herbal/Medicinal plants having collection of rare and endangered medicinal plants of the country and especially Western Ghats have been planted. User friendly bilingual illustrative information boards and signages have been placed to educate people about the importance of medicinal in plants in our day to day life including their therapeutic values. List of medicinal plants is at **Annexure B.**

Medicinal / Herbal Plant Section in Biodiversity Park

(e) Spice Garden: India is popularly known as “Land of Spices “and is the world’s largest producer, consumer and exporter of spices. Goa's climate also favours the growth of spices. The spice garden showcases the different spice plants found in Goa along with their medicinal, culinary, spiritual values for the visitors to see the plant habit and appreciate their importance.

Spice Garden at Biodiversity Park

(f) Sacred groves: Miniature of Sacred groves are created in the park to make people aware of the role of religious beliefs and customs in conservation of biodiversity. Sacred groves are locally called Devachi Rai, Devranor Pann.

(g) Rashi van: In Vedic Astrology each of the 12 signs of the Zodiac is represented by a tree. The concept of Rashi van involves the planting of these trees in a grove and nurturing them, to help develop a place of sanctity. The section is developed.

(h) Orchidarium: The Western Ghats is home to nearly 300 species of orchids. Some of the orchid species which are endemic to Western Ghats are conserved in the park. A variety of orchids are being planted in the biodiversity park to showcase rich orchid wealth of the Western Ghats

Rashi Van at Biodiversity Park

Orchids Planted in Biodiversity Park

(i) Fauna: Gaur, the state animal, is frequently seen in the nearby forest areas. Panther, jungle cat, leopard cat, toddy cat, deer’s, wild boars, golden yellow jackal, porcupines, giant squirrels, hare, Monitor Lizard and snakes are some of the other animals found in the forest. Over hundreds of species of resident birds and butterflies can also be sighted in the park. Murals of state animals, birds, butterfly and other prominent faunal species endemic to the area have been displayed in the park for information of all visitors especially children.

Murals in Biodiversity Park

(j) Butterfly Park: Goa is home to more than 250 species of butterflies owing to its diverse forests. The commonly found butterflies are Blue Mormon, Plain Tiger, Lime Butterfly, Common Crow, Yellow Pansy, Common Leopard, etc. In order to showcase butterfly diversity of Western Ghats and Goa especially, a butterfly section is being created. In first phase host and nectar plants of the identified butterflies have been planted in the park. In the APO of 2022-23 fund under CAMPA is approved to set up a butterfly conservatory in the Biodiversity Park.

(k) Nature-trail / cycling-trail / Birding-trail: The nature trail / cycling trail of approximately 2 km length which passes through all the sections of the park has been developed. All along the trails bilingual informative boards have been placed. A walk on the trail provides valuable information to visitors while simultaneously provides opportunity to appreciate nature. This short trail in the wilderness has so much diversity to offer. It is a paradise for Butterfly lovers and Birdwatchers.

Nature Trail in Biodiversity Park

Wooden Bridge at Biodiversity Park

Sinages along Nature Trail

(I) Waterbodies and Check Dams: For soil and moisture conservation in the park at appropriate locations water bodies, check dams, gabions loose bolder check dams etc have been made. Four artificial water have been created. The seasonal stream cascading down through the undulating terrain of the forest is an enchanting view. After a long walk-through forests, one can sit by the side of the water body and rejuvenate with serenity in the lap of nature.

Check Dams and Water Bodies in Biodiversity Park

(j) Nature Education Centre [NEC] cum Information Centre: An NEC cum information centre have been developed at park to provide information to the visitors.

Nature education Centre / Information centre at Biodiversity Park

(k) Eco- Tourism Structures

Tree Top Hut at Biodiversity Park

Burma Bridge

Biodiversity Park

Adventure Zone at Biodiversity Park

(l) Souvenir shop

A souvenir shop at Biodiversity Park being run by local community

(n) Information boards and Signage's:

Hon'ble Chief Minister of Goa along with PWD Minister, and PCCF Goa in a resting hut at Biodiversity Park

Resting Place

(o) Public Convenience

Information Sinages at Park

A Public Convenience at Biodiversity Park

11. **CAMPA Fund Utilized:** During the two financial years as per APO approved by the Executive Committee of the National CAMPA various works have been carried out. A total of Rs Sixty-Nine Lakhs (approx) have been incurred from CAMPA fund since last financial year. Various works are being taken up to further develop the park during the current financial year.

12. **Community Participation:** Then project inter-alia aims at conserving Biodiversity in selected landscapes while improving rural livelihoods through participatory approaches. Effort of the Department is to strengthen local community through Biodiversity conservation measures. From the very beginning local people have been engaged for setting up of Biodiversity Park. The park has provided gainful employment opportunities to the local people. A souvenir shop has been set up and efforts of the Department are to continue its operation and maintenance through the local community.

13. **Inauguration of Biodiversity Park:** The inauguration of the Biodiversity park was done by Hon'ble Chief Minister of Goa Dr. Pramod P Sawant [HCM] on 4th Feb, 2021. HCM was informed that park has been developed by forest department with objective to conserve Biodiversity of the region and to generate and create awareness among all about the importance of Biodiversity in our day to day life. Unique to the park is that, most the works in the park will be managed through the local Self Help Groups (SHG's). This attempt will further strengthen the Atamanirbhar Abhiyan of the Government to create the employment opportunities to local people at their door step. HCM mentioned that an excellent park has been developed by the department which will help all concerned to understand and appreciate the value Biodiversity and this is also going to be a popular Eco-Tourism site and will attract lot of tourist in days to come.

Hon'ble Chief Minister of Goa Inaugurating Biodiversity Park at Mollem on 4th February, 2021

2. RESTORATION AND RECLAMATION OF MINED AREAS IN GOA

1. Background

In compliance of direction of the Hon'ble High Court of Bombay at Goa Forest Department took up plantation works in mined areas for its restoration. The plantation and maintenance work have been taken under State plan and under CAMPA. Details of plantation taken up in last four financial years is as under.

S.No	Plantations	Area [ha]	Year	GPS Reading
1	Mining dump plantation with fruit bearing saplings at Tudov Potrem Sanguem Goa	5.00.	2018-19	15°13'1.91"N 74°13'46.91"E
2	Mining dump plantation with fruit bearing saplings at Villiena, Sanguem Goa	3.00	2018-19	15° 9'43.23"N 74°14'32.03"E
3	Mining dump plantation with fruit bearing saplings at Vagpet Bhati Sanguem Goa	5.00	2019-20	15°11'27.14"N 74°14'41.35"E
4	Mining dump plantation with fruit bearing plants at Rumbdem, Mangal Sanguem Goa	5.00	2019-20	15° 4'26.30"N 15° 4'26.30"N
4	Mining dump plantation with fruit bearing saplings at Tudov Potrem Sanguem Goa	10.00	2020-21	15°12'38.94"N 74°14'13.78"E
5	Mining area reclamation plantation with fruit bearing saplings at Velpem Bhati, Sanguem Goa	5.00	2021-21	15°11'51.87"N 74°15'2.10"E
6	Mining area plantation in filled up pit with fruit bearing saplings and grass in between rows at Tudov Potrem, Sanguem Goa	5.00	2021-22	15°12'50.57" N 74°13'53.06"E
7	Raising of grass plot in 3ha. Area on mining degraded area using vetiver and guinea grass at Tudov Potrem, Sanguem Goa	3.00	2021-22	15°13'0.69" N 74°13'53.67"E
8	Raising of grass plot in 4ha. Area on mining degraded area using vetiver and guinea grass at Tudov Potrem, Sanguem Goa	4.00	2022-23	15°12'38.53"N 74°14'16.67"E

2. Plantation Activity

Satellite image of the planation site

2.1. Some of the Major Challenges Encountered during Plantation Activities

2.1.1. Water Logging

2.1.2. Devoid of Top Soil

2.1.3. Gully formation

2.2. Management Interventions to overcome challenges

2.2.1. Removal of water from site by creating way/path so that water does not get stagnated

2.2.2. Gully plugging and Taking up soil from the adjoining Mining dump and mixing it with farm yard manure to add nutrient to the soil.

3. Results

Mining area Restoration with Vetiver and Guinea Grass and Fruit bearing Tree

Arial view of plantation site

Citing of Black Panther at Reclaimed and Restored Mined Area

3. NETAJI SUBHAS CHANDRA BOSE GRAM UPVAN, SANKHALI-GOA

Introduction

The Social Forestry, Parks and Gardens Division of Goa Forest Department with a mandate to improve green landscapes and conserve biodiversity outside forest area in state developed a 'Gram Upvan" in an area of 1.30 Ha at Harvalem Village, near Sankhali, Bicholim Taluka, North Goa District in 2021. The Goa, Daman and Diu Housing Board Goa is owner of said land by whom it was handed over to Sankhali Municipal Council who subsequently handed over land to Forest Department for creation and maintenance of Gram Upvan.

GPS Coordinates: N 15° 33' 41.9", E 074° 01' 31.5", N 15° 33' 46.2", E074° 01' 31.8".

Project Cost & details:

The Cost of the projects is about Rs.50 lakhs and fund have been provided through State plan and from CAMPA under Rule 5 (2) (m) of CAF-2018.Various works like landscaping, setting up of herbal / medicinal garden, entry gate, plantation of native tree, shrubs and herbs, fencing, visitor amenities- resting place, nature trail, solar lights etc.

Objectives of Gram Upvan:

1. Plantation of native trees, shrubs and herbs including medicinal plants to showcase Biodiversity of the region.
2. To inculcate knowledge and importance of Biodiversity among one and all specially children.
3. Specifically, to inculcate a sense of familiarity with Herbal & Medicinal Plants.
4. To educate the people in identifying different types of Herbs, Shrubs, Trees and their Medicinal uses.
5. To encourage people to plant Herbs, in their small kitchen garden.
6. To achieve a cleaner and greener environment in their vicinity.
7. To prepare Eco-conscious citizens for future.
8. To provide green and clean landscape for recreation.

Inauguration of Gramupvan: The Upvan was inaugurated and dedicated to the people of Goa by Dr. Pramod Sawant, Hon'ble Chief Minister of Goa on 10th April, 2021 and named as "Netaji Subhas Chandra Bose Gram Upvan" on the occasion of World Environment Day i.e., 5th June, 2021.

Pictures before the development of Netaji Chandra Bose Gram Upvan at Sankhali

Pictures after restoration of degraded land and beautification of area

Landscaping by planting Trees, Shrubs, Herbs and other species

Nature Trail

Host and Nectar plants are planted to attract Butterflies

Resting Place / Rain Shelter

Contribution: Chief Executive Officer, Compensatory Afforestation Fund Management and Planning Authority, Goa

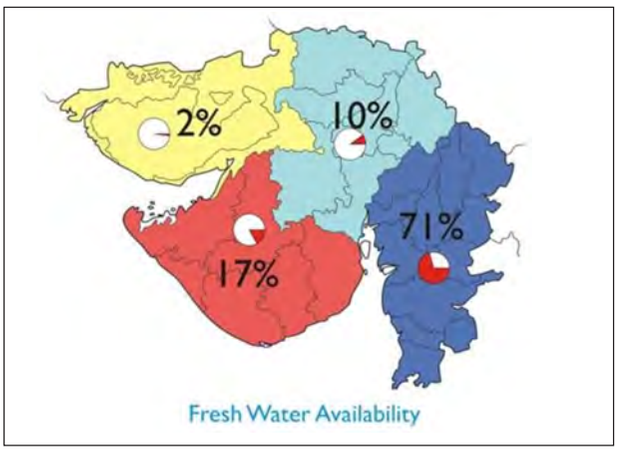
GUJARAT

SOIL AND WATER CONSERVATION WORKS FOR EFFECTIVE ECO-RESTORATION

1. Background

Gujarat is a water stressed State with very skewed water availability across different regions. It is characterized by variations in the topography and wide variations in annual rainfall. Three fourth of the area of the State is unsuitable for ground water withdrawal due to rocky terrain and coastal region. Further, the supply of surface water is limited and thus the State has a long recorded history of droughts. The rainfall pattern in Gujarat is erratic and uneven which leads to imbalances in distribution of water in different regions. Gujarat at present has only 2% of the country' s water reContributions with 5% of the country's population.

Gujarat state can be divided into four distinct units on the basis of water reContributions endowment namely Kutchh, North Gujarat, South & Central Gujarat and Saurashtra. Except southern Gujarat, water availability is very less in rest of 71% of the geographical area of Gujarat State. Further, more than 40% rainwater flows into the sea as run off every year due to absence of water conservation structures.



Due to the ever increasing pressure on the forests and natural reContributions, the water regimes in the forest areas have become stressed. This is mainly due to the opening of forest cover, loss of vegetation, under storey, excessive grazing and different factors responsible for loss or thinning of forest cover. Natural vegetation and forests conserve water, moisture and soil and result in extensive reduction of the runoff during rains in well stocked forest areas. Due to loss of forest cover results in the erosion of top fertile layer and organic matter of the forest soil as well as the adjoining agricultural land, which is irreversible. In degraded forest areas, this loss is immense and it takes a very long time for eco-restoration and productivity of these areas.

2. Desertification looming large

Desertification is land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities leading to loss of productive ecosystem and biodiversity. There is an urgent need to stop and reverse the process of land degradation. Sustainable management of soil, water and biodiversity are required for protecting the land from further degradation. There are global efforts to combat desertification. India is signatory to the United Nations Convention on Combating Desertification (UNCCD) and is committed to achieve the land degradation neutral status by 2030. The Convention addresses specifically the issue of Desertification, Land Degradation and Drought (DLDD). Desertification Cell at Ministry of Environment, Forest & Climate Change (MoEF&CC), Government of India, New Delhi represents India in UNCCD and has established a multi- institutional mechanism for India's reporting to UNCCD related to implementation of Indian programmes for combating desertification and land degradation. 96.40 mha area of the country is undergoing process of land degradation i.e., 29.32% of the Total Geographic Area (TGA) of the country during 2011-13, while during 2003-05 the area undergoing process of land degradation is 94.53 mha (28.76% of the TGA).

Gujarat is the state with third highest area under desertification/ land degradation with respect to country TGA and fourth highest with respect to state TGA. The state is observed with 52.29% of the total geographical area under desertification/ land degradation for the period of 2011- 13. The desertification/ land degradation area in Gujarat has increased about 0.94% since 2003-05. The most significant process of desertification/ land degradation in the state is Water Erosion (19.67% in 2011-13 and 19.30% in 2003-05) followed by Salinity (13.48% in 2011-13 and 13.47% in 2003-05), Vegetation Degradation (11.82% in 2011-13 and 11.49% in 2003-05) and Wind Erosion (6.00% in 2011-13 and 6.01% in 2003-05).

Analysis shows that around 23.95% (2011-13) and 23.64% (2003-05) of desertification/land degradation with respect to total TGA is contributed by Rajasthan, Maharashtra, Gujarat, Jammu & Kashmir, Karnataka, Jharkhand, Odisha, Madhya Pradesh and Telangana in descending order. Jharkhand, Rajasthan, Delhi, Gujarat and Goa are showing more than 50% area under desertification/land degradation.

The most significant process of desertification/ land degradation in the country is Water Erosion (10.98% in 2011-13 and 10.83% in 2003-05). The second most significant process is Vegetation Degradation (8.91% in 2011- 13 and 8.60% in 2003-05), which is followed by Wind erosion (5.55 % in 2011- 13 and 5.58 % in 2003-05).

3.0 Importance of soil and water conservation work

Due to the land degradation and loss of vegetation, more than 50% of water flows down through nallahs and streams, carrying lot of top soil causing huge soil erosion from these areas. This results in very less water percolation and water retention in the soil. If the same area is fairly covered with vegetation, more than 50% water is retained in arid and semi-arid regions. This results in creation of good microclimatic conditions conducive for vegetative growth. As per an estimate, if the area is properly treated, approximately 4,00,000 cubic meter of water can be retained in an area of 100 ha during one rainfall season. Soil and water conservation works provide a conducive niche ecosystem and microclimate for vegetative growth which supports the agriculture in the adjoining areas through edge effect wherein the moisture regime is maintained for a longer period which supports the growth of crops for the adjoining farmers, often tribal population

Soil and water conservation is an important component of all the eco-restoration and afforestation works in Gujarat state. It is very helpful for combating the rate of desertification and efforts towards achieving land degradation neutrality. In past the production of timber was the major produce from forests. In the changed perspectives, water is now being considered as the major produce supporting the agriculture and other land based occupations. In Gujarat state following major activities are taken up for soil and water conservation in forest areas including compensatory afforestation and components taken up from the net present value of CAMPA fund. Ridge to valley approach is followed for a comprehensive treatment of the area for reducing the run-off of rain water and storage by way of percolation in the ground and storage in bigger structures. Both vegetative as well as physical barriers/structures are taken up for this purpose. Some of the important interventions for soil and water conservation adopted in Gujarat state are as follows:

3.1. Vegetative interventions

- Plantation of Bamboo, Agave, Euphorbia, Ipomoea on the contours and trenches
- Stabilization of bunds by vegetative means by planting grasses, bamboo, agave and Ipomoea
- Vegetative gully plugs by planting Ipomoea
- Bamboo planting in Contour trenches
- Planting of cuttings of species that sprout as part of brushwood structures.
- Bamboo plantation on the slope of the nallahs and streams

3.2. Physical interventions

- Brushwood structures
- Contour Trenches

- Continuous contour trenches
- Gradonies
- SAPAR trenches
- Trenches in Rann area
- Stone bunding
- Gabions
- Earthen check dams
- Percolation tanks
- Van Talaodis
- Desiltation
- Check walls
- Check dams

4.0. Soil and water conservation work taken up during last three years in Gujarat state

District	2019-20			2020-21			2021-22		
	No of Check Dam	No of Van Talavadi / Percolation Tank	Total	No of Check Dam	No of Van Talavadi / Percolation Tank	Total	No of Check Dam	No of Van Talavadi / Percolation Tank	Total
Arvalli	5	1	6	4		4	3		3
Banaskantha	15	30	45	8		8	9	1	10
Banni Grassland			0		1	1			
Baria	11	15	26	3	27	30	3		3
Bharuch	11	9	20	2		2	2	2	4
Bhavnagar	12	10	22	15	29	44			
Chhota-Udepur	10	15	25	7	24	31	2	5	7
Dang (N)	3	2	5				4		4
Dang (S)			0	1		1	4		4
Gandhinagar			0	4		4			

GIR (E)	13		13		1	1			
GIR (W)		10	10	1	1	2			
Godhra	6	9	15	3	36	39		5	5
Jamnagar			0	9		9			
Junagadh	10	3	13	16	11	27			
Kutch (E)	14	40	54	13	24	37			
Kutch (W)	15	20	35	18	31	49			
SF Kutch		15	15						
Mahisagar		15	15	4	37	41	2		2
MNP Jamnagar	2	1	3		1	1			
Morbi		10	10	20	15	35			
Narmda	5		5	6		6			
Patan	12	20	32	2	19	21			
Sabarkantha	12	2	14	33		33	5		5
Surat	10	17	27	13	10	23			
Surendranagar		1	1	35	15	50			
Valsad (N)	10	15	25	3	1	4	2		2
Valsad (S)	10	17	27	10	21	31	3		3
Velavadar		6	6		1	1			
Vyara	15	33	48	8	16	24	13	14	27
WL Vadodara	15	2	17						
Dhragdhra	7	6	13				0	0	0
Grand Total	**223**	**324**	**547**	**238**	**321**	**559**	**52**	**27**	**79**

5.0. Contour trenches as part of afforestation works in Compensatory Afforestation and Plantations taken up from Net Present Value

District	2022-23		2021-22		2019-20	
	Plantation (ha)	Contour Trench	Plantation (ha)	Countour Trench	Plantation (ha)	Countour Trench
Ahmedabad	114.00	34200	97.00	29100		
Aravalli	5.00	1500	123.00	36900	198.00	59400
Amreli			21.44	6433		
Banaskantha	749.00	224700	419.42	125826		
Baria	50.00	15000				
Bharuch	853.00	255900	294.00	88200	112.10	33630
Bhavnagar	70.40	21120	766.00	229800		

Chhotaudepur	615.00	184500	110.00	33000	100.00	30000
Dahod	458.00	137400	106.00	31800	121.00	36300
Dang	385.00	115500	75.00	22500		
Devbhumi Dwark	a 149.00	44700	7.65	2295		
Gandhinagar	292.00	87600	18.18	5454		
Gir-Somnath	11.00	3300				
Jamnagar	665.00	199500	334.60	100380		
Kutch	1028.40	308520	1119.18	335754	171.00	51300
Mahisagar	160.00	48000	25.00	7500	264.00	79200
Morbi	78.67	23600	376.75	113025		
Nadiad	20.00	6000	135.00	40500		
Narmada	1360.00	408000	248.00	74400		
Navsari	95.00	28500	10.00	3000		
Panchmahal	160.14	48040	404.00	121200	371.00	111300
Patan	198.50	59550	308.50	92550		
Porbandar	5.00	1500				
Rajkot	75.00	22500	373.02	111906		
Sabarkantha	840.00	252000	195.00	58500	25.12	7536
Surat	235.00	70500	130.00	39000	559.20	167760
Surendranagar	347.00	104100	178.00	53400		
Vyara	55.00	16500	1.00	300		
Valsad			230.37	69111		
Vadodara	13.41	4024	120.00	36000		
Total	**9087.52**	**2726254**	**6226.11**	**1867834**	**1921.42**	**576426**

6.0. Soil and water conservation work by preparation of DPR by using LiDAR technology

Ministry of Environment Forest and Climate Change, Government of India facilitated a project for preparation of Detailed Project Reports (DPR) for several States for areas ranging from 5,000 to 10,000 ha by using LiDAR through WAPCOS. The objective of the project is to tackle the runoff at the originating points for which use of modern technology has been adopted for planning and identifying site locations for construction of appropriate and feasible micro soil and water conservation structures in the forest area on a ridge to valley concept in a holistic manner.

The project area is located in Sabarkantha district in Gujarat state. A total of 11654 ha area was selected for this purpose. The annual rainfall in the area is about 821 mm and an estimated soil loss from the area is 1.57 tonne per ha per annum. The forest falls under the Southern Tropical Dry Deciduous Forest with Sub Type- Dry Teak Forest. The total project cost is about Rs. 54.85 crore. The identification of location of the site for interventions like catchment area, dimensions, submergence area, storage capacity, fetch length and cost estimates has been provided in the DPR. Run off management strategy is two pronged: harvesting it and reduce its erosive velocity. Site specific water harvesting structures have been proposed for this purpose.

7.0. Selection of interventions

- The structures have been planned in the area to generate maximum fetch length along the streamlines, rather than holding the water in an area. This will further improve the fertility of the area which will help in the accelerated growth of trees and other plant species.
- In higher order drains and lower reaches where slope is less, Anicuts (Check Dams) have been taken up to harvest the run off.
- In low density areas of forest, the water structures have been combined with catchment area treatment works like contour trenches, staggered trenches are being taken up to increase moisture and reduce the erosive velocity of run off. Afforestation is also being taken up in poor vegetation areas.

7.1. Based on the above approach the following interventions are proposed in the DPR

- Staggered trenches
- Continuous Contour Trenches (CCT)
- Deep Continuous Contour Trenches (CCT)
- Afforestation works
- Loose boulder check dams
- Mini percolation tanks
- Earthen check dams- Van Talavs
- Check dams
- Gabions
- Sunken ponds

7.2. Project Components

S.No.	Activity	Unit	No.	Cost (Rs in Lakhs)
Water Harvesting Structures				
1	Check Dam	No.	66	499.65
2	Earthen Check Dam	No.	704	64.35
3	Gabion	No.	12	43.56
4	Loose Stone Check Dam	No.	302	27.4
5	Mini Percolation Tank	No.	342	171.17
6	Percolation Tank	No.	205	214.16
7	Sunken Pond	No.	20	99.7
		TOTAL	**1651**	**1120.51**
Plantation				
8	Afforestation	Ha	600	2268.42
9	Aided Natural Regeneration	Ha	1170	1250.4375
10	Catch Area Treatment	Ha	179	77.865
11	Silvipasture and horticulture	Ha	100	378.07
12	Silvipasture	Ha	241	389.58132
		TOTAL	**2290**	**4364.37382**
	Grand Total			**5484.88**

Implementation of activities w.e.f. 2021-22

Holistic Eco-restoration Efforts using soil and water conservation in 186 ha forest area (Pinpur, Surat Forest Division)

A plantation in 186 ha forest area in compartment nos. 52, 53 and 54 was taken up in Pinpur village in Surat Forest Division during 2018-19. Staggered contour trenches, continuous contour trenches, boundary trenches, percolation tanks etc. were taken up in the area to improve the moisture regime and to reduce erosion. 42622 running meters of CCTs and 60,000 staggered trenches were made in the plot. 3 van talavs and three earthen bunds were also created. Desilting of two checkdams was also done to recreate the storage capacity. A total of 154938 seedlings were planted in the forest area, in addition to the usual silvicultural operations.

The forest area has been restocked and the local Joint Forest Management Committee has taken benefits in the form of grass in the first years.

8.0. Total water storage in CAMPA 2019-20 Pinpur Beat, Umarpada Range, Surat Forest Division

S. No.	Name of activity	Quant.	Capacity (cu.m)	No. of times filled in rainy season	Total water percolation / storage in rainy season (cu.m)	Total water percolation / storage in rainy season (lakh Litre)
1	Boundary Trench (2m*1m*1m)	51272	51272	3	153816	4614.48
2	Continuous trench (1m*1m*1m)	42622	4262	3	12786	383.58
3	Van Talavdi desilting	3	4041	2	8082	161.64
4	Contour trench (1m*0.45m*0.3m)	60000	8100	3	24300	729
5	Earthen pond	3	1091	3	3273	98.19
6	Checkdam desilting	2	1200	2	2400	48
7	New check dam	1	600	2	1200	24
	Total				**205857**	**6058.89**
	Total water conservation in one rainy season			**610 million litre**		

9.0. Eco-restoration brings water security to the villagers

Nandarkha village in Vejalpur Taluka, district Godhra is a small village inhabited by about 1500 population. A Joint Forest Management Committee is working in the village to manage about 178 ha forest area.

A plantation under Compensatory Afforestation was taken up in the village in 20 ha area in 2020-21. Apart from planting of 17160 saplings, 6 percolation tanks were created in the plantation as part of soil and water conservation work. About 16.8 million litre water is stored in these percolation tanks which has resulted in the significant rise of water level in the wells, borewells and handpumps in the village. The handpumps that used to go dry during the summer months are now yielding drinking water during the lean period also, thus reducing the drudgery for the local people.

પાણીના સ્તર ઊંચા લાવવા ગોધરા વન વિભાગ દ્વારા
વેજલપુર રેન્જ ખાતે ૩૦ લાખના ખર્ચે છ તળાવડીઓના નિર્માણ
૧.૯૮ કરોડ લીટર પાણીનો સંગ્રહ કરાયો : ૧૭ હજારથી વધુ ઈમારતી અને ફળાઉ વૃક્ષોનો ઉછેરાયા

મયૂર જાની — વાકશક્તિ
પંચમહાલ જિલ્લામાં ટેમ્પા યોજના હેઠળ ગોધરા વન વિભાગ દ્વારા કરાયેલી સુંદર કામગીરી
નાંદરખા પાસેના વનમાં ૬ પર્કોલેશન ટેકના નિર્માણ દ્વારા
૧.૯૮ કરોડ લિટરથી વધુ પાણીનો સંગ્રહ
આસપાસના વિસ્તારોમાં પાણીના તળ ઊંચા આવશે

10.0. Van Talav as Contribution of irrigation

In Surat Forest Division, a van talav has been created in Govat village by an earth work of about 1200 cm. Due to the improvement of water regime in the nearby, forest area has improved. Local people are using the water from the talav, as well as recharged aquifer for agriculture crop irrigation. Due to creation of this talav, there is no water scarcity in the village even during the summer months.

11.0. Water conservation in Surat Forest Division

Total water storage in CAMPA 2019-22, Surat Forest Division

S.No.	Name of activity	Year	Quant.	Capacity(cu.m)	No. of times filled in rainy season	Total water percolation/storage in rainy season (cu.m)	Total water percolation/storage in rainy season (lakh Litre)
1	Boundary Trench (1.2m*0.6m*1m)	2019-22	72249	52019	3	156058	1561
2	Boundary Trench (2m*1m*2m)	2019-22	25640	51280	3	153840	1538
3	Continuous trench (1m*1m*1m)	2019-22	12440	12440	3	37320	373
4	Contour trench(1m*0.45m*0.3m)	2019-22	1500	203	3	608	6
5	Contour trench(2m*0.45m*0.3m)	2019-22	70835	19125	3	57376	574
6	Hill top tank	2019-22	2	4041	2	8082	81
7	Mati pada	2019-22	4	8097	3	24291	243
8	New check dam	2019-22	29	17400	2	34800	348
9	Van Talavdi	2019-22	24	24000	2	48000	480
10	Checkwall	2019-22	13	6500	2	13000	130
					Total	533375	5334

12.0. Narmada River Rejuvenation

Tropical Forest Research Institute (TFRI) has prepared a DPR for rejuvenation of Narmada Catchment to augment the water flow periods in the river. The total area of riverscape in Gujarat state is 1834.35 sq km, which forms 0.93 percent of the total area. Priority classification of the area has been done and about 14265 ha is high priority area; 30839 ha is medium priority and 139065 ha is low priority in Gujarat state. In addition to the plantations, specific SMC interventions have been proposed in the DPR, which are as follows:

Division	SMC work	Cost (Rs.in Lakh)	No.
Bharuch	Bank Stabilization (Protection Wall)	209.95	4
	Brush wood	16	4
	Check Dam	580	13
	Check Wall	70	4
	Gabion Structure	64	4
	Nala Bunding	1.26	4
Bharuch Total		941.21	33
Chhota Udaipur	Bank Stabilization (Protection Wall)	75	3
	Rajpipla	365	10
	Check wall	102	8
	Nala Bunding	3.32	5
Chhota Udaipur Total		545.32	26
Kevadia	Bank Stabilization (Protection Wall)	33	2
	Border trench	37.13	38
	Brush wood	3.85	8
	Contour trench	55.75	8
	Check Dam	465	17
	Check Wall	105	19
	Gabion Structure	300	8
	Gully plugging	100	2
	Nala Bunding	86.94	20
Kevadia Total		1186.67	92
Rajpipla	Bank Stabilization (Protection Wall)	341.25	10
	Brush wood	252.48	22
	Check Dam	495	27
	Check Wall	579	31
	Gabion Structure	107.7	14
	Gully Plugging	1.48	11
	Nala Bunding	23.45	10
Rajpipla Total		1800.35	125
Grand Total		4473.54	276

Work as per the DPR have been taken up since 2020-21 in Gujarat state

13.0. Conclusion

Soil and moisture conservation taken up for holistic treatment of the forest areas bu utilizing funds from Compensatory Afforestation Fund Management and Planning Authority in different agro-climatic zones in Gujarat state are effectively leading to eco- restoration of the forest area resulting in effective approach towards land degradation neutrality. Water and soil conservation along with afforestation activities have set in the ecological processes in different degraded forest areas. Specific approaches in the peculiar salinity affected areas successional stages for vegetative cover have set in which is considerably controlling the desertification advancement in this region

Contribution: Dr. Jaipal Singh
Additional Principal Chief conservator of Forests, Land and Chief Executive Officer, Gujarat State, CAMPA

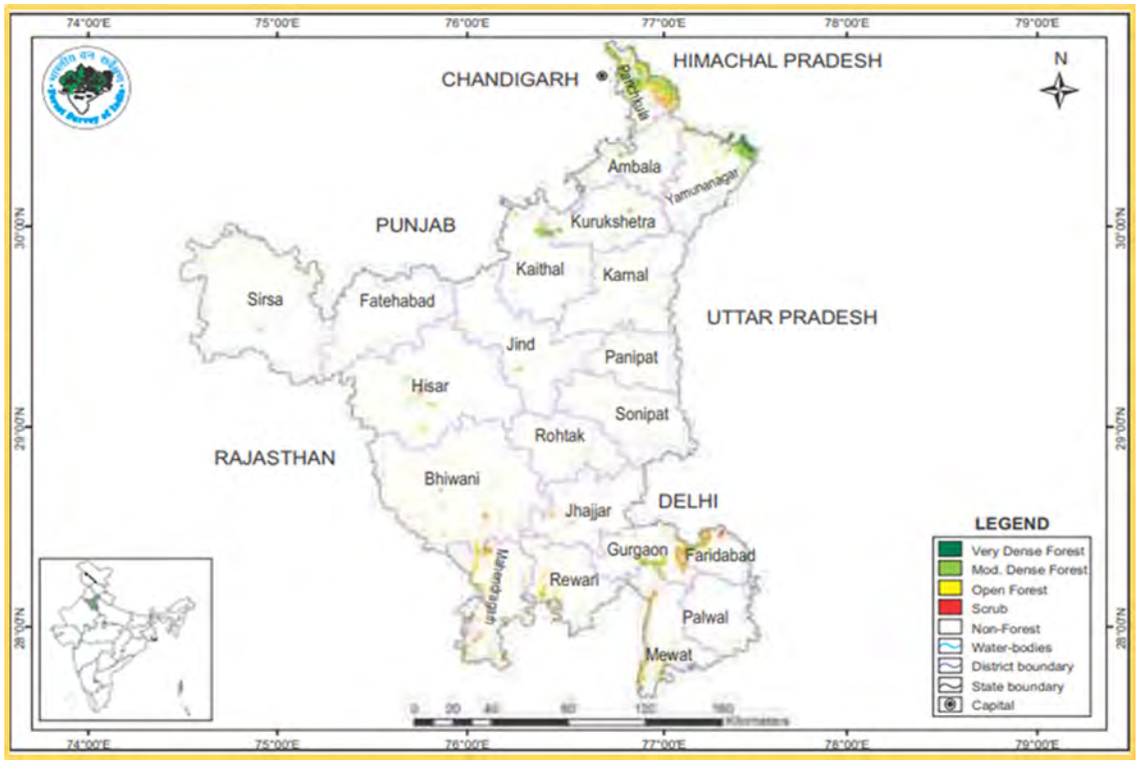
HARYANA

1. SUCCESS STORIES

Introduction

As per the recent ISFR, the forest cover in the state is 1,602.44 sq km which is 3.62% of the State's geographical area. In terms of forest canopy density classes, the State has 28.00 sq km under Very Dense Forest (VDF), 450.90 sq km under Moderately Dense Forest (MDF) and 1,123.54 sq km under Open Forest (OF). Forest Cover in the state has increased by 14.44 sq km as compared to the previous assessment reported in ISFR 2017.

The State has reported extent of Recorded Forest Area (RFA) 1,559 sq km which is 3.53% of its geographical area. The reserved, protected and unclassed forests are 15.97%, 74.28% and 9.75% of the recorded forest area in the state respectively.



Forest Map of Haryana

The Haryana Model is a success story widely acknowledged globally. State specific Agroforestry and ToFs models have been formulated and adopted for enhancing various ecosystem services. This will facilitate in harnessing the potential of Agroforestry and TOFs in shaping “Climate Action” as per India’s commitments for Carbon Neutral Economy by 2070.

Yamuna Nagar district, Haryana has developed into a centre for wood-based industries, producing more than 50% of the plywood used in the nation. This plywood is made from agroforestry-based wood, and it generates about USD 120 million annually while employing about 0.1 million people.

The India plywood market reached a value of INR 195.8 billion in FY 2021-22. It is estimated that the Indian plywood market will reach INR 297.2 billion by 2027-28, exhibiting a CAGR of 7.4% during 2022-23 to 2027-28.

Ecosystem Services

- Economic Security in extreme climate variations
- Supplements farmers income
- Value chain linkages
- Sequesters Carbon

Poplar + Turmeric model of agroforestry in Yamunanagar, Haryana

Poplar plantation in Yamunanagar, Haryana

Interaction with Veneer manufacturer in Yamunanagar, Haryana

Farmer harvesting Poplar trees in Yamunanagar, Haryana

SUCCESSFUL PROJECS UNDER HARYANA, CAMPA

2. SOIL AND MOISTURE CONSERVATION WORK IN GURUGRAM UNDER NPV SCHEME, 2020-21

In the endeavour to conserve soil and moisture, 3 ponds have been dug at Rojka Gujjar in area notified under section 4 &5 of Punjab Land Preservation Act,1900.

Project Background

The project landscape in Gurugram comprises of Aravalli hills which is the oldest mountain system of Indian sub-continent. Increasing population of human and cattle, injudicious use of natural reContributions, unscientific mining activities, uncontrolled grazing and unfavourable climatic conditions resulted in the present state of ecological deterioration.

The ground water is characterized by high fluoride and other salts contents that are known to be hazardous to health. The traditional ponds have over the years become silted and hold lesser and lesser quantities of water with each passing year. Thus, there is urgent need to revive the traditional water harvesting system through repair, renovation and rehabilitation of existing Johads.

Every conservation effort relies heavily on strong community participation for its success Thus with the effort of the forest department supported by local residents and environmentally active people these ponds were created. Details of these ponds are given below-

Surya Mandir Johar, Rojka Gujjar

Kankar wala Johar. Rojka Gujjar

Bada Mandir Johar, Rojka Gujjar

This work was initiated in the year 2020-21, after a thorough hydrological assessment at suitable sites were conducted for ponds. Baseline analysis projected optimum locations for the purpose of storage of runoff during the rainy season wherein eventual ground water recharge would be done.

Benefits of the Project

Benefits of the project to the community and the environment are as follows-

- **Economic benefits**- Though no evaluation of ecological services provided by these ponds have been attempted in monetary terms but the Ponds shall meet water needs for rearing domestic cattle for the local population thereby reducing drudgery. The ponds shall be improving ground water level, reducing runoff and thus reducing flooding of urban areas during rainy season, water conservation and thereby improving life and livelihood of local population are certain to have monetary value and economic benefit.
- **Environmental benefits**- Improving ground water recharge, reducing runoff and thus reducing flooding of urban areas in rainy season, Ecological regeneration of the landscape, Provision of drinking water for wildlife and thus improvement of habitat.
- **Social benefits-**By this project around mandays/ year has been generated over the last four years. Social Infrastructure has been created for meeting water needs of the domestic cattle being reared.

3. MANAGEMENT OF WILDLIFE HABITAT IMPROVEMENT WORK, HISAR, 2020-21

Project Background

Due to increasing development works, increasing agricultural activities and increase of population, declining habitats of wildlife. Wild animals facing acute shortage of food, water and shelter. To ensure improve the habitat for wild animal and the availability of water throughout the year for wild animals and decline the intensity of men-animal conflict, 10 no. of CC water ponds were proposed in the wild animal habitat area.

Ten CC pond were also constructed in village water pond Bir Bar Ban Jind Distt. Jind, Village Ramsara and Mehuwala Distt. Fatehabad Village Gindra and Chakjalu Distt. Sirsa, Village Fartiya Kehar, Dhani Todha and Dhulkot Distt. Bhiwani Village Kajla, Malahpur, Distt. Hisar.

Water Village Kajal Distt. Hisar

Water pond Village Mallahpur

Water pond Gindra Distt. Sirsa

Water pond Fartiya Kehra Distt. Bhiwani

Water pond Fartiya Dhulkot Distt. Bhiwani

Water pond Ramsara Distt. Fatehabad

Latitude Longitude of Project Site

- Bir Bara Ban Jind: 29°18'4.73724"N 76°17'47.23044" E
- Village Gindra Distt. Sirsa: 29^{0}63'12.3"N 74^{0}76'24.9" E
- Village Chakjalu Distt. Sirsa: 29^{0}76'36.85" N 74^{0}76'54.70" E
- Village Fartiya Kehar, Distt. Bhiwani: 28°43'71.27" N 75°83'94.99"E
- Village Dhulkot Distt. Bhiwani: 28°55'21.52"N 75°40'31.12"E
- Village Dhani Toda Distt. Bhiwani: 28°40'59.18" N 75°82'79.50" E
- Village Ramsara Distt. Fatehabad: N29° 18' 05" E 75° 17' 49" 520
- Village Mehuwala Distt. Fatehabad: N 29º 26' 57" E75° 20'31"248

Water Pond Blr Bara Ban Jind

- Village Kajla Distt. Hisar: 29.204412N 75.574122 E
- Village Kajla, Malahpur, Distt. Hisar: 29°14’29.112”N 75°

The work was initiated in the year 2020-2021. Before starting the work site suitability, feasibility and technical suitability of the site were checked and assessed by a technical person with involvement of local farmers and wildlife conservative people. In planning and implementation of the project, at every step local people, farmers and activists were involved.

Incorporation of Restoration and FLR approach

- Awareness among farmers and local people for conservation of wild life enhanced
- Intensity of man-animals conflict declined
- Rate of wildlife accidents and crimes reduced
- People fills the ponds with water during acute shortage period even with their own reContributions.

Benefits of the Project

Benefits of the project or initiative to the forest, environment, people and community are as follows-

- **Economic benefits**- Though no evaluation of services provided by these ponds has been attempted in monetary terms, the pond shall meet water needs of the wild animals of the area.
- **Environmental benefits**- Improving the availability of water for wildlife, enhanced the protection and conservation of wild life thus improvement of habitat.
- **Social benefits-** By this project man-animals conflict declined. Approximately 1400 mandays has been generated. Social infrastructure created for meeting water needs of the wild animals will be met.

4. PLANTATION UNDER CAMPA CA AT HISAR MAJOR DISTRIBUTARY RD 32 TO 118 L&R AFTER REMOVING MANY YEARS OLD ENCROACHMENT OF FARMERS, 2020-21

Project site is located at Hisar (Territorial), Hisar Major Distributary Running through Hansi, Hisar and Adampur range of Hisar Territorial Division.

Latitude & Longitude of Project Site: 29°26'3385" N 76°20'1598" E

Project Background

In this project, almost 91 ha notified forest area was under encroachment for many years. This encroachment was affecting the forest cover of the whole district. In this context, a total of 90.147 ha plantation was achieved by planting 90147 number of plants. In addition-

- The demarcation of the land was done through drone mapping and DGPS machines
- Total 158 ha land was vacated from various sites of Strip Forests.
- Out of 83 ha CA Planting 5 ha plantation was done on Bhatla Minor

Various Forest Landscape Restoration Strategies

Some of the forest landscape restoration techniques adopted were-

- Forest Landscape Restoration applied in the region
- Forest Boundary was marked with fence posts.
- Plantation of 90147 plants was carried out on forest area.
- Encroachment was removed.
- Demarcation of forest land was done.

Restoration and FLR Approach: Encroachment was removed over a large area covering villages Rajthal, Bhaini Amirpur, Narnaund, Aurangshahpur, Majra, Madha, Rajpura, Palli, Dhani Brahmna, Gujjar Bada, Gagan Kheri, Alipur, Kharar, Raipur, Satrod, Siswal, Mohabbatpur and Modakhera. A total of 90147 number of plants of various species were planted on the vacated land.

Benefits of the Project

Benefits of the project to the environment and community are as follows-

- **Economic benefits**: The land was under encroachment for many years and these encroached lands have zero revenue value for the forest department. 90147 plants are planted on the land which will very soon generate revenue for the department.
- **Environmental benefits**: These 90147 trees will release oxygen and the environmental value of the area will increase. The trees will provide fruits for wild animals, birds and local people. When these plants become trees in future several habitats for animals, insects and birds will develop in this region.
- **Social impacts**: These 90147 trees will provide oxygen, fire wood and fruits etc. for local people.

5. CAMPA PLANTATION (TALL PLANTS) FOREST LANDSCAPE RESTORATION, FOREST RANGE, REWARI, DISTT. HARYANA, 2020-21

CAMPA plantation (Tall Plant) Forest landscape restoration project was carried out in revenue estate of village Pali, Distt. Rewari, Haryana. This plantation project site is known as Pali Section 38 and the village is situated at a distance of about 17 km from district headquarters Rewari on Rewari- Narnaul road. Pali Section 38 was notified by Haryana Government in July 2013.The total area closed under section 38 of IFA, 1927 is about 250 acres. This region is extended to Aravalli hills of village Pali, Bawana, Gothra and village Balihar.

Background of the Project

The project area has known to have good vegetation cover in past but due to excessive biotic pressure, it is slowly degrading. During the year 2020-21, plantation activities were carried out in available degraded gaps. The plantation done at this area was to compensate the forest land diversion in case of D-III- 5055, Diversion of Forest Land 10.86 ha in favour of PD, NHAI for widening of NH-8 Gurgaon – Kotputli- Jaipur Road km 92.835 to 97.800, 2016. The plantation activities were taken over in this area during July 2020 wherein about 21720 number of plants were planted.

Need of the Project

It was brought to notice that on the boundary of this site, many farmers had encroached the area and were doing various agricultural activities. An area of about 21.72 ha was covered in different contiguous patches under plantation activities under this project.

- *Azadirachta indica*
- *Dalbergia sissoo*
- *Holoptelea integrifolia*
- *Ficus religiosa*

Besides plantation, sowing of the following types of seeds were carried out in the project area-

- *Acacia senegal,*
- *Acacia leucophloea,*
- *Azadirachta indica,*
- *Zizyphus mauritania*

An area of about 21.72 ha covered in different contiguous patches under plantation. The average height of the plants planted in this area is about 7-8 feet at present and the survival of plants is up to the mark i.e., more than 90%.

Benefits of the Project

Benefits of the project to the environment, people and community are as follows-

- **Economic benefits**- Labourers from the surrounding areas will be engaged in the plantation protection and other cultural operations leading to socio-economic gains.
- **Environmental benefits**- The overall forest cover of the area will be increased. Since this area falls in the continuous patch of Aravalli hills from Rajasthan to Haryana side, it will act as a corridor for wild animals.

Social benefits- Community engagement will be promoted and improve the local ecosystem services for the better good of the local communities.

6. PLANTATION UNDER CAMPA CA COMPONENT AT BHATLA MINOR RD 0 TO 31 L&R AFTER REMOVING MANY YEARS OLD ENCROACHMENT OF FARMERS, 2021-22

Project site is located at Hisar (Territorial) Bhatla Minor RD 0 to 31 L&R located in Hansi range of Hisar Territorial Division.

Latitude & Longitude of Project Site- 29°8'36.5388"N 76°1'42.9564"E, 29°9'22.4496"N 75°55'20.6976"E

Background of the Project

- Almost 154 ha notified Forests area was vacated from encroachment.
- Total area was planted under state and CAMPA Schemes out of total 154 ha, 5 ha was planted under Compensatory Afforestation. 5 ha plantation was done in the given area by planting 5000 plants.
- Various forest landscape restoration were applied in the region. Forest boundary was marked with fence posts. Plantation of 5000 plants was carried out on the Forest area. Encroachment was removed and demarcation of forest land was done
- Encroachment was removed from a very big reach covering villages Panchayats and villagers of Gangankheri, Bhatla, Jaggabada, Kulana and expert private. Demarcation agencies, local authorities i.e., D.C., Hisar, Irrigation Department, Revenue Department, NGOs and Higher Authority of Forest Department were engaged.

Forest Landscape Restoration Strategies

- Boundary was marked with fence posts.
- Plantation of 5000 plants was carried out on the forest area.
- Encroachment was removed.
- Demarcation of forest land was done.

Benefits of the Project

Benefits of the project to the environment, people and community are as follows-

- **Economic benefits**- The land was under encroachment for many years and these encroached lands have zero revenue value for the forest department 5000 plants are planted on the land which will very soon generate revenue for the department.
- **Environmental benefits**- these 5000 trees will release oxygen and the environmental value of the area will increase. The trees will provide fruits for wild animals, birds and local people. When these plants become trees in future several habitats for animals, insects and birds will develop in this region. Benefits of the project or initiative to the forest, environment, people and community.
- **Social impacts**- These 5000 trees will provide oxygen, fire wood & fruits etc. for local people.

OTHER ACTIVITIES (2020-21)

Contribution: Chief Executive Officer, Haryana State CAMPA

HIMACHAL PRADESH

JAL BHANDARAN YOJANA

Water is the most precious natural reContribution and a universal asset. Water provides life supporting system for human beings, flora and fauna. Proper planning, development, management and optimal utilization of water reContributions are of paramount importance for socio-ecological development. The twentieth century has seen phenomenal growth in the use of water. The world population has tripled, but the use of water for human purposes has multiplied six fold. Leading experts on water reContributions are warning that the world is fast heading towards" a water shock", which may even dwarf the oil crisis. Experts also fear that shortage of water is likely to be so acute in future that the next world war may well be fought over disputes relating to sharing water reContributions among various countries. Today, about 80 countries comprising 40 per cent of world's population suffer from serious water shortages. (UN, 1997).

The average annual water availability in the country remains more or less fixed according to the natural hydrologic cycle, but the per capita water availability is reducing exponentially due to increasing population. In India, the per capita water availability came down from 5300 cubic meter to 2200 cubic meter in the early nineties against the world's average of 7400 cubic meters and Asian average of 32 cubic meters. As per United Nation standard, the countries with annual per capita water availability of less than 1700 cubic meter are considered as water stressed and those less than 1000 cubic meter as water scarce.

India is home to 18 per cent of the world's population, it only holds four per cent of global usable water reContributions. Water insecurity would have dire consequences for India's economy, food and health security. With energy demand expected to rise, India needs to focus on improving water use efficiency and ensuring cooperation in the use of shared water Contributions, to work towards water security.

Division- Hisar, Component- CA (Tall Plant), Site- Hisar Major Distributary, Year- 2020-21

As part of the Himalayan mountain ecosystem, Himachal Pradesh is home to a wide range of natural water reContributions; enormous volume of water comes from the catchment areas of Satluj, Beas, Ravi Yamuna and Chenab rivers but ground water reContributions is limited. It is irony that this water rich state is also not free from drought at times. The Precipitation declines from west to the east, and south to the north. The average rainfall in Himachal is 1,111 mm, varying from 450mm in Lahaul and Spiti to over 3,400 mm in Dharamshala. There are 10512 traditional Contributions of water for drinking in rural habitations. The most feasible option is to harvest rain water along the stream/nallahs in order to recharge these traditional water Contributions and also to enhance ground water table in long run.

Keeping in view the above narrated facts the Jal Bhandaran Yojana is formulated to meet the water demand of village habitations which are in dire need of water for domestic as well as irrigation purposes and to recharge/enhance ground water level.

Jal Bhandaran Yojana primarily aims at collecting and storing any form of water; rainfall, runoff or sub-surface follow for multiple uses. The water harvesting structure is site specific and designed to fulfill multiple objectives. General design procedure will include site selection, hydrology, hydraulic and structural design. The objectives of the Yojana are Recharging of ground water and conservation of natural reContribution base, Reduction of Soil Erosion, Augmentation of Natural Regeneration, Reduction of vulnerability to Forest Fires, Generate Employment opportunity in rural areas. Earth fill dams, Stone masonry dams, Cement Concrete dams, Large Ponds and Sub-surface dams are the types of water harvesting structures to be built under Jal Bhandaran Yojana.

Duration of the Yojana is of two years and total 200 nos. of WHS to be proposed for construction within these two years having approximate poundage capacity of 8-10 lac litres per structures. In the previous financial year 44 structures are completed and functional, the 80-85% works of 31 sites are completed. During this current financial year total 125 new structures have to be constructed out of which 75 sites are identified and allotted and for the remaining 50 sites identification work is under progress.

PATALSU C-IVA DANIDHAR, 2008-09, KULLU FOREST DIVISION

CA PLANTATION: NALAGARH FOREST DIVISION
Quiwal CA 6 Ha. Plantation 2012-13

July 2013

August 2021

March, 2022

STRUCTURES CONSTRUCTED

Name of Division : Bilaspur
Name of Site: Markand

Name of Division : Palampur
Name of Site : WHS Bhagotla

Name of Division : Dharamshala
Name of site : UP 75 K Chakban ther Gainda Nallah

Name of Division : Palampur
Name of Site : Shamlat Jamal Khad

Name of Division : Rajgarh
Name of Sites : Dharoti Ka Nala

Name of Division : Nalagarh
Name of Sites :

Name of Division : Una
Name of Site : Androli

Contribution: Chief Executive Officer, Himachal Pradesh State Authority, CAMPA

JAMMU AND KASHMIR

1. LOW-COST PLANTING INTERVENTION INITIATED BY J&K FOREST DEPARTMENT: UTILIZATION OF SEED BALLS

What is seed ball?

Seed balls are low cost and effective means of fast plantation, by encasing the seeds in a mixture of clay and compost. This protects the seeds by preventing them from drying out in the sun, getting eaten by birds, animals or from blowing away.

Why seed ball?

It is an affordable, sustainable and effective conservation tool for establishing vegetation in difficult areas.

Its preparation and application is extremely simple. Seed balls can be prepared in the forest nurseries with the already available ingredients. Once prepared and properly dried, seed balls can be transported to any difficult terrain and utilized. It offers such an ease of transportation and application, without the threat of drying out on the way, mortality, root shock etc.

How to prepare seed ball?

For the preparation of seed balls, common and locally available ingredients are utilized.

Ingredients:

1. Local soil with some clay contents (well seived). Higher clay content will make the seed balls hard to break during rain and hence be avoided.
2. Husk or coco peat. (As binding material)
3. Well rotten farmyard manure (Well seived).
4. Dried seeds of native species of grass, fodder, fruit trees and other multipurpose tree species as per objective of greening.

Cocopeat | Good Earth | Vermicompost | *Albizzia lebbek* (Siris) seeds

Ingredients required for preparation of seed ball

Process

Method of preparation:

1. Mixing of 1 portion of soil with half portion of farmyard manure and traces of husk/cocopeat.
2. Add water to make a good mixture and prepare the dough.
3. Take small quantity of dough in hand and roll into a ball. Create a hole in the middle of ball and place the

seeds (5-7 seeds for grasses or 2-3 seeds of tree species) in the hole and roll.

4. Rolling and compaction of seed balls should be such that it binds the seeds and the mixture.
5. Size of the seed ball shall vary as per the size of the seed.
6. Seed balls are to be dried under shade for 48 hours at least.

Points to remember:

1. Before making seed balls, test the viability of seeds, to check the viability of seeds by sowing small quantity of seeds in a sand bed or use recently collected seeds, unless seeds are known to have long viability.
2. Seeds showing high germination percentage should only be selected.
3. For better results, Orthodox seeds of native species should be used.
4. Recalcitrant seeds like neem, jamun etc with short viability should be avoided.
5. Local and hardy species may provide better results.
6. For effective germination, ratio of seed ball mixture should not be rich in clay content. If more clayey soil is added, ball will not split open even after getting enough rains. If the quantity of FYM or vermicompost is more, seed ball will not hold the shape of the ball. Hence a balanced ratio is required.

Preparation and drying of seed balls

Time for preparation of seed balls

For monsoon areas seed balls are to be prepared in the month of June.

Placement and broadcasting

Seed balls are not meant to be buried in the ground, instead, insert them partially in the ground. Make a small cup shaped hole in the ground, plant the ball so that its partially above and partially below the ground.

Best time for deployment of seed balls

Rainfall plays critical role in cracking the seed ball and exposing the seed so that the moisture reaches up to seed level. As the **s**eeds in the seed ball are wrapped in the mud and compost mixture, they first need to absorb water before germination. Keeping this fact in mind, it is recommended that seed balls should be deployed during pre-monsoon showers, so that it gets enough moisture for germination.

Number of seed balls to be utilized per hectare

Number of seed balls to be utilized for an area depends upon the condition of the site and type of treatment it requires. It may vary from 2000-4000 per hectare, when being treated mainly with seed balls.

Application of Seed balls

Areas where seed ball interventions can be applied	Site conditions and species suitable for making of seed balls
Muck dumping sites, landslide areas and mined over areas.	Muck dumping sites and other similar areas are dry and have low nutrient content. Therefore, selecting suitable plant species is important for initial rejuvenation. Native pioneer plants with semi-arid adaptive features are recommended eg: *Acacia mollisima, Acacia nilotica and Dalbergia sissoo.*
Inaccessible degraded & open areas and areas with steep slopes.	In steep slopes there is an apprehension of seed balls rolling over the hill and land in a gorge. For such steep slopes, seed balls are only effective if deployed in small cavities, that can hold the ball. However aerial seeding seems to have a better potential for rejuvenating steep slopes, eg: *Pannicum maximum* (Guinea grass), *Vetiveria zizanoides* (Khus grass), *Setaria sphacelata* (Jandi grass), *Carissa spinarum* (Gharna) and *Carissa Caronda* (Karonda).
Natural meadows and other grazing lands.	The serious problem of overgrazing in these vast grazing areas results in decreasing productivity. Seed balls of grass species like *Pennisetum pedicellatum, Setaria, Cynodon* species etc can be used. Some grass species of high altitude meadows are: *Trifolium partense* (Red clover), *Trifolium repens* (White clover), *Festuca arundinacea* (Tall fescue) and *Onobrychis viciifolia* (Sainfoin). All these species are native species.
Land under possession of BSF/CRPF/Army and other agencies.	As these areas are vast , seed balls of species like *Ficus benghalensis, Ficus religiosa, Delonix regia Terminalia arjuna, Butea monosperma, Syzygium cumini, Pongamia pinnata,Bauhinia variegata* and ornamental species can be utilized for monsoon areas. For winter zone, conifer species and broadleaved like oak, maple can be used.
Non forest lands such as *kahcharai* lands and other village common lands.	A significant amount of land is available in the form of *kahcharai* & other common grazing lands with panchayats which requires rejuvenation with grasses eg: *Pennisetum purpureum* (Napier), *Pennisetum pedicellatum* (Dinanath grass), *Cenchrus ciliaris*, *Setaria sphacelata, Panicum maximum* and *Dendrocalamus* (Bamboo) fodder like *Grewia, Melia*, *Albizia, Bauhinia, Emblica, Terminalia* and other multi-purpose tree species. Such lands can be covered with the involvement of PRIs/ BMCs/JFMC's by providing them with seed balls and other planting material. They will be planted, maintained, and protected by PRIs/BMCs /JFMC's itself.
Wildlife areas	Wildlife habitats can be rejuvenated with local fruit and fodder trees like *Zizyphus, Mulberry, Aegel marmelos, Ficus bengalensis, Psidium, Bauhinia, Dalbergia* etc may prove useful in mitigating human wildlife conflict.

Mode of deployment: Placement of seed ball/ Broadcasting

Placement of seed balls shall be made by making a small cavity in accessible area by using suitable implements like kudali. Broadcasting of seed balls to be done aerially in inaccessible area like steep slopes to cover maximum area.

Monitoring

For effective monitoring, it is recommended that seed balls are to be utilized in a defined area by a designated staff. Once seed balls are placed, the concerned field staff be officially entrusted with the responsibility of documenting the number of seed balls utilized and subsequent monitoring on germination and survival. For recording the performance of seed balls, the following format is recommended:

Mode of deployment of seed balls using seing and kudali

Along with this, information like rainfall, slope, elevation, terrain has to be reported as well.

Progress Documented

In the Financial Year 2020-21 and 2021-2022, 8.30 lacs and 50.51 lacs number of seed balls were prepared under CAMPA and other schemes. These seed balls were distributed to different agencies like Wildlife Department, Territorial Forest Divisions, National Highway and Gram Panchayats etc. for their placement and utilization in wildlife areas, steep slopes, muck dumping sites along national highway, old plantation units, private lands and others. Such broad-spectrum utilization was designed to test the efficacy of such low-cost plantation intervention in different areas with different species. The details of which is given below:

Table: Details of number, species, scheme and area of utilization of seed balls by J&K Forest Department:

S.No.	Financial Year	No. of seed balls (in lacs)	Scheme	Species		Area of placement and Monitoring
				Trees/Shrubs	Grasses	
1.	2020-21	8.30	CAMPA and other schemes	*Acacia catechu (khair), Acacianilotica (kikar), Albizzia lebbek(siris) Bauhinia variegate (Kachnaar), Dalbergia sissoo (shisham) Emblica officinalis (Amla), Psidium guava (Amrood), Ziziphus jujuba (Ber), Jatropha curcas (Rattanjot), Dodonea viscosa (Sentha), Pongamia pinnata (such chan),Sapium sebiferum (Makhan), Myrsine Africana (Googli)*	*Pannicum maximum (Reversdale grass/guinea grass) Setaria spp. (Jandi grass), Cenchrus spp. (Anjan grass), Napier grass- Hybrid (Pennisetum Purpureum X Pennisetumglauca), Bambusa bambos (Kantila bans), Dendrocalamus strictus (Laathi bans)*	Inaccessible areas: Steep slopes, along national highway, muck dumping sites, degraded areas, Wildlife areas and private land through Village Panchayats. Monitoring: Progress has been monitored by Beat Guard/designated staff under "One Beat Guard One Village Programme." in case of J&K.
2.	2021-22	50.51	CAMPA and other schemes			

The species selected for preparation of seed balls were indigenous and native of the area where they were broadcasted. It was found that seed balls give very good results in stabilization of slopes, if seeds of non-palatable eg. *Sapium sebiferum* and local species were utilized in making of seed balls. Therefore, for stabilization of slopes, pioneer species were selected like grass and shrubs species eg. *Dodonea viscosa* were used. It was also observed that seed balls of grasses especially *bamboo* and fodder grasses gave excellent results (ranging between 70%-75%) in Wildlife areas and old plantation units. Though the performance of seed balls of tree species vary from species to species. It has also been viewed that seed balls of species having big seed is not very successful.

Such low-cost plantation intervention reserves huge potential of greening degraded and inaccessible areas provided a little study of the local species with fast germination is done beforehand, the time of local seed collection is known and seed balls are placed just after the onset of first monsoon shower. However, some precautions are to be taken while carrying out the seed balls trials like fodder species are not to be utilized in open areas, because their initial growth may be got grazed by local livestock and one may not be able to witness the germination. Though, such measures shall vary from place to place and species to species.

Germination and growth of seed balls of *Dalbergia sissoo* after 4 months of placement.

Growth of seed balls of *Acacia nilotica* after 6months of placement

Table: Showing survival percentage of different species utilized for preparation of seed balls under different zones of Jammu and Kashmir

ZONES	TREES/SHRUBS		FODDER GRASSES	
	Species (Common Name)	Survival % age	Species (Common Name)	Survival % age
Sub-tropical to intermediate zone (500- 1500m)	*Acacia catechu (khair)*	12-15	*Pannicum maximum (Reversdale grass/guinea grass)*	70-80
	Acacia nilotica (kikar)	25-30	*Setaria spp. (Jandi grass)*	65-75
	Albizzia lebbek (siris)	35-40	*Cenchrus spp. (Anjan grass)*	60-70
	Bauhinia variegate (Kachnaar)	15-20	*Napier grass- Hybrid (Pennisetum Purpureum X Pennisetumglauca)*	80-90
	Dalbergia sissoo (Tali/shisham)	50-60	*Bambusa bambos (Kantila bans)*	80-90
	Emblica officinalis (Amla)	5-10	*Dendrocalamus strictus (Laathi bans)*	80-90
	Psidium guava (Amrood)	20-25		
	Ziziphus jujuba (Ber)	10-15		
	Jatropha curcas (Rattanjot)	50-60		
	Dodonea viscosa (Sentha)	50-60		
Temperate zone (1500-3000m)	*Pongamia pinnata*	65-75	*Festuca arundinacea (Tall fescue)*	70-80
	Sapium sebiferum (Makhan)	65-75	*Trifolium pratense (Red clover)*	60-70
	Myrsine Africana (Googli)	65-75	*Trifolium repens (White clover)*	60-70

Conclusion

Seed ball is a low-cost greening method and allows seed to germinate on site. With seed ball intervention large areas can be covered in short span of time. One of the main reasons for the campaign to continue is that it is an inexpensive way of regenerating forests when compared to other ways of afforestation and reforestation. It's an affordable, sustainable, and effective conservation tool for establishing vegetation in difficult areas.

Seed ball intervention has high potential in areas where protection from grazing is assured. The deployment of this intervention in landslide areas, wildlife areas, protected barren areas with land owning agencies and village panchayat areas is highly recommended.

Seed balls germinated and growing as plants

2. CONSERVATION OF RARE, ENDANGERED AND THREATENED SPECIES IN JAMMU AND KASHMIR UNDER CAMPA

Introduction

Himalayan birch or bhojpatra (*Betula utilis* D. Don) is a famous forestry species distributed in sub-alpine zone of Himalayan range between 2700 m to 4500 m. It makes tree line vegetation all alongside of the Himalayas and also on northern shady slopes and ravines. It is the only broad-leaved angiosperm tree species in the Himalayas which is widespread at subalpine altitudes. The species is endemic to Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Sikkim and Uttarakhand. It is a moderate size tree that can grow up to 20 m in height. The bark of Himalayan birch was used centuries ago in India as paper for writing lengthy scriptures and texts in Sanskrit and other scripts. Its use as paper for books is mentioned by early Sanskrit writers Kalidasa (c. 4th century CE), Sushruta (c. 3rd century CE), and Varahamihira (6th century CE). This species is also a valuable timber tree of commercial importance. The tree is also lopped for fodder, making agriculture tools and for fuel wood.

Birch currently has severely reduced population due to overgrazing and erosion occurs. The species has already been declared as critically endangered in Kashmir by Environmental Information System (ENVIS), Centre on Conservation of Medicinal Plants and Foundation for Revitalization of Local Health Traditions (FRLHT), Bengaluru.

Naturally growing *Betula utlis* mature tree in Udil range of Kistwar Division

Conservation needs

Betulaceae taxa has the ability to grow at high altitudes which means they serve a vital role in watershed protection, soil stabilization and conservation of wild populations. Birches in particular are good pioneer species and can rapidly colonise cleared areas, preventing soil erosion and paving the way for reestablishment of previous forest cover. These qualities make Birch an important species for use in reforestation and restoration projects of J&K Forest Department. In this context, it becomes imperative that high-Altitude nurseries are established by the department for raising of Birch saplings and their widespread plantation to give a head start in blanks or degraded areas. The J&K Forest department under the aegis of Compensatory Afforestation Fund Management and Planning Authority (CAMPA) Scheme has started conservation of Betula utilis in Sindh, Jhelum valley & Marwah Forest divisions.

Betula mature tree 10 feet girth at baltal Sonamarg, near Amarnathji Base Camp Co. 63(a)/Sindh

Conservation strategies

- Establishment of demonstrative plot for field front line staff, Conservationists, students & scholars of various institutions.
- In-situ conservation of Betula trees.
- Research in propagation and conservation of Betula trees.
- Nursery propagation of Betula species and artificial regeneration
- Reduction in biotic interference and sensitization of locals

Physical achievements

Sindh Forest Division, Ganderbal : The division started raising of Betula and its associate species in the year 2019-20 under "Betula Conservation Project". This project was launched in Malhar Nursery under CAMPA with the aim to use the raised saplings in reforestation and restoration projects of J&K Forest Department especially in the high altitude Sonamarg area and also along the Amarnath ji yatra tracks.

Table: Year-wise raising of Betula in Malhar nursery, Sindh Ganderbal

S.No.	Year	Supplies made	
		Betula nursery raising	Betula field planting
1	2019-20	26000	-
2	2020-21	27000	-
3	2021-22	10000	21000
Total:		**63000**	**21000**

Table: Availability of Betula saplings in nursery August 2022.

S.No.	Name of Plant species	Number available in nursery as on date
1	Betula	40542

Betula and maple grown in polybags.
(2 year old at Malhar Nursery Ganderbal)

Three year old Betula Saplings in polybags.

JV Forest Division Baramulla: The conservation efforts have started with establishment of Betula conservation unit at 3/Khad of Khadniyar Block of Doabgah Forest Range. The project is proposed to be executed in three financial years beginning year 2021-22 and the details of works to be taken up are as under: -

S.No	Year of Execution	Compartment/Nature of work	Quantity
01	2021-22	Chain Link Fencing	3000 Rft
		Plantation	2000 Nos
		Raising in Nurseries	10000 Nos
		Soil Moisture Conservation Structure	01 No
		Sub Total 2021-22	
02	2022-23	ANR (Patch Sowing)	4000
		ANR Dibbling/Seed inoculation of seed balls	4000
		Maint. Of Raised Saplings	10000 Nos
		Providing & Fixing of Shutter shed	01 No
		Sub Total 2021-22	
03	2023-24	Maintenance of Saplings	10000 Nos
		Plantation of raised saplings	10000 Nos
		Sub Total 2023-24	



Fencing and Planting of Compartment 3/Khd for the year 2021-22

Achievements for the financial year 2021-22

	Nature of Work	Quantity	Physical
01.	Fencing	3000	3000
02.	Soil Moisture Conservation Structure	01 No	01
03.	Planting	2000	1000

Marwah Forest division : The conservation work started through funds under CAMPA which were provided for both in-situ and ex-situ conservation of Betula utilis in regular annual plans of division. To conserve this species small units were established under CAMPA scheme which are detailed as under:

Year wise fencing carried out for *In-situ* conservation of under CAMPA Scheme

Range	Block	Year	Co.No	Area (ha)	Fencing (Rft)
Udil	Synthan	2018-19	76/U	4	1200
			76/U	4	1200
			76/U	4	1200
			77/U	4	1200
			77/U	4	1200
			77/U	4	1200
		2019-20	0	0	0
		2020-21	76/U	5	1500
			76/U	5	1500
			77/U	5	1500
			77/U	5	1500
		2021-22	77a/U	4	1200
			77a/U	4	1200
			77a/U	4	1200
			77a/U	4	1200
			77a/U	4	1200
Total				**64**	**19200**

Years wise plantation for *In-situ* conservation of the species under CAMPA scheme

S. No	Range	Block	Year	Co. No	Area (ha)	Plantation (target)	
						Phy (target)	Ach (Nos)
1	Udil	Synthan	2020-21	76/U	4	400	400
				76/U	4	400	400
				76/U	4	400	400
				77/U	4	300	300
				77/U	4	200	200
				77/U	4	300	300
3			2021-22	76/U	5	400	400
				76/U	5	400	400
				77/U	5	400	400
				77/U	5	300	300
4			2022-23	77a/U	4	500	500
				77a/U	4	500	500
				77a/U	4	500	500
				77a/U	4	500	500
				77a/U	4	500	500
		Total			**64**	**6000**	**6000**

Conservation outcomes

The species now is being propagated in department nurseries and conserved in natural habitat with increased focus given it ecological and cultural value. In the year 2021-22, Betula saplings were planted in special closures established in natural habitat areas as part of reforestation programme along with other conifer species in which saplings have shown promising growth. Moreover, in many new established units, wooden fencing also has been used rather than PCC concrete fence posts to minimize cost. The nomadic graziers and local villagers are sensitized simultaneously so as to ensure their active participation so vital for any conservation efforts. The conservation efforts are definitely moving in right direction e.g. in Marwah division fencing to prevent biotic interference in Co No. 77/Udil has resulted in good natural regeneration with new saplings in such closures coming up well.


Natural Regeneration of *Betula utilis* in Co 77/Udil of Marwah forest division

Moreover, for *Ex-situ* conservation of plants are being raised in different Nurseries in polybags, the seeds are being collected from pre-identified mature healthy trees in natural habitat areas with good natural patches


Seeds of Betula (*Betula Utilis*) being collected and used for Artificial regeneration

Future measures and way forward: A combination of *In-situ* and *Ex-situ* conservation measures are being followed which will be continued in areas identified for raising fresh saplings in wild by artificial plantation while conserving natural patches by elimination of biotic pressure. Also, efforts are now being initiated to link Betula conservation to Biodiversity Management Plans e.g. in Pakal Dul wherein sapling raising in different Nurseries this year is as under-

Year	Division	Name of the Nursery	No. of Plant to be raised (in PB)
2022-23	Kistwar	Chingam	10000
		Pathri Morh	10000
		Pahalgwara	10000
Total			30000

Proposed site in Co.55(b)/Sindh for reforestation of *Betula utilis* 2022-23.

In the current year of 2022-23, closures have specifically been proposed under CAMPA for restocking of the species in the forests including in Thajwas Wildlife Sanctuary Sonamarg. Hence, natural landscape which had species historically as part of its habitat are being targeted through intervention to help reclaim its pristine old glory.

Pinus gerardiana spps

Introduction

Pinus gerardiana locally known as "CHILGOZA" is an economically important slow growing, evergreen, endemic tree species of family Pinaceae. The species is scattered among 2000 as well as 3350 m of elevation in valleys of the North-West Himalayas including J&K. On an average site quality, the tree reaches maturity at the age of 80-100 years It is endemic in forests of Kishtwar Forest Division and as is the case elsewhere, it is considered an important species because of its influence on ecological processes and economic dependence of local people in the region. Health benefits of eating Pine Nuts include reduces the risk of heart disease, cure diabetes, reduce cancer risk, boost in brain health, improve bone strength etc.

Mature *Pinus gerardiana* tree growing in Paddar Range of Kishtwar Forest Division

Conservation needs

Natural regeneration of chilgoza pine is very poor or entirely lacking in most of its traditional areas The most important factor responsible for this of course is the collection of cones by the locals/right holders. Due to collection of edible seed by human beings, practically no natural regeneration can be expected and is limited to cliff rocks and areas where there are plenty of bushes to protect young seedlings from birds and rodents. Similarly, goat grazing is also very inimical to natural reproduction, although some seedlings may appear under the protection of thorny bushes. Beside these, species has erratic and infrequent seed year and dormancy related problems which also reduces its regeneration in natural habitats. So severe biotic interference and lack of regeneration in this pine may result in the extinction of the species. Accordingly, Jammu and Kashmir Forest Department started special projects under CAMPA scheme starting with Kishtwar forest division. Fencing of degraded areas followed by afforestation through plantation of nursery raised chilgoza pine saplings are expected to bring quicker results to the Chigoza population in the area but wider requirement for its salvation lies in measures to promote natural regeneration by better management of adverse factors described about could protect this species

Pinus gerardiana seeds collection for nursery raising of saplings and artificial regeneration

Conservation strategies

- Fencing of the traditional and degraded areas for reducing biotic interference and ex-situ conservation of species.
- Seedlings raising in departmental nurseries starting with Kistwar forest division
- To develop behavioural change and generate awareness among local villagers for checking over exploitation of Chilgoza pine.
- Promoting Chilgoza pine under 'Har Ghar Hariyali' initiative of J&K government to augment the "Trees Outside Forests" (TOF) and ensuring constant supply of Chilgoza seed to local as livelihood as a long-term measure

Physical achievements

The work on conservation has been started in Kishtwar forest division and till date 55 ha of forest area stands fenced and 15000 saplings have also been raised in Gulabgarh Nursery to be planted in current year in fenced area. In order to conserve aforementioned species, special funds under CAMPA are being provided to the Kishtwar Forest Division for fencing of vulnerable areas.

The Year wise details of works is as under-

S. No.	Year	Division	Comptt. No.	Area Fenced (ha)	Fencing (Rrt)	Sowing/ Dibbling	DRSM
1	2019-20	**Kisthwar**	12/P	15	4500	0	70
2	2020-21		12b/P	10	3400	20000	300
3	2021-22		13/P	30	9000	0	220
		Total		**55**	**16900**	**20000**	**590**

Fencing work in Comptt. 12/Paddar of Kistwar forest division

Chilgoza saplings raised in Gulabgarh Nursery in Paddar Range of Kishtwar Forest Division

Conservation outcomes

Pinus gerardiana conservation measures have shown success to great extent. The seed collected from healthy mature trees in forest have shown germination though germination percentage is on lower side. Still saplings have been successfully raised in the nursery by Kishtwar forest division. These plants shall be transplanted in the fenced area will help in ex-situ conservation of the species. However, no natural regeneration is seen in already fenced areas which remains a cause of concern requiring more research into this issue.

Future measures and way forward

In the current year i.e., 2022-23, a total of 15000 poly bagged nursery raised saplings will be planted in already fenced areas in Comptt. 12/P & 13/P and this will be followed by 20000 another plantation in 2023-24. Subsequently, the field survival data will be recorded and used to develop future large-scale plantation if encouraging results are seen. The local villager awareness about species importance with special camps will simultaneously be done so that grazing in fenced areas by tress pass is checked. Additionally, Chilgoza saplings will also be distributed among villagers under 'Har Ghar Hariyali' initiative beginning from current year 2022-23.

Taxus wallichiana

Introduction

Taxus wallichiana Zucc., common name Himalayan Yew is a tree belonging to family Taxaceae. In India, it is found at altitudes between 1800 and 3300 m above mean sea level. It is a medium-sized, temperate, Himalayan Forest tree of medicinal importance with adult tree having 10-20m height and 1.5 to 1.8m girth. It has been used by the native populations in treatment of common cold, cough, fever, and pain. Its uses are described in Ayurveda and Unani medicine. It received attention recently as its leaves and bark were found to be the prime Contribution of taxol, a potent anticancer drug. Taxus species in Himalayas are often found growing under the canopy of other tree

A mature *Taxus wallichiana* tree

species such as *Abies pindrow, Betula, Pinus wallichiana, Acer cesium, Rhododendron arboretum* and *Quercus semecarpifolia.*

Conservation needs

A decline of Himalayan yew populations in the wild has been linked with decline in associated traditional knowledge of its medicinal uses and ethnobotanical importance among the younger generations especially of indigenous villagers including ayurvedic practitioners. Various risk factors have been attributed to reduction of numbers over time. At present risk factors like small population size, slow germination from seed and propagation, narrow range, habitat specificity destructive harvesting, over grazing and utilization pressure for medicinal uses has increased the risk of extinction with no sizeable regeneration from natural forests reported in present habitat in J&K. Keeping in view these threats and its ecological and medicinal importance, JV Forest Division started Taxus conservation Project in Baramulla district.

Conservation strategies

- Establishment of closures in natural habitat by fencing to create effective barriers for preventing biotic interference
- Sensitization of field front line staff, local villagers for awareness
- Taking help of Conservationists & scholars of institutions /universities to identify potential the sites for plantation in wild
- Simultaneous ex-situ and In-situ conservation measures for research and analysis to use data for better propagation and conservation of Taxus trees.
- Nursery propagation of Taxus species for artificial regeneration and faster revival.

Physical and financial achievements

The project is proposed to be executed in three financial years and the details of works taken up and to be taken up are as under: -

Sr. No	Year of Execution	Compartment/Nature of work	Quantity
01	2021-22	Chain Link Fencing	3000 Rft
		Plantation	2000 Nos
		Raising in Nurseries	10000 Nos
		Soil Moisture Conservation Structure	01 No
02	2022-23	ANR (Patch Sowing)	4000
		ANR Dibbling/Seed inoculation of seed balls	4000
		Maint. Of Raised Saplings	10000 Nos
		Providing & Fixing of Shutter shed	01 No
03	2023-24	Maintenance of Saplings	10000 Nos
		Plantation of raised saplings	10000 Nos

Achievement for the financial year 2021-22

S.No.	Nature of Work	Quantity
01.	Fencing	3000
02.	Soil Moisture Conservation Structure	01 No
03.	Planting	2000
04.	Plant Production	10000

Chain link fencing done to prevent biotic interference in JV forest division

Sapling in Polybags raised from local seeds

Pit preparation and plantation of saplings in flied in closures

Conservation outcomes

The chain link fencing and artificial regeneration measures taken till date have shown that it is possible to rapidly revive and repopulate the degraded area. The saplings planted are under study to examine the field growth parameters and mortality data which would lay ground for future interventions. Nursery poly bag raising stands successfully done and it scaling up with dedicated and well-trained staff can achieve much greater success of the project.

Future measures and way forward

Due to very low regeneration of Taxus from seeds there is need to enhance it artificially which can be done by applying different seed treatments at Nursery stage, also further experimentation is needed to find the alternative method of propagation involving vegetative methods. Seed mother trees need to be scientifically marked with help of experts so that better germplasm at initial stage is used to produce study saplings which can survive first few years in field after plantation.

Buxus wallichiana

Introduction

Buxus wallichiana locally known as 'CHIKRI' is an economically important slow growing, evergreen, endemic tree species of family Buxaceae. On an average site quality, the tree reaches maturity at the age of 40-50 years. It forms the populations in the high altitude of north-western Himalayas. This plant is used for the manufacture of large variety of handicrafts like Combs, Pen stands, Hangers, Toys, Decoration items etc. which are sold in the local markets. It is also an important part of cottage industry of Poonch-Rajouri region and the livelihood of many artisan families depend on this valuable species. It generates good income to the people who are involved in the wood carving industry. Due to increasing demand of Chikri handicrafts, over grazing, usage of such wood for fuel by locals and nomads, Chikri trees especially those outside demarcated forests are facing threat of reduced numbers. Besides this, Buxus wallichiana is traditionally used in indigenous and local medical health care as a bitter tonic. It is considered Diaphoretic, Vermifuge, Anti-rheumatic, Antihelmentic, Analgesic, Purgative, Diuretic, Antiepileptic, Antileprotic and is considered useful in haemorrhoids.

A mature *Buxus wallichiana* tree growing in Comptt. 49/K of Kandi range Rajouri Forest Division

Conservation needs

Chikri wood is an important local cottage industry and artisans create beautiful traditional handicrafts. Initially the artisans used to procure Chikri wood from the private lands but with increasing demand and overexploitation leading to decline in number of Chikri trees in the private lands, people shifted toward the forest areas for the procurement of Chikri wood. Initially, in order to conserve such RET-species including chikri which many scholars consider as threatened, the Jammu and Kashmir Forest Department started special projects under CAMPA scheme for fencing of Chikri forest areas. The fencing has yielded good results and regeneration has been observed in the such fenced forest areas which is an encouraging sign. Hence, to further strengthen conservation, special funds under CAMPA have been provided to the Rajouri Forest Division and Poonch Forest Division for fencing of vulnerable Chikri areas for protection and prevention of such trees.


A natural patch of Chikri in 50/K Beat Budhal B Range Kandi of Rajouri Forest Division

Conservation Strategy

- To fence the area having good Chikri patches in the wild and prevent its degeneration by the nomadic and the local village livestock (especially the sheep and goat), which while passing through the CHIKRI patches feed upon young saplings and trample the newly grown seedlings. Hence in order to promote the natural regeneration, Closures have been established in vulnerable areas.
- To conserve this plant, seedlings have also been raised in polybags at departmental nursery at Kandi which are being used in Artificial regeneration through pit plantation.
- To develop behavioural change and generate awareness among local villagers who used to burn Chikri wood for cooking to switch to alternate/cleaner fuels
- Promoting the Chikri Plants under 'Har Ghar Hariyali' to augment the "Trees Outside Forests"(TOF) and ensuring constant supply of wood to artisans and simultaneous reduction of pressure on forests

Physical achievements

The details of special closures with following targets were established with funds received under CAMPA are as under-

S.No.	Year	Range	Compartment No.	Area Fenced	Rft	Plantation
1	2020-21	Rajouri and Kandi	113/R,106/R, 40/R,48/R,22/R	48 Ha.	14400 feet	18000
2	2021-22	Kandi	22/R,40/R,50/R	68 Ha.	20300 feet	25500
		Total		**116 Ha**	**34700 feet**	**43500**

Besides this, 10,000 Chikri saplings have been raised at departmental nursery kandi for plantation in the year 2022-23.

Conservation outcomes

The fencing has definitely checked not only overgrazing but also acted as physical barrier for biotic interference. Illicit damage also has been reduced significantly by meetings with local villagers by involving Sarpanches and explaining the need to help save young saplings and a positive response for conservation has been seen. Young plants are coming up well which is largely encouraging sign in closures.

Linking Employment Generation and Cultural value and conservation

A total number of around 125 families are involved in Chikri handicraft production at Thanamandi, Baribekh,and Mangota areas of district Rajouri. The wooden products are sold in the local markets especially in the famous market around Shadra Sharief Sharine. Also, these products are sold in handicraft shops in the towns of Rajouri and Poonch. Tourists and Pilgrims are the main buyers of these handicraft items. The Handicraft articles made of *B. wallichiana* wood is considered blessings of the holy Shrine and hence, boxwood products have good market demand. Hence, these handicraft families have been identified and engaged to look into alternatives to chikri wood for which abundantly available shisham, mango, etc are being tried. Many have come forward for demanding chikri saplings to be planted in their private lands as well as volunteered not to cut chikri from forest nearby villages.

Traditional handicraft items made from Chikri wood by local Craftsman

Chikri young plants conserved due to efforts of local staff with sensitization of villagers

Future measures and way forward

The J&K Forest department recognises the handicraft involving the Chikri products as an important traditional livelihood which needs to be preserved and promoted in a sustainable manner. This needs to be scientifically managed by sustainable supply of Chikri wood not only from the forest i.e, dry and fallen wood but also from Chikri trees outside forest areas. Hence as a part of 'Har Ghar Hariyali' campaign, from current year 2022-23, Chikri saplings will also be distributed among villagers around traditional Chikri areas especially where local artisans are involved in making Chikri handicrafts. It is envisaged that the Village Forest committees in these areas will be engaged closely to ensure the sustainable raw material supply to secure the livelihoods without compromising the conservation needs with respect to the species. The capacity augmentation of Kandi nursery is also envisaged which will be done with CAMPA funds so as to raise more saplings for planation in closures established in degraded Chikri areas in phased manner.

3. SPECIAL PROJECT UNDER CAMPA: GREENING OF KANDI RANGE (KAMRAJ FOREST DIVISION, NORTH CIRCLE KASHMIR)

Kandi Range of Kamraj Forest Division was subjected to considerable amount of degradation, particularly due to illicit felling of trees for timber and firewood during the peak period of turmoil in Kashmir Valley.

This range forms catchment of Wular Lake, one of the largest fresh water lakes in Asia and a Ramsar site. The major crop of the range is mixed coniferous forests i.e. Deodar, Kail and Fir.

The department has taken several measures to rehabilitate these forests. On the one hand, strict enforcement measures are being taken against habitual timber smugglers and on the other hand, assisted natural and artificial regeneration of forests are being undertaken since 2019 in a project mode, with the involvement of local people. Special attention has been paid to increasing livelihood opportunities for the local people in these activities. A total of 78 ha degraded forest area has been rehabilitated with protective fencing and planting of 1.12 lakh plants by the end of March 2022.

Besides, a montane eco-park and trekking routes have been developed in the area which are attracting large number of tourists, thus contributing towards the livelihood for the local people. The strategy is giving encouraging results. The illicit damage and other forest offences have completely stopped and forests are showing signs of recuperation and restocking.

View of Wular lake from Kandi Range of Kamraj Forest Division

Old stumps showing forest degradation in Co.30 of Kandi Range

Montane Ecopark established by J & K Forest Department as part of Entry Point Activity in Village Rajpora of Kandi Range.

Green Kandi Project
Forest Nursery Located in Baramulla District




Local Labour engaged in Plantation Works providing them livelihood


Plantation in Co.30/K under CAMPA- Area treated 30 hectares and Plants planted 37500

Plantation in Co.35/K under CAMPA- Area treated 13 hectares and Plants planted 11150

Local Labour engaged in Plantation Works providing them livelihood

Before

After

Area treated by way of fencing and plantation under Green Kandi Project under CAMPA

Aerial View of treatment site showing regeneration in plantation site Co.30/k in Kandi Range

4. AFFORESTATION OF CRITICALLY DEGRADED AREAS

Tosamaidan (king of meadows) is a large tract of meadow in Pir Panjal Forest Division of Kashmir region. With glaciers in the backdrop, meadows and water bodies of Tosamaidan are surrounded by Kail and Fir forests with occasional broadleaved associates like Ash, Maple, Bird Cherry and Walnut. The area has been brought on the tourist map and the Government has set up Tosamaidan Development Authority for development of the area for tourism purpose.

During the peak of turmoil in the valley, forests of Tosamaidan were subjected to felling of trees by timber mafia. Besides the area is subject to excessive and uncontrolled grazing pressure. Thousands of livestock graze the area during the short growing season from mid-May (after melting of snow) to mid-October (before snowfall).

With a view to restore the pristine glory of Tosamaidan forest area, a special project was taken up under CAMPA in 2018-19. A total of 224 ha of degraded forest area has been rehabilitated with chain-link fencing and planting of 1.85 lakh conifer, broadleaved and medicinal plants since 2018-19 till March 2022. The measures also include soil & moisture conservation works to improve the moisture regime.

With effective closure to grazing leading to improvement in soil stability and ground cover, the root stock is coming up well, particularly the medicinal plant wealth. Natural regeneration from seed bearing conifer trees has also started appearing during the current year.

Further, in order to enhance livelihood opportunities for the local communities, trekking routes have been developed which are being utilized by tourists.

Co.104/Kh Bandipora Forest Division

Before (2016)

After (2020)

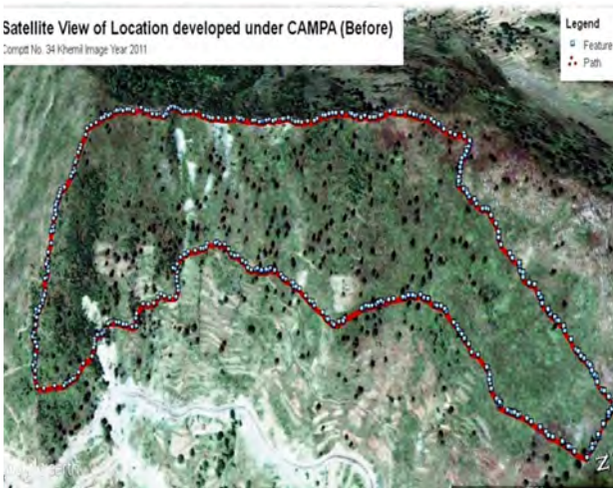
Co.43/M (Hengnikoot) (2015-16) Langate Forest Division

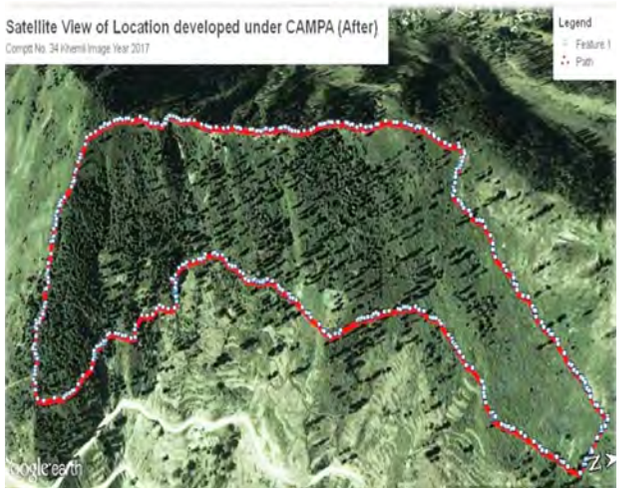
Co.43/M (Hengnikoot) (2015-16) Langate Forest Division

Before (2016)

After (2020)

KMZ file of Comptt 34, Kehmil Before treatment (in 2011) & After treatment (in 2017)





Before

After

Co. 22/Btt. Nashri Near Sumit Dhaba (2019-20 & current financial year)

Fencing = 500 Rft, Grass Slip= 500 Nos

Contour = 42.92 Cum, DRSM = 40 Cum

Before

After

Installation of Coir fiber logs to control surface soil erosion

Before

After

Before

After

Before

After

Laying of Non woven Geo textile mat is going on along the National Highway at Co. 23/Btt. Dhalwas Needle Specification:- Needle punched coir felt with double side PP netting

Co. 89/Dudu Dogra (2014-15)

Intervention :-

Fencing = 6000 Rft, PB Plantation = 8000 Nos

After One Year

After Five year

Profuse Regeneration of Chir Pine

Contribution: Chief Executive Officer, Jammu and Kashmir State CAMPA

JHARKHAND

1. "ENHANCING CLIMATE RESILIENCE OF FORESTS AND ITS DEPENDENT COMMUNITIES IN JHARKHAND THROUGH CAMPA"

Introduction

Jharkhand was carved out of the southern part of Bihar state on 15 November 2000. Jharkhand shares its border with the states of Bihar to the north, and Chhattisgarh to the west, Orissa to the south, and West Bengal to the east. It has an area of 79,714 km^2. The name "Jharkhand" means "The Land of Forests". Jharkhand accounts for 3.4% of the total forest cover of the country and ranks 10th among all states. The recorded forest area of the state is 23,605 sq. km which is 29.61

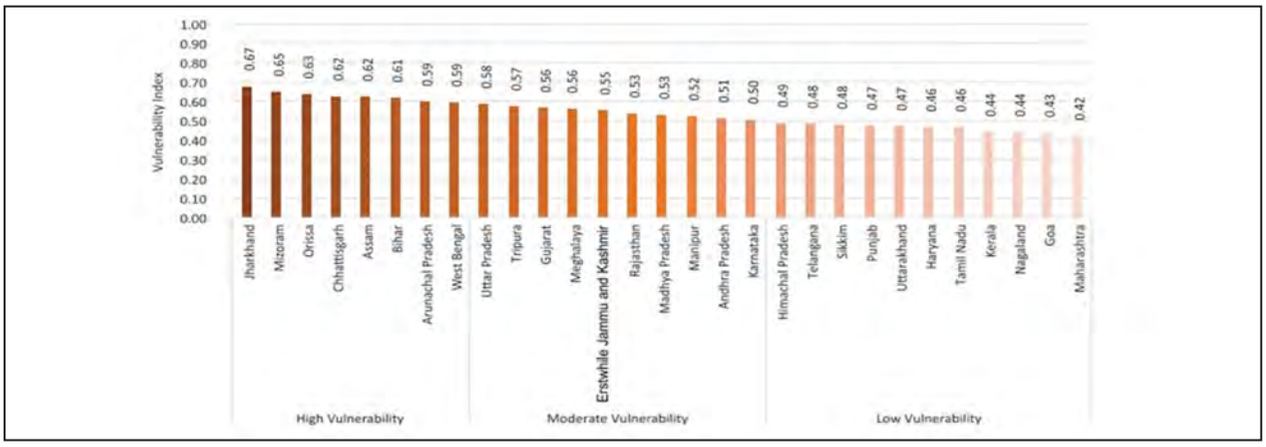
% of the geographical area of the state. As per Champion and Seth (1968) Classification for Forests, the state has five forest types viz. Moist Peninsular Low Level Sal-3C/C2e (ii), Dry Peninsular Sal-5B/C1c, Northern Dry Mixed Deciduous Forest-5B/C2, Dry Deciduous Scrub- 5/DS1, Dry Bamboo Brakes- 5/E9. These belong to two major forest type groups viz. Tropical Moist Deciduous-Group -3 and Tropical Dry Deciduous Forests-Group -5. The Forest Types of India: Revisited (2013) by ICFRE, Dehradun has revised them as Moist Peninsular Sal-III/IIID, Dry Mixed Deciduous Forests-V/VC, Dry Sal Bearing Forests-V/VD and Dry Grasslands- V/VE. The important sps. which constitute the forests are-Sal, Teak, Mahua, Asan, Dhaura, Gamhar, Kusum, Palas, Arjun, Chiraunji etc. The richness of flora of Jharkhand (erstwhile Bihar) was described by H. H. Haines in his book titled The Botany of Bihar and Orissa (Haines 1921-1925) and the book A Forest Flora of Chotanagpur (Haines 1908). Working Plans of Forest Divisions are also valuable Contributions of information about flora of that area.

Jharkhand has 32 tribal groups. These are the Asur, Baiga, Banjara, Bathudi, Bedia, Binjhia, Birhor, Birjia, Chero, Chick-Baraik, Gond, Gorait, Ho, Karmali, Kharia, Kharwar, Khond, Kisan, Kora, Korwa, Lohra, Mahli, Mal-Paharia, Munda, Oraon, Parhaiya, Santal, Sauria- Paharia, Savar, Bhumij, Kol and Kanwar.

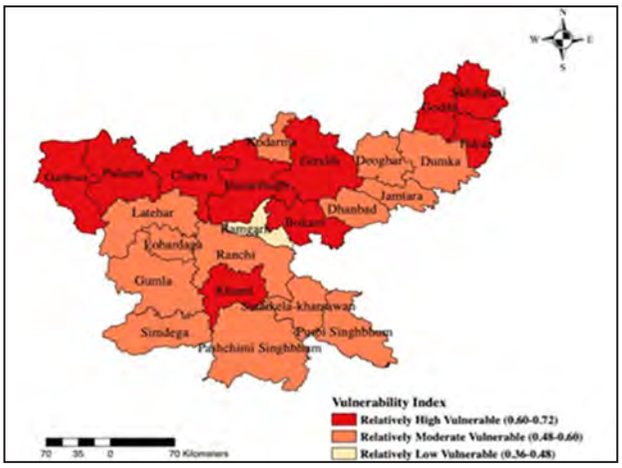
Forests make up 29.76 percent of the Jharkhand's land mass and provide essential reContributions to the daily livelihoods to forest dependent communities– close to 1/5th of total population. Forests are key to ecosystem services, including mitigation and adaptation to climate change, influencing weather patterns, capturing and storing carbon, providing food and fuel wood for many poor and vulnerable communities, conserving biodiversity and generating employment.

Despite its green cover , the state has the highest vulnerability to climate change, with a vulnerability index of 0.6742. Ten of the state's 24 districts, namely Sahibganj, Pakur, Chatra, Garhwa, Palamau, Giridih, Hazaribag, Bokaro, Khunti, and Godda, are classified as highly vulnerable . Department of science and technology has carried out a study for measuring vulnerabilities across states and districts in which the highest vulnerability index was obtained for Jharkhand (0.67) and the lowest for Maharashtra (0.42). This vulnerability ranking is based on a set of indicators that were used in this assessment with a specific objective.

These indicators predominantly focused on socio-economic drivers as well as those related to primary sector- based livelihood along with some biophysical and institutional factors.



Contribution: Vulnerability report by DST-Govt of India



Further Jharkhand has also lagged behind in many of the Sustainable Development Goals (SDGs). It has shown negative trends in most of the indicators across the different SDGs.

Contribution: SDG report for India by Niti Ayog (Page no-223)

Summary of the initiatives taken under various schemes of CAMPA for mitigation and Adaptation by Department of Forests, Environment and Climate Change, Jharkhand:

The underlying objective of the CAMPA scheme is to compensate for forest land that is diverted for non- forest use. This mandate continuously adds to the pool of forest reContributions and has created a massive green cover in the state and resulted in social and economic outcomes.

These works envisage to enhance capacities and providing support services for facilitating Adaptation; Create carbon sink for mitigation, improvement of forest micro climate through Soil and Moisture Conservation (SMC) & Water Harvesting (WH); enhancement of gender sensitivity and climate resilient livelihood systems; and to bring about energy-use efficiency and alternative energy use. The works undertaken under CAMPA have brought visible contribution in the wake of the national commitment to make India carbon neutral by 2070. The idea of LiFE and Panchamrit by the honourable Prime Minister is also gaining attention under compensatory afforestation schemes.

1. Creation of Carbon Sink

1.1. Climate change mitigation: CAMPA plantations have created massive carbon sinks with the potential to offset GHG emissions and increase carbon sequestration capacity. As of 2021, carbon sequestration from a sample area of 72.193 ha of the CAMPA plantations (2016-17, 2017-18, 2018- 19) was found to be 907.29 tons and the carbon capture (CO_2 offset) was 3320.713 tons CO_{2e}. Thus, plantations created under CAMPA have the potential to limit the effect of climate change. Also, the large volume of carbon accumulated in the soil improves its quality.

1.2. Carbon markets: Forestry sector has gained prominence in carbon markets in recent years as policymakers, regulators and other key stakeholders realize its vast potential to reduce and offset carbon dioxide. Regulated markets and rapidly evolving voluntary markets allow for commoditisation of sequestered forest carbon for trade. Today, the forestry sector alone makes for almost half of the global carbon offset credits. In this context, the vast plantations under CAMPA (Jharkhand) have the potential to benefit from forest carbon offset mechanism. Out of the three different project types[1] that qualify to produce carbon offsets, CAMPA scheme in Jharkhand can participate in the afforestation or reforestation category which is linked to projects restoring tree cover to previously non-forested land.[2] The assessment of the scheme's performance in 3 years alone has recorded more than 127 species in the surveyed sites, spread across approximately 9515.2 ha. The carbon stock for 9515.2 ha of CAMPA plantations is broadly estimated to be 717,350.93 tCO^2/ha.[3]

[1] Other two types of projects- Avoided Conversion (AC)- Preventing the conversion of forested land to non-forested land; Improved Forest Management (IFM)- Projects involve land management activities that increase or at a minimum maintain the current level of carbon stocking.

[2] https://content.ces.ncsu.edu/an-introduction-to-forest-carbon-offset-markets

[3] Calculated based on forest carbon stock estimates for Jharkhand published by Forest Survey of India in the *State of Forest Report 2019*. **Forest carbon stock in Jharkhand=75.39 tCO2/ha**

1.3. Ecosystem services: Forest is an important reContribution in Jharkhand and provides several ecosystem services that range from provisioning to indirect regulating and supporting services, as also cultural services in the forms of tourism and religion in Jharkhand. For instance, it is an important Contribution of fruits, seeds and medicinal plants for the local population living in fringe areas. Similarly, they also provide key regulating services in terms of site-based air quality regulation, climate regulation, water regulation (Water conservation, water quality and health maintenance), carbon sequestration, as well as regulation of natural hazards (storms, flooding, etc). In terms of cultural services, the local population has new avenues for eco-tourism and spiritual and religious tourism. The total valuation of ecosystem services from the surveyed CAMPA plantations is INR 18506.08 million per year of which INR 4503.87 is from Assisted Natural Regeneration (ANR) sites and 14002.21 from Artificial Regeneration (AR) sites

1.4. Reduce biodiversity loss: CAMPA activities in Jharkhand focus on preservation and protection of forest biodiversity and the assessment of CAMPA scheme has recorded more than 127 species . Controlling overgrazing and forest fires are key activities to protect biodiversity. Control of overgrazing helps improve soil quality by preventing surface erosion. Similarly, control over forest fires protects the natural habitat of local floral and faunal species.

Under CAMPA, a range of wildlife interventions are also undertaken to protect and preserve the rich biodiversity found in Jharkhand. Interventions like water holes and check dams prevent animals from migrating into new habitats due to water shortage. Culverts and causeways constructed under the scheme has reduced damage to flora from water logging and erosion. Lastly, structures like watch towers and elephant proof trenches help in protecting wildlife.

1.5. Productive use of reclaimed land: CAMPA works have reclaimed barren land into forest cover. Such land would have otherwise laid unproductive, contributing to soil erosion and negatively affecting air quality. Communities have observed a decline in wind erosion, which is a health hazard that causes difficulty in breathing and allergies. The greenery of the plantation sites, which were previously barren, have created intangible aesthetic value at the community level. These plantations are also a Contribution of firewood for subsistence for the forest fringe communities.

2. Infrastructure development: Roads constructed during the plantation phase have yielded additional benefits for remote villages located near these plantation sites by improving connectivity to other areas. Similarly, soil and moisture conservation structures such as check dams constructed under CAMPA are able to control the flow of water and thus reduce surface runoff. Communities

Forest of Palani (Ramgarh) towards REDD+

have observed higher water levels after soil moisture conservation structures were constructed under CAMPA that has improved water availability.

3. Capacity Building Initiatives for Adaptation : Capacity building is the process by which individuals obtain, improve or retain the skills, knowledge, tools, equipment or other reContributions to do their work competently. It also refers to further developing the performance and thus leading to greater capacity. Villagers of 2500 villages have been given training in different aspects especially for preparation of microplan. The microplan covers all the aspect of village /forest development.

- **Awareness generation:** Under awareness generation villagers and members of JFMCs have been made aware about the changing weather patterns and climate in their area. Awareness of lesser use of chemicals, soil health, reasons for forest fires, improved cultivation practices , management of forests have been done
- **Income generation:** They were trained on taking up different livelihood intervention under the project with adaptive capacity built for taking up these interventions. These include agriculture and animal husbandry based livelihood activities. Mostly the existing skill sets have been improved.
- **Employment generation:** CAMPA engages local population in the creation and maintenance phases of planting and other operations such as nurseries

Capacity building and interaction with villagers

construction works. Depending on the size of plantation, an average 20 to 40 man-days is generated during advance work and planting phases, and both men and women participate equally. GKRA- Hazaribagh , Giridih and Godda districts were selected under GKRA during COVID -19 to give employment to migrated labours in 2020-21 from CAMPA fund .Plantation was carried out on 9058.37 Ha and generated 404548 mandays in these three districts. Similarly 5605872 mandays were created under Atmnirbhar Bharat in all the 24 districts from CAMPA fund.

- **Forest based livelihoods:** As the major aim of CAMPA project is to carry out afforestation work . Plantation of Species of NTFP has helped to generate livelihood . Regeneration of Sal after coppicinig operation has helped in harvesting for making sal leaf plates. Similarly, Palash and Kusum species, which are also available in the plantation sites, could be used to cultivate Lac.

Most of the trainings have been based on the low carbon life style ranging from agronomic practices like use of organic formulations in place of chemicals to use of improved cook stoves for reducing fuel wood consumption. All these will contribute to the INDC.

4. Improving local micro climate through soil and moisture conservation and water harvesting structures: This has been the most important initiative as this is the core for success of the project. Under this initiatives activities can be divided under three heads-

- **Area treatments:** Area treatment helps landscapes in reducing soil erosion, improving ground water percolation, changing land use pattern, reversing land degradation and improving soil carbon. In last five years Area treatment with Contour trenches is 48972.29 ha and Drainage line treatment with 97943 gully plugs . Contour trenches can help in arresting of 29,18,749 Cum of runoff water per year.
- **Water storage and harvesting structures:** These are structures built for storage of runoff and use of the surface and sub-surface flow ..3500 Checdams have been constructed.

Check dam in Jamshedpur

Cropland near check dam

Interventions under this component have played a great role in moving towards carbon neutrality by reducing emission and increasing sequestration. Activities like contour trenches, gully plugging and check dams have supported in reducing emissions by ensuring greater ground water recharge and gravity irrigation where as it has also helped in carbon sequestration through deposition of silts in the contours, and check dams. Drainage line treatments have led to improvement in the flow in the drainage line and reclamation of land degraded due to deposition of sand in the fields. Further activities like plantations have directly supported in sequestration to the tune of 2 tons of CO_2 equivalent per hectare.

The improvement in the soil moisture regime in have led to improvement in the natural regeneration along with improving flow in the originating drainages and improvement in water levels of wells in the villages as observed by the villagers. Thus, the work has helped in low carbon lifestyle in the landscapes for moving towards low carbon lifestyle.

Capacity building measures with support system of weather station has helped in climate resilient and low carbon crops. Training on animal husbandry and integrated farming systems has led to greater productivity per unit area with lesser emission.

Intervention in SMC and WHS has led to increased area under irrigation and creation of more water storage structures, which help in carbon sequestration.

Conclusion:

Hence works undertaken through CAMPA have brought visible contribution in the wake of the national committment to make India carbon neutral by 2070. The idea of LiFE and Panchamrit by the Hon'ble Prime Minister is also gaining attention under compensatory afforestation schemes.

2. CAMPA – A TOOL OF GREEN JOB TO MIGRATING PRIMITIVE TRIBE

In the year of 2011, Works under CAMPA were just started. It was the month of July 2011. We came to know that Sabar families of Jamshedpur were planning to move out of Jharkhand in search of daily wage employment. They were planning to leave their villages to look for jobs outside Jharkhand. Although they had not decided which place to go to, they were lured by job opportunities through local agents supplying workforce to different clients including private construction agencies, farms and other employers in states like Maharashtra, Tamil Nadu, Punjab, Madhya Pradesh, Chhattisgarh, Karnataka and even Jammu.

Sabar is PVGT (Particularly Vulnerable Tribal group) with only 9688 in number in Jharkhand (census 2011). They are mostly concentrated in East Singhbhum (Jamshedpur). For the survival of PVTGs it is necessary that their traditional habitat and culture is maintained which cannot be possible if they move out of the state. I was posted as Divisional Forest Officer, Dhalbhum (Jamshedpur). As these tribes live in nature, when I came to know about their plight, I planned to talk to them and offer employment. We get fund under CAMPA with the objective to increase green cover (CA) and compensate Ecosystem services which lost during diversion of forest land. These people are at the centre of nature. Hence we first offered them works under CAMPA. Before the Sabar group comprising Batu Sabar. Manglu Sabar, Phulmani Sabar, Parvati Sabar, Madhu Sabar and Somvari Sabar could go ahead with their plans; we visited Musabani immediately offered them jobs for the plantation drive being carried out by the forest department for which the funds are provided by the compensatory afforestation management plan authority (CAMPA) of the central government. They were roped in plantation activities, road repairing, construction of check dams etc. In first phase twenty families were of Sabars were involved in Musabani and Ghatshila block. Later on it was extended to other blocks also with other PTGs also. These works not only gave them wages (Green Job) but also improved infrastructure of their villages. It also improved livelihood option based on NTFPs. Saplings of Arjun, Asan, Kusum were planted which are host trees of Tassar silk and Lac cultivation. It fulfilled the ultimate objective of CAMPA also to increase green cover and improve ecosystem services.

Excerpts of some newspaper-

TELEGRAPH- "If the migration of members of a primitive tribe has stopped at Tumangkocha village in East Singhbhum's Musabani block, it's mainly because of the forest department.

The Dhalbhum forest division has roped in as many as 20 Sabars to work as daily wage-earners under CAMPA (Compensatory Afforestation Fund Management and Planning Authority), thus preventing them from moving to other states in search of livelihood. CAMPA was envisioned under the Compensatory Afforestation Fund Bill, 2008, which was introduced by the Union ministry of environment and forests to streamline efforts to increase the green cover."

HINDUSTAN TIMES—"Finally there is hope for around 20 Sabar families from Musabani who were recently planning to migrate to other states in search of livelihood. The Sabars changed their minds, courtesy an initiative taken by the divisional forest officer (DFO), Dhalbhum, Sanjeev Kumar, due to which a mass employment opportunity was created for them."

Forest dept initiative to check migration

Green jobs for primitive tribes

OUR CORRESPONDENT

A BETTER LIFE

जमशेदपुर, 14 जुलाई 2011

दैनिक जागरण

3

वन विभाग की पहल : सबरों के बीच पहुंचे डीएफओ

जागेगी किस्मत, मिलेगा रोजगार

सबरू

- समस्याओं से अवगत हुए संजीव कुमार

3. IMPROVEMENT OF DEGRADED FORESTS THROUGH SILVICULTURE OPERATION IN JHARKHAND

Introduction

Jharkhand has an area of 79,714 km^2. As per FSI Report of 2021 it has 23721.14 sq. Km of forest cover which is 29.71 % of geographical area of Jharkhand. But area of open forest and medium dense forests are 21120.09 sq. km. whish are full of root stock interspersed with gaps. In order improve density of forests Scheme of Silviculture Operation with assisted natural regeneration has been taken up. These are done mainly in the area of Rehabilitation Working Circle. In last five years a total of 25792 Ha of such forest land has been treated under this Scheme with CAMPA Fund.

General constitution of crop taken for silvicultural operation

- Silviculture operation is mainly done in Rehabilitation working circle with Sal and miscellaneous forests which are stagnated in bushy stage (Sal rooted wastes) or perpetual sapling stage due to extremely adverse biotic factors like unregulated felling, grazing and forest fire. The areas virtually without any vegetal cover i.e. scrubs are also included in this scheme.
- Areas which rehabilitated or planted by artificial planting in the past but degenerated back to bushy stage or blanks again due to inadequate protection.
- Areas under coppice Working Circle of the previous working plan which degenerated into bushy or sapling forest due to excessive unregulated fellings, extensive grazing, recurring incidence of fire and other biotic factors.

Objective of Scheme

(1) To arrest the further degradation of the forests and restoration of ecological status as a result of rising biotic pressure.

(2) To increase biodiversity of the forests by encouraging the growth of vegetation in natural way.

(3) To optimize the productivity of forests by restoration of density of the crop stand by filling the gaps by artificial planting and assisting the existing root stock to rehabilitate by tending silvicultural operations.

(4) Soil and moisture conservation of the forest land to arrest soil erosion and loss of soil nutrients and make it available to the growing stock of the area and assist their rehabilitation and growth into healthy forests. The scheme proposes to make site specific soil/ moisture conservation measures like construction of smaller check dams, silt detention dams, contour trenches and bunds and gully plugging as per requirement of the area.

(5) For effective control over the ever rising biotic pressure on forest land and regulation of forest use by local people with the help of members of the JFMC by optimizing the management/ regulation principles with the sustained availability of timber, fuel wood, small timber and fodder to the local population.

(6) Rehabilitation of blank areas technically called scrub with adequate soil depth by artificial plantation/ Sowing of seeds of suitable species.

Activities undertaken

Silvicultural operations are mainly carried out on priority basis. The soil conservation site specific schemes are also executed along with silvicultural operation. Major steps taken are -

1. The natural regeneration is protected.
2. Soil and moisture conservation measures are compulsorily be executed as on integral and inseparable component in this schemes.
3. A 20' wide strip on the outer boundaries and along highways are preserved and protected unless the area is totally blank.
4. The dead, dying diseased and uprooted trees are marked as a measure of salvage felling. If any trees under the above category is the natural habitat or nesting/ breading place for wild life then these are preserved.
5. The fruit bearing species like Aonla (Embelica), Mahua, Imli, Harre, Bahera, Jamun, Bel, Tendu and Kachnar present in the area are preserved.
6. Tree species associated with the religious faiths like Pipal, Bargad etc. are also spared.
7. Views of the local communities are necessarily obtained before taking decision in the matters of execution and choice of species subject of suitability of site and other relevant factors in mind.

Technique:

The technique for rehabilitation will broadly consist of:

A. Fencing of the area.

B. Coppicing and cutting back of defective stems and pollards.

C. CULTURAL OPERATIONS: - The cultural operation consists of cleaning and stool thinning. The useless species interfering with or likely to interfere with the growth of the main species are cut. The number of shoots per stool is reduced to two or three. The climbers are cut.

D. SOIL AND MOISTURE CONERVATION WORKS: - Soil and moisture conservation works are taken up along with other operations and are completed before onset of monsoon. These working include main operations namely contour trenching, Nala bundings, check-dams, silt detention dams and gully plugging as persite requirement.

Contour trenches are taken up all over area. In the areas above 25^0 slopes, trenches are dug in accessible areas only. The section of the trenches are 45 cm and dug in staggered fashion to slow down the water flow and allow safe escape to excess run off and preventing damage to the structures. Soil from trenches is heaped on the lower side of the trenches. The contour interval between consecutive trenches is kept 1.5 m. The laying out of contour lines are done with great precaution as faulty direction may lead to wastage of precious reContributions.

Depending upon the slope, the distance between two consecutive trenches are keptas follows:

Slope in degree	Distance between consecutive trenches
Up to 15	8 m
15 to 25	5 m
Above 25	3 m

Silt detention dam/ Nala bundings/ check dams/ gully plugging are in sloppy and along Nala/ rivulets to reduce run off and to arrest the silt. Nala bundings / gully plugging starts from the top of Nala downwards. The entire catchments from ridge to valley are taken as a unit to reduce the cost and make it most effective.

E. Gap plantation in totally blank areas with suitable species.

F. Tending of rehabilitated natural crop and planted crops; and

G. Strict protection of the crop against unregulated felling grazing and fires.

H. Singling of shoots in the next year.

Results: The area thus treated with this technique regains its vegetation growth. Shoots sprout from coppice / dressed stumps. Species like Sal (Shorea robusta) attains height of 10-15 feet in two years. It comes up with associates like Asan and other herbs which increases biodiversity of the area. Similarly such operation raises water table of the area which improves regeneration of the forest area. Ultimately there is increase in density of forest also.

Some of the photographs of the results are as under –

Before operation Place-Morangi, Year 2017, Hazaribagh

After Silviculture operation, June 2021

After Operation, in June 2021

रांची, सोमवार
07.06.2021 | प्रभात खबर | 02

सिल्वी कल्चर से हरा-भरा बना मोरांगी जंगल

मोरांगी जंगल में हरियाली लौटी.

वर्ष 2017 में उजड़ गया था मोरांगी जंगल.

प्रतिनिधि, हजारीबाग

हजारीबाग में 50 हेक्टेयर में फैले मोरांगी जंगल उजड़ने के बाद फिर से हरा-भरा बना है. यह जंगल हजारीबाग-रामगढ़ एनएच 33 पर कृषि पर्यटन केंद्र के पूर्वी हिस्से में सटा हुआ है. वर्ष 2017-18 में पूरे भू-भाग पर साल, केंद, पलास सहित अन्य पेड़ों के ठूंठ व झाड़ियां नजर आते थे. बड़े पेड़ों की जगह घुटुस की झाड़ी और झुरमुट जंगल में था. जनसंख्या दबाव में उजड़ रहे जंगल को फिर से हरा-भरा करने का सफल प्रयोग वन विभाग ने मोरांगी जंगल में करके दिखाया है. सिल्वी कल्चर से जंगल बढ़ाया गया. वर्तमान में 12 से 15 फीट उंचाई वाले पौधे मौजूद है. जंगली जानवर और जलीय पक्षियों का आना भी शुरू हो गया है.

सिल्वी कल्चर के कार्य : सिल्वी कल्चर ऑपरेशन में कटे पेड़ों के ठूंठ नये कोमल पत्ते निकलते हैं. इन्हें बढ़ने का अवसर दिया जाता है. पौधों के विकास उनकी मोटाई का आकलन सैंपलीन कर किया जाता है. ऑपरेशन एरिया को 50 गुणा 5 मीटर के दायरे में बांटकर पौधों को सैंपलीन की गयी. पेड़ों की ठूंठ को तेज धारदार हथियार से काटा गया. ठूंठ से नये पौधे निकलने लगे. इससे ही जंगल बढ़ने लगा.

जनसहयोग से बचा जंगल : ग्रामीणों के सहयोग से जंगल बचाने का कार्य हुआ. वर्ष 2017-18 में कैंपा योजना के तहत इस जंगल को हरा-भरा करने का काम शुरू हुआ. जंगल के चारों ओर ट्रेंच खुदाई की गयी. जंगल के आसपास गांवों में रहनेवाले लोगों को जागरूक करने का अभियान चलाया गया. मिट्टी की कटायी रोकने और मिट्टी में नमी बरकरार रखने के लिए भी काम शुरू हुआ. जंगल में मौजूद पानी के प्राकृतिक स्रोत को कई जगह मिट्टी से बांधकर छोटे-छोटे डैम बनाये गये. ग्रामीणों का जुड़ाव करने के लिए इन छोटे-छोटे डैमों में मछली पालन किया गया. जिससे ग्रामीण जलस्रोत को बचाने के लिए खाली जमीन में छोटे-छोटे गड्ढे बनाने में रुचि ली.

फॉरेस्ट सर्वे ऑफ इंडिया ने 2017- 19 में वन संपदा की वृद्धि की रिपोर्ट जारी किया था. इसमें झारखंड में 58.41 वर्ग किलोमीटर की वन वृद्धि दर्ज हुई थी. इसमें हजारीबाग परिक्षेत्र के चतरा वन प्रमंडल में 11.35 प्रतिशत वर्ग किलोमीटर की वृद्धि दर्ज हुई थी. हजारीबाग परिक्षेत्र में जंगल में बढ़ाने में ग्रामीणों, वन कर्मियों का संयुक्त पहल मान सकते है. **संजीव कुमार**, आरसीसीएफ

4. GREENING OF FORESTS AND SMILES OF MIGRANT LABOURS UNDER GKRA — A SUCCESS STORY IN THE TIMES OF CORONA PANDEMIC IN JHARKHAND

Abstract

Jharkhand is a land of forest with 29.71 Percent of its geographical area under forest cover. But it is vulnerable state due to prevalence of Rainfed agriculture and various climate generated factors. It forces many people to migrate in different states in search of wages based labour works. In early 2020, Corona Pandemic broke out which resulted into unemployment condition of these labours in the states where they were working. And they had to come back their home in Jharkhand empty handed. It could have created a condition of another crisis but schemes like Garib Kalyan Rojgar Abhiyan (GKRA) and Atm Nirbhar Bharat lunched for their respite. CAMPA fund played a crucial role. The present narration is all about how CAMPA fund were utilized under GKRA in Jharkhand.

Introduction

During Early March 2000, World witnessed deadly arrival of Virus generated pandemic COVID-19. This led to losses in financial markets worth trillions of United States dollars have spread through — economies worldwide, leading to reductions in production, employment, incomes and consumer demand resulting into economic decline — closures of factories**,** construction works, etc on an unprecedented scale. Consequent job cuts and a rapid increase in unemployment Job losses among migrant workers from the state of Jharkhand who are particularly vulnerable, led to reverse migration to their home state (mainly to rural areas), reduced remittances, loss of livelihood and increasing poverty and food insecurity. Production, trade and employment have been scaled down in response to the low demand. Since the construction sector is a major employer (including for migrant workers), its decline contributed substantially to increased unemployment.

In response to the economic crisis government initiated economic stimulus packages to bail out financial institutions and to stimulate production and consumption. The Government of India came up with Garib Kalyan Rojgar Abhiyan (GKRA) to tackle the impact on workers in India. Employment generation through public works was an important thrust of many of the stimulus packages. An increase in jobs was expected to enhance income, increase consumption and thus stimulate production and further employment, helping to break the downward spiral.

In Jharkhand three districts-Hazaribagh, Giridih and Godda were earmarked for GKRA because of relatively large number of migrating labours in these districts. CAMPA Funds were used to implement this scheme in these districts.

Forestry in the Economic Stimulus Package

Forest Department always plays important role for the upliftment of the people living around people, some of which are—

(i) Employment to local people in rural and remote areas.

(ii) Fodder, fuel and small timber for agricultural implements, house construction as per the Government norms.

(iii) providing 90% share of the produce as per the resolution of government of Jharkhand from the earning of forests

(iv) Facilitating irrigation and fishery facilities by constructing water harvesting structures/ check dams in rural areas.

(v) Providing livelihood base on NTFPs.

Thus, Forestry could have a positive role in the economic stabilization efforts, particularly through job creation and the rebuilding of the natural capital base. In Jharkhand three districts were selected under GKRA- Hazaribagh, Giridih and Godda. In these districts, forest divisions carried out works related to afforestation, Silvicultural Operation, Infrastructure development, Wildlife habitat improvement etc under CAMPA thus helping in job creation and economic stabilisation in the times of Covid-19 crisis.

The divisions which worked for it are – Godda Forest Division, Giridih East Forest Division, Giridih West Forest Division, Hazaribagh West Forest Division, Hazaribagh East Forest Division, Hazaribagh Wildlife Forest Division, and Hazaribagh Social Forestry Division.

Employment generation through CAMPA under GKRA

Compensatory Afforestation:

Maintenance: Maintenance of CA plantations was carried out in 4498.299 ha during 2020-21.

Plantation in CA: Plantation in 719.5 ha was carried out in these three districts during 2020-21 under GKRA using CAMPA Fund.

Advance Work (First year work): Advance work on 1687.6 Ha was carried out under CA.

CA: Advance work and Plantation under GKRA in Madh Gopali, Hazaribagh

IWMP: Work under Integrated Wildlife Management Plan was carried in Giridih and Hazaribagh district.

Net Present Value:

Maintenance: Maintenance of plantations was carried out in 680 Ha during 2020-21.

Plantation : Plantation in ha was carried out in these three districts during 2020-21 under GKRA using CAMPA Fund.

Silviculture Operation: Advance work of Silviculture operation in 1760 Ha, Completion in 1050 Ha and maintenance in 2439 Ha were carried out during this period in these districts.

Check Dams: Fifty six earthen check dams with stone pitching were constructed.

Forest Guard Quarters: Five forest guard quarters were constructed.

Grassland Development: Works related to grassland development in (Advance and 2nd year) in 45 ha.

Grassland development in Hazaribagh

Forest Road Repairing: 254.7 Km of forest roads were repaired under GKRA in these three districts.

Soil Moisture Conservation: It was carried out in five hundred Ha.

Check dam in Hazaribagh

Forest Guard quarter, Hazaribagh

Impact

An impact study done in these districts to know the effect of action taken by forest divisions show that the number of people migrating to other states/areas have been almost halved after the initiative of forest department as large number of people got employment at their doorsteps. During this period (2020-21), Apart from this the number of people working in the agriculture and associated activities has also increased. The decrease in migration had a positive effect on the health of people also as they have sufficient supply of good food with sustainable income. The natural assets created during forestry operations give rise to secondary and tertiary economic activities. Plantation of NTFP yielding sps gives livelihood option for Lac and Tassar cultivation. Water harvesting structures created are helpful not only for wildlife and regeneration of forests but also has improved water table which has direct impact on agriculture production and meeting water crisis.

All the forest divisions of these districts acted properly for the help of people in need and did a very commendable job by providing employment to local migratory labours by creating 404548 man days bringing smile on their face besides improving green cover and water regime.

Sl.No.	Name of Districts	Man-days Generated
1	Hazaribag	142270
2	Giridih	150581
3	Godda	111697
	Total	404548

Sanjeev Kumar, IFS
Additional Principal Chief Conservator of Forests-CEO, CAMPA, Jharkhand (India)
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KARNATAKA

ACTIVITIES UNDERTAKEN

We know that land, labour and capital are the three main factors for economic and developmental activities. Out of these, land is the most critical as far as India is concerned because we have to meet the developmental needs of a burgeoning and increasingly aspirational population. Projects for roads, rails, communication, energy, education, health, drinking water are a priority for the country. All of these need large chunks of land, some of which fall inside forest areas and have to be made available for such projects. Thus, the downside of development in such a scenario is loss of forest habitats.

However, recognising the fact that there should be a balance between development and environment for a sustainable future, the Government of India from time to time has enacted various legislations and guidelines for promotion and protection of forests. The Forest Conservation Act, 1980 and the Compensatory Afforestation Act, 2016 and rules 2018 ensure that diversion of forest land should be adequately compensated for. This is done by charging the user agencies certain sums of money which are used for afforesting alternate lands to be provided by the user agencies at their cost. This is called compensatory afforestation.

The Supreme Court in WP 202 of 1995 has passed a series of orders directing the Central Government from time to time to establish a mechanism for utilization of monies received from user agencies in lieu of forest areas diverted to such agencies.

The Government of India issued guidelines dated 2nd July, 2009, outlining the manner of utilization of funds deposited with the ad hoc body.

An amount of Rs 1350 crores was transferred to Karnataka vide order F.No. 11-100/2015-FC Government of India MoEF&CC, National authority dated:29/08/2019

1. As per the CAF Act and Rules the funds have been spent on the following activities:

i. Project Specific Activities
ii. Activities under the Net Present Value (NPV)
iii. Activities under the Interest component

Project Specific Activities : These include Compensatory afforestation (CA) and Site-specific activities (SSA) and are specified at the time of granting permission for diversion of forest land.

a. **Compensatory Afforestation** : Is carried out either on private land that is equal in extent to the land being diverted or on double the extent of forest land, where ever so specified.

b. Site Specific Activities – Are specified at the time of granting permission for diversion and are carried out in and around the diverted area. They are of the following types:

- Safety Zone Plantation – Entails planting in a strip of 7.5 m on the outer border of leased/diverted area
- Fencing for demarcation of the site
- Reclamation works for waste dump stabilization
- Dwarf or medicinal species plantation, in case of wind and power projects
- Catchment Area Treatment Plan (CATP) usually for hydel projects
- Wild life habitat improvement like grassland improvement etc

Salient points about CA

Compensatory afforestation has been taken up in all the lands provided for the purpose. Some of the lands that are provided by the user agencies are very refractory in nature. Raising trees on such lands is challenging but innovative means have been utilised to bring such areas under tree cover. Selection of species, raising of nurseries, mechanised planting techniques etc are carefully selected. In majority of CA areas, earth work (advance work) is carried out through bull dozers which are used to excavate continuous trenches. This causes substantial loosening of earth which absorbs water like a sponge as soon as the first rains arrive paving the way for a successful plantation.

The fully regenerated area can be better appreciated in the video which is attached with this document.

Wherever CA is specified in forest lands care is taken to select sites like, mangroves, encroachment prone areas, swamps etc

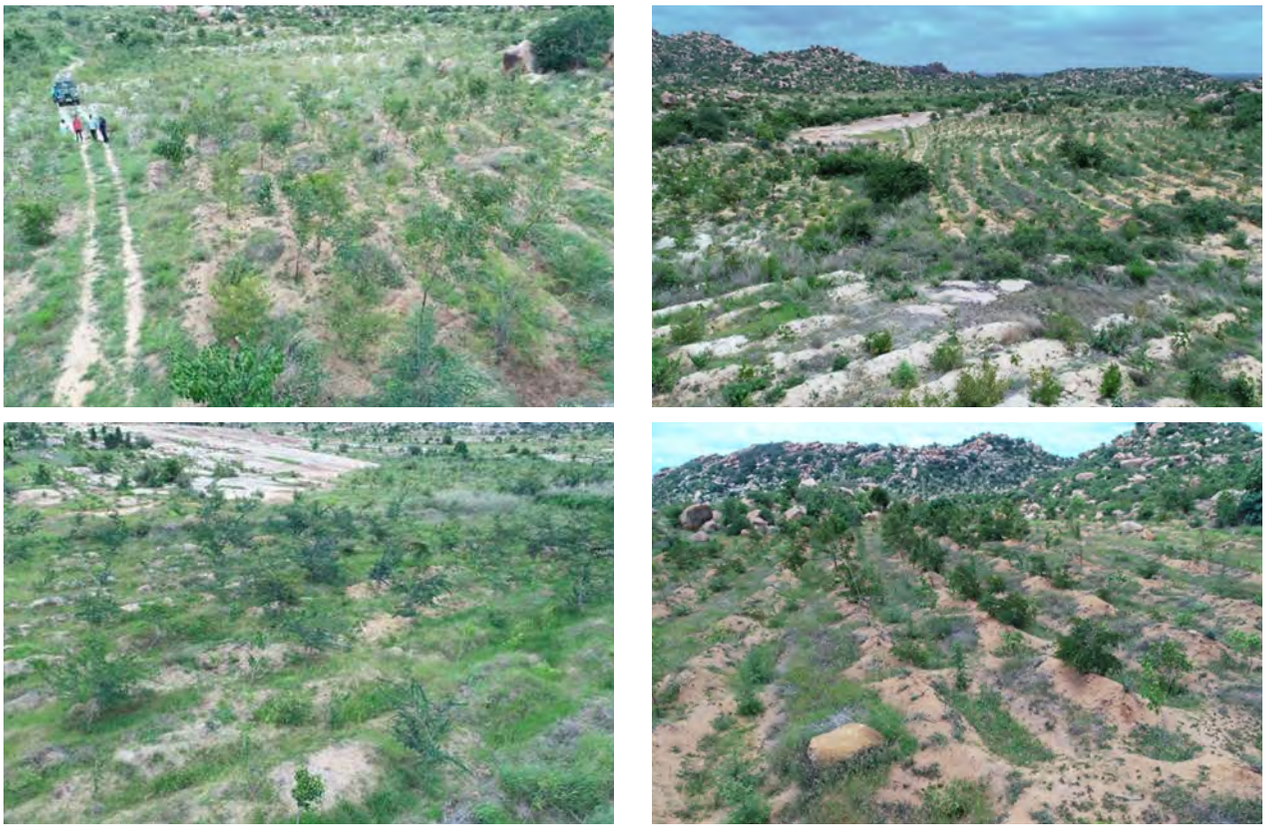
CA Progress Report upto March 2022				
Activities	Physical Target (Ha.)	Financial Target(Rs.Lakhs)	Physical Achievement	Financial Achievement
CA Raising	548.00	127.66	538.62	117.87
CA Maintenance	7245.38	1087.59	7245.76	932.20
Site Specific Activities like ACA, PCA, CATP etc				
Raising	19.41	12.16	19.41	12.16
Maintenance	3376.60	216.88	3376.60	216.88
Fresh Works				
CA Advance works	950.00	295.64	516.81	280.79
Site Specific Activities	6.50	3.58	6.50	3.58

Advance works using D-80 bull dozer

Continuous trenches formed

Planting (2 seedlings per trench) Neem, Pongamia, Hardwickia etc.

One year old plantation



Mangrove planting

Linear plantations under CA

i. Activities under the Net Present Value (NPV) component

	Activities out of 80% (Rule 5(2)				20% 5(3)
1	Forest Protection & consolidation	Conservation & regeneration of forests	WL protection & mgt.	R&D	Infra & HR
2	Survey & Demarcation	Aided Natural Regeneration (ANR)	Habitat improvement in Protected Areas	QPM Production	Nursery Modernisation
3	Boundary consolidation Pillars/CPT/fence etc.	Artificial Regeneration	Road Maintenance	Research plots	Capacity building HR
4	Fire protection Fire lines/ watchers	Sandal regeneration	Fence/EPT	Nursery works	Buildings for frontline staff
5	Forest roads/paths Construction/maint	Catchment plantation	Planting in non forest lands in WL corridors	Silviculture	M&E
6	Biodiversity management	Research	Animal rescue centers		IEC
	Fuel saving devices		Voluntary Relocation		Biodiversity

ii. Activities under the Interest component Sec 6 (c). The interest component is further sub-divided into 60% and 40%. As per Rule 6 of SCAF, 60 % of interest amount is spent on incremental costs of compensatory afforestation and wild life management and 40% on the administrative expenses of the state Authority including wages of contract staff, payment of sitting fees, hiring of office space etc.

Salient achievements under NPV:

i. Relocation of villages from the Kali Tiger Reserve – The reserve is spread over 1100 sq km in Karnataka but is part of a larger area of evergreen forests extending between Goa and Karnataka forming a contiguous belt of nearly 10,000 Sq Km. The importance of this pristine forest patch cannot be gainsaid which is why it was declared a tiger reserve in 2007. The reserve is dotted by approx. 7000 families of Kunbis, Marathas and Gowlis, who were encouraged by the forest department to agree to the package of relocation provided under the NTCA guidelines. What makes this a unique scheme is that it is completely voluntary. Further the department is not responsible for providing alternate land to the people, rather they are paid a sum of Rs15 lakhs per family in three installments and they willingly leave the reserve using the money to buy land elsewhere and resettle themselves resulting in creation of large inviolate areas for the wild animals to thrive. The villagers inside the resrve lead very difficult lives due to the lack of modern facilities like, schools, hospitals, roads etc. The children have to trek long distances, often in inclement weather to reach their schools, the sick and the elderly have to be carried in palanquins to the nearest hospital if the need arises. The young adults in the families are increasingly more and more aspirational and are migrating in large numbers to nearby towns and cities in search of employment and a better life. Another looming social crises is that the young male members are not able to find suitable brides as people are averse to marrying off their daughters to men living in such remote locations. All in all the people are looking for a way out of a bad situation and the Forest department is happy to help them to do so. People get a better life and wild life gets inviolate areas. Looks like a win-win situation.

However it is not as easy as it may appear by the above account, to deal with diverse interest groups. It requires consummate skill to handle the social dimensions involved in such an exercise with some fringe elements always trying to upset the apple cart. The credit for the smooth operation of the effort goes to the young and dynamic Park Director whose meticulous planning, transparent working, leading by example and proper liaison with the district authorities are a Contribution of constant inspiration to his team who are motivated to put in their best efforts. The teams, especially the ACF go beyond the call of duty in helping the villagers find suitable land, acquiring the relevant documentation from various govt authorities including electricity and water connections and handhold the relocated people in starting their new lives.

Village relocation in Kali Tiger reserve under CAMPA

Medukona hamlet relocation

Sulawali hamlet relocation completed

ii. Man, Animal conflict Management – Karnataka is a state which can boast of very successful implementation of both Project Tiger and Project elephant with the result that it is today the highest-ranking states in terms of the number of tigers, elephants in addition to a variety of endemic species of flora and fauna. This increase in numbers of flagship species has obviously led to increase in human animal encounters resulting to conflict situations. The state govt has allocated huge reContributions for mitigation measures by way of boundary demarcation with elephant proof trenches, solar fences, tentacle fences etc. Funds under CAMPA have augmented these efforts.




Railway Barricade Works/ Solar Fencing/ EPT Bandipura and Nagarhole

iii. Habitat improvement – One of the main issues in the National parks and sanctuaries like, Bandipur and Nagarhole is infestation by lantana. Hence removal of lantana has been undertaken as part of grassland rejuvenation activities. During the last three years approx. 1500 ha have been treated.



Grassland management work at Antarasante range Nagarahole TR.

iv. Aided Natural Regeneration (ANR) - 23625.88 ha of forests have been covered by gap planting of native species in natural forests, during the last three years.

SMC works under Compensatory afforestation

v. Artifical Regeneration (AR) – 2100 ha of degraded forests have been planted during the last two years under this model.

vi. Studies - A few studies are being funded under CAMPA on topics which are the felt needs of the department. Major ones are:

- Carrying capacity of Western Ghats – this is being carried out in collaboration with the Institute of Social and Economic Change (ISEC) Bangalore, which is a reputed institute of the Govt of india at a cost of Rs 25 lakhs
- Conservation of the Mahasheer – River Cauvery is home to the mahasheer fish or tiger fish but with the dwindling habitat mainly due to hydel projects there is a need to study the populations and their behavior with the aim to breed them in captivity and release the fingerlings downstream. The study is under progress at a cost of Rs 20 lakhs
- Low cost drip irrigation plantation model – While planting the seedling, a pipe of about 1.5 feet long with a diameter of 2 inches is placed in the pit along with the seedling. About 3 inches of the pipe projects above the ground which is used to water the plant during the dry season.
- Liivelihood project for Soliga tribals – The lantana that is uprooted from the forests as part of grassland rejuvenation programme can be used to manufacture utility products which have a ready market in cities like Bangalore. With this idea a project at a cost of Rs 15 lakhs has been started involving the Soliga tribals in Chamrajnagar Division.

Infrastructure for front line staff

A decision has been taken that wherever possible residential buildings for frontline staff will be in taluka or hobli headquarters in a cluster so that the families are able to stay together in one place with support from each other. These places have better access to education, health etc. this way the staff are assured of the safety of their families.

Innovative technologies

Drones for fire fighting, GIS enabled infrastructure at range level has been provided including a ICT deputy RFO in each range. Rs 2 crore of CAMPA funds have been dovetailed into the programme.

Rs 2 crore were spent on mapping of forest boundaries at the cadastral level with help from the Karnataka Remote sensing Agency. Thus the entire forest boundary has been digitised.

Contribution: Chief Executive Officer, Karnataka State, CAMPA

KERALA

ECO-RESTORATION

Systematic management of the forests of Kerala started around one and a half centuries ago. During most of this period, forest management was mandated to serve the economic interests of the State; initially colonial and subsequently that of independent India. In many places, this has alienated local people from meeting their livelihood aspirations from the forests to which they had unhindered access in the past. Over the years, this limitation of access to the forests has led to conflict between people and Forest Department. As of now, there are multiple aspirations and contradictory objectives to be reconciled on the frontier of forest management. Impending and escalating issues like human-wildlife conflict, impacts of climate change and developmental imperatives compound the problem.

Kerala has always been at the vanguard of balancing conservation and development. Kerala has also pioneered several innovative approaches on the frontier of natural reContributions conservation. In continuation of this approach, and as a strategy to safeguard the State from the deleterious impacts of climate change, the central tenet of forest management is being recalibrated to that of improving ecosystem services particularly hydrological security. Several initiatives have been taken up with this objective. To institutionalize this transition in forest governance, the Government of Kerala has implemented a **Policy on Eco-restoration during 2021 through the government order G.O (MS) 29/2021/F&WLD dated 17.12.2021.**

This ambitious policy which is the first of its kind in the country aims to restore natural ecosystems and processes as fundamental to the existence and well-being of life. To improve and restore the health of existing forests and to ensure soil and water conservation in a phased manner, removal exotic species like , Acacia/ Wattle/Eucalyptus and planting of local indigenous species based on peculiarities of each location were proposed and approved in the Annual Plan of Operations of CAMPA funds during year 2021-21 and 2022-23. The details of Eco restoration activities carried out in 2021-22 and proposed works during the current financial year is summarized below.

a) Details of eco restoration activities carried out as per approved CAMPA APO during 2021-22

Eco-restoration of monoculture plantations to natural forests	Unit	Area	Amount (in Lakhs)
Eco-restoration activities in monoculture plantations (Creation- by planting indigenous/misc. species/ preparatory works)	ha	309.04	149.26
Eco-restoration activities in monoculture plantations (Maintenance)	ha	168.86	48.55

b) Details of Physical and Financial target of eco restoration activities as per approved CAMPA APO during 2022-23

Eco-restoration of monoculture plantations to natural forests	Unit	Area	Amount
Eco-restoration activities in monoculture plantations (Creation- by planting indigenous/misc. species/ preparatory works)	ha	336	341.75
Eco-restoration activities in monoculture plantations (Maintenance)	ha	499.26	226.06

This Eco restoration policy is considered a landmark policy of the State of Kerala, the actions on which will help the State contribute to achieving the national level goals on Nationally Determined Contributions (NDC), Sustainable Development Goals (SDG), and the COP26 declaration of for a Carbon Neutral Nation by 2070. The utilization of CAMPA funds in tune with the eco restoration policy will helps to attain the following specific objectives.

1. The degraded monoculture plantations will be converted to multispecies, multilayer natural forest ecosystem so as to enhance the environmental and ecological benefits to the society.
2. The water harvesting, ground water recharging and other watershed characteristics of the area will be improved so that the water availability to adjoining villages may be enhanced during lean season.

3. The area will be protected from forest fire and other adverse factors so as to enhance ecosystem functions and biodiversity values of the area.
4. Human wildlife conflict will be reduced by increasing food and water availability inside forest.
5. Employment to local people will be ensured through sustainable harvest of NTFPs from the area.

Contribution: Chief Executive Officer,
Compensatory Afforestation Fund Management and Planning Authority, Kerela

MADHYA PRADESH

VOLUNTARY VILLAGE RELOCATION SATPURA TIGER RESERVE, NARMADAPURAM

Introduction

The largest protected area of Madhya Pradesh, Satpura Tiger reserve is located in the Satpura hill ranges south of river Narmada. The area forms a part of the largest contiguous forest and tiger habitat in India. It is one of the most diverse habitats in the state with the confluence of teak and sal forests bestowed with many unique features from ecological, archaeological, historical, anthropological as well as forestry point of view in addition to wildlife conservation. Satpura Tiger Reserve, representative of the Central Indian highlands is a very important tiger habitat.

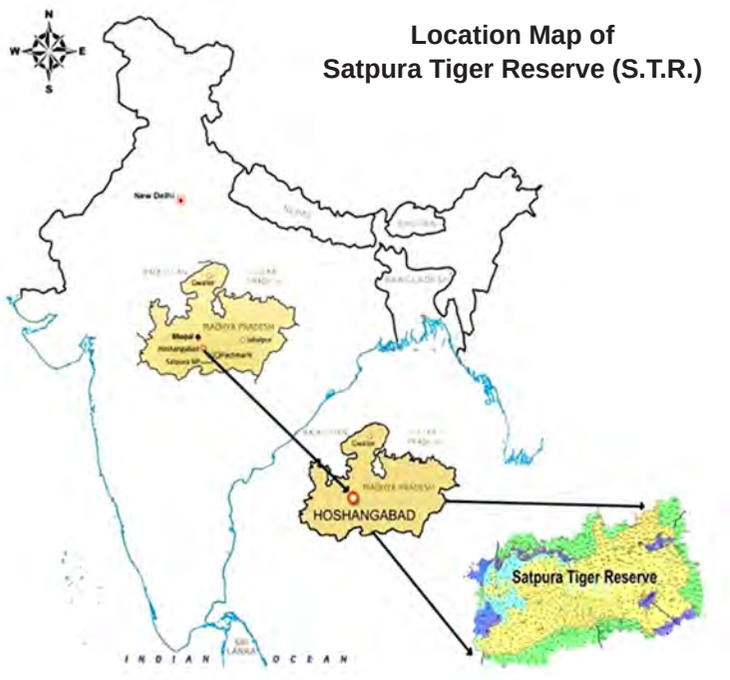
Area Details

Satpura Tiger Reserve is mostly within the Narmadapuam district of the state of Madhya Pradesh. It extends from east to west in southern part of district with parts of the Buffer zone in the Betul and Chhindwara districts, in the Satpura ranges of central Indian highlands. Area comes within Itarsi, Sohagpur and Pipariya Tehsils of Narmadapuram district. It is situated between the following geographical co-ordinates:-

Latitude	Longitude
22° 31' 27.42" N	77° 53' 27.45" E
22° 42' 36.31" N	78° 30' 7.49" E
22° 27' 25.51" N	78° 35'11.84" E
22° 18' 17.66" N	78° 7' 37.35" E

Earlier the landscape was demarcated into three different protected areas i.e. Bori and Pachmarhi Wildlife Sanctuaries and Satpura National Park which were accorded different levels of protection under the Wildlife (Protection) Act, 1972. The first biosphere reserve in the state, Pachmarhi Biosphere Reserve, is also overlapping with the area of Satpura Tiger Reserve.

Location Map of Satpura Tiger Reserve (S.T.R.)



In 2000, the area of these three PAs was together declared as a Tiger reserve.

1. Satpura National Park 524.37 km^2
2. Pachmarhi Sanctuary 491.63 km^2
3. Bori Sanctuary 485.72 km^2
4. Satpura Tiger Reserve (Total) 1501.72 km^2

The buffer zone was included in the reserve area in 2011. As a result, the total area is now 2133.30 km^2 of which the core zone is spread over 1339.26 km^2 and the buffer zone is 794.04 km^2 (of which the buffer area inside PAs is 170.75 km^2).

Conservation History

Satpura Tiger Reserve has the longest conservation history in the country dating back to 1865 when the first reserve forest was notified in Bori, now a part of the core area of Satpura Tiger Reserve. In recognition of its unique and rich biodiversity, the landscape was declared the first Biosphere Reserve of Madhya Pradesh in 1999 by UNESCO before it was a tiger reserve. Owing to its incredible biodiversity and cultural values of Satpura, it has been included in the tentative list of UNESCO World Heritage Sites 2021.

Relocation Process

The National Tiger Conservation Authority has issued the Protocol/Guidelines for Voluntary Village Relocation in Notified Core/Critical Tiger Habitats of Tiger Reserves (Ref. F. No. 15-4/2010-NTCA (Part-III)) to facilitate the State Forest Departments to carry out voluntary village relocation and rehabilitation from notified core/critical tiger habitats. The process is in compliance with the relevant provisions of the Wildlife (Protection) Act, 1972, and the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, while complying with the earlier advisories issued in this regard.

Proposal for relocation by Gram Sabha

Pre-Relocation meetings wherein the rationale, benefits, process of relocation is explained to the villagers are conducted by the forest department. After the relocation of first few villages, exposure visits were organized for the villagers to see for themselves how the villagers are living after relocation

Consent for relocation by each unit

Along with the collective consent of the gram sabha, each relocation unit is given the opportunity to decide for themselves if they want to relocate. A consent form is given by every family/ individual that is considered as a separate unit to ensure that the relocation is truly voluntary.

Relocation unit

Each of the following is considered a separate relocation unit

- Family – Husband, Wife and Children below 18 years age
- Person (unmarried male or female) above 18 years age
- Specially-abled Person
- Orphan

Selection of Compensation package

According to the NTCA guidelines, the following options for compensation are available for the villagers willing to be relocated. Before April 2021, the unit cost was Rs10 lakh per unit and current unit cost is 15 lakhs

Option I –Payment of Rs. 15 lakhs per family in case the family opts so. In this option, rehabilitation / relocation process by the Forest Department is not mandatory.

(i) In Forest Village,where there are no tenurial rights, two bank accounts are opened for each family viz., a savings account with a deposit of Rs. 3 lakh, and a joint savings account with the District Collector for an amount of Rs. 12 lakhs. Fixed deposit is created so that the beneficiaries can earn the interest for at least 3 years.

(ii) In Revenue Village,based on the consent of the family/relocation unit, there are two options available:

Option A-Compensation amount of Rs.15 lakhs (inclusive of the assets value) to be deposited in the beneficiary account (joint account with the spouse in case of married couple)

Option B- Compensation as per asset valuation to the individualfirst and remaining amount distributed equally for the development of the village.

Option II –Carrying out relocation / rehabilitation by the Forest Department with the following per family norms out of Rs. 15 lakhs:

- 2 hectares of agriculture land is provided per family. For this purpose, clearance under the Forest (Conservation) Act, 1980 for diversion of degraded forest land is obtained. The maximum part of the package i.e. 35% is used for procurement and development of land.
- Payment of compensation for the assets like agricultural land owned by individual /family should be done based on the evaluation, amounting to 30% of the total package of Rs. 15 lakhs.In case the valuation for village assets exceeds 30% of the package,then the balance amount should be provided through funding support from the State Government.
- Payment amounting to 20% of package is provided to each beneficiary for homestead land and house construction.
- 5% of the total package is provided as incentive per beneficiary/family.
- 10% of the total package is used for development of community facilities. In case agricultural land is made available for free, 35% of the package is also used for development of community facilities. A community development plan is prepared for each relocated village in consultation with the District Collector while

ensuring convergence with ongoing District level schemes.

- The balance amount, if any, after the community development works should be deposited in the respective Gram Sabha to benefit the relocated villagers.

S. No.	Head	% of the package
1	Agricultural land procurement and development	35%
2	Settlement of Rights / compensation for assets	30%
3	House and homestead construction	20%
4	Incentive	5%
5	Community facilities	10%

Hybrid Option – Combination of Option-I and II created to overcome the disparity between demand and availability of land.

- Not included in the official guidelines per say and was conceptualized because of local factors like the slow process of diversion of forest land under the Forest Conservation Act, 1980 and eagerness of the villagers to relocate. This has been a unique feature of the R&R process in Satpura Tiger Reserve
- A family in a village usually consists of 2 or more relocation units
- Based on the consensus family members involved, somecan choose Option-II while others choose Option-I
- Villagers can avail the benefits of both options including support of the forest department in relocation and rehabilitation as well as the freedom of utilizing the cash according to their needs

Constitution of Eligibility Determination Committee

A committee headed by the Sub-Divisional Magistrate (SDM) is constituted by the District Collector that is responsible for determining the eligibility of every relocation unit for compensation. Like the district level committee,this committee also includes representatives from different relevant departments like revenue department, tribal department,

This is based on the voter records from three years or more of Panchayat, state or general elections and all people featuring in any of these records are entitled to receive compensation.The cut-off date for the completion of the process is declared by the Collector. The final list of all eligible relocation units is made public and communicated well to the villagers.

Preparation of Village Development Plan

A detailed village development plan is prepared including all the information about the present village like the number of households, livestock population, village assets, and the plan for relocation like the number of identified relocation units, details relating to settlement of rights, incentives provided, other related details including access to forest reContributions, Irrigation facility, Anganwadi/School, Hospital, fare price shop, telecommunication facility etc. The plan also includes details of livelihood support and handholding, Grievance redressal system etc.

Diversion of Land

In case of Option-II, forest land is made available for the resettlement of villages for which clearance is needed under the Forest Conservation Act, 1980. When the clearance is obtained, the responsibility for development of the land lies with the forest department.

The process for obtaining the requisite clearance is time taking. Satpura Tiger Reserve has worked out ways to overcome this issue like Settlement of more than one village in the same area and providing the Hybrid option for compensation to villagers.

Support in Selection of Area for new settlement

Although the guidelines do not mandate the forest department to assist villagers who have opted for Option-I in relocation and rehabilitation, Satpura Tiger Reserve management has been supporting villagers in selection of the area where they would be resettled as well as agricultural land. In some villages this is done directly by the staff i.e. Range Officers, Range assistants and forest guards while in some villages the help of civil society organizations have been taken.

Transfer of compensation amount

The compensation amount for each relocation unit is deposited into a joint savings account of the wife and husband in a Nationalized Bank, and passbooks are handed over.

Mechanism for beneficiaries to obtain a monthly income through interest from the fixed deposit of 13 Lakhs in the case of Option I

In case of option I, the beneficiary should be given a timeline for purchase of agricultural land, construction of

house etc. The amount should be allowed for withdrawal from the fixed deposit only for the creation of fixed assets. The agreed amount for the land/house purchase**,** should be given to the seller through a bank draft, and the beneficiary must indicate this in the sale deed.

Monitoring

NTCA's guidelines also mandate constitution of the District level and State level monitoring committees to ensure smooth execution of the process. The composition of the committees is given below

State-Level Monitoring Committee

- Chief Secretary of State - Chairman
- Secretaries of related depts. - Members
- Principal Chief Conservator of Forest & Head of Forest Force - Member
- Non-official members of MP Tiger Foundation Society - Members
- Chief Wildlife Warden - Member Secretary

District level Implementing Committee (for ensuring convergence of other sectors)

i. District Collector - Chairman
ii. CEO - Member
iii. Representative officials from: PWD, Social Welfare, Tribal Department, Health Department, Agriculture Department, Education, Power and Irrigation Departments - Members
iv. Deputy Director of the Tiger Reserve/PA - Member Secretary

The district level committee has been formed with the District Collectors of all three districts i.e. Hoshangabad, Chhindwara and Betul where the families have settled.

Grievance redressal system

Meetings and dialogue with villagers in the buffer zone as well as with those relocated outside the tiger reserve is a regular feature of management. It is important not only for addressing any conflict or discontentment among the villagers but also for eliciting their support in forest protection.

An accessible system for grievance redressal has been created for the relocated families with the support of the district administration. These are:

1. Jan Sunwai or Public hearings which are held every week by the collector. Forest department staff as well as NGOs support the villagers in speaking out their concerns in these hearings.

2. Lok Kalyan Shivir are also organized by the District Collector along with the forest department and all line departments in the district where people are made aware of all the government schemes.

Contribution: Chief Executive Officer,
Compensatory Afforestation Fund Management and Planning Authority, Madhya Pradesh

MAHARASHTRA

GOOD PRACTICES

Plantation under Compensatory Afforestation

- As per the Forest Conservation Act 1980 in Maharashtra State total 68390.592 Ha. Forest area diverted for non-forest purpose since 1980 to till March 2021.
- Since 1980 rains to 2021 rains planting over an area of 100957.981 ha. Has been undertaken under Compensatory Afforestation.
- These plantations are maintained for 10 year period under CAMPA Funds.
- The data of plantations from last 5 year is uploaded on e-Green Watch portal with the polygons and photographs. The latest updated status of uploading data on e-Green Watch Portal is as under:

Plantation Year	No. of Afforestation Site as per APO	Uploading Status						Avg. Survival %
		Polygon	Before Plantation Photos	After Plantation Photos	% of Polygon	% Before Plantation Photos	% of After Plantation Photos	
2017-Rain	130	128	100	113	98.46	76.92	86.92	67.87
2018-Rain	138	138	104	107	100.00	75.36	77.54	72.72
2019-Rain	643	643	643	640	100.00	100.00	99.53	81.30
2020-Rain	47	47	47	47	100.00	100.00	100.00	89.47
2021-Rain	351	351	327	304	100.00	93.16	86.61	95.77
Total	1309	1307	1221	1211	99.85	93.28	92.51	81.43

The best practices are adopted for ensuring good survival of the plants. The testimonial photographs are as given below:

Time Series photographs of Plantations – 2021 Rains

Compartment No. 385, Pusad Range, Pusad Division, Yavatmal Circle

Time Series photographs of Plantations – 2020 Rains

Compartment No. 82, Gondia Range, Gondia Division, Nagpur Circle

Time Series photographs of Plantations – 2019 Rains

Time Series photographs of Plantations – 2018 Rains

Time Series photographs of Plantations – 2017 Rains

Compartment No. 958, Kurkheda Range, Wadsa Division, Gadchiroli Circle

Contribution: Chief Executive Officer, Maharashtra Compensatory Afforestation Fund Management and Planning Authority, Maha CAMPA

ODISHA

GOOD PRACTICES OF COMPENSATORY AFFORESTATION

Compensatory afforestation is one of the most important conditions stipulated by the Central Government while approving proposals for de-reservation or diversion of forest land for non-forest uses. It is essential that with all such proposals, a comprehensive scheme for compensatory afforestation is formulated and submitted to the Central Government. Such compensatory afforestation schemes no doubt has to be site specific and thus per hectare rate will vary according to species, type of forest and site. in this regard, it has been decided that henceforth the compensatory afforestation schemes which are being submitted along with the proposals for forestry clearance, must have technical and administrative approvals from the competent authority and should be in conformity with cost based on species, type of forest and site.

For Central Government Undertaking Projects, Compensatory afforestation may be raised on degraded forest land twice in extent of forest area being diverted. Certificate of Chief Secretary regarding non-availability of non-forest land for compensatory afforestation will not be insisted. The user agency will deposit the amount for compensatory afforestation with the concerned State Govt. on receiving the demand and the actual transfer/use of forest land will be affected only after the receipt of the demanded amount.

CAMPA is an institutional mechanism to receive and manage funds for raising compensatory afforestation

Diversion of Forest land in Odisha

The total forest area diverted in the State under Forest (Conservation) Act 1980 up to March 2022 is 59475.837 ha. In lieu of diverted forest land, MoEF & CC has stipulated compensatory afforestation over 79972.8 ha up to March. 2022. The compensatory afforestation over 70749.85 ha has already been undertaken till 2021-22 plan period. An area of 6130.82 ha has been included in current APO 2022-23. (The area under CATP, Other Stipulations etc. are taken up separately)

Sl. No.	Area Category	Area in ha
1.	Total Forest Area Diverted up to March. 2022	59475.837
2	Total Stipulated Area (As per GOI) for Compensatory Afforestation up to March, 2022.	79972.81
3.	Compensatory Afforestation completed up to March, 2022 including extra achievement of 183 Ha	70749.85
4.	Balance Area to be covered	9222.96
5.	Proposed CA in APO 2022-23	6130.82

Taking the Afforestation target of APO 2022-23 with the previous year achievement, the achievement against area stipulated is 96%.

Sector wise Diversion of Forest Land

Name of Sector	No.	Area in ha.
Irrigation	85	10653.050
Industry	34	4438.520
Mining	194	30051.064
Energy	8	159.450
Roads & Bridge	54	1449.370
Railways	25	2768.290
Defence	4	3865.250
Human Habitation	5	366.460
Transmission Line	76	4403.063
Others	57	1321.320
Total	**542**	**59475.837**

MOEF & CC, Govt of India has accorded approval for diversion of Forest Land for non-forestry purpose under Sec 2 of FC Act, 1980. The details of Forest Land diverted upto 31-3.2022 is detailed below;

Year	Forest Area Diverted. (In ha)	Year	Forest Area Diverted. (In ha)	Year	Forest Area Diverted. (In ha)
1980	-	**1994**	407.37	**2008**	796.42
1981	-	**1995**	317.94	**2009**	2938.05
1982	218.31	**1996**	1354.61	**2010**	753.37
1983	284.07	**1997**	1551.71	**2011**	992.75
1984	1029.22	**1998**	4705.75	**2012**	237.45
1985	531.74	**1999**	480.78	**2013**	2580.57
1986	769.87	**2000**	1137.30	**2014**	2982.14
1987	1788.41	**2001**	1509.34	**2015**	1120.74
1988	836.46	**2002**	607.82	**2016**	603.54
1989	1737.99	**2003**	1447.75	**2017**	736.58
1990	2630.13	**2004**	594.29	**2018**	3887.24
1991	2.66	**2005**	2648.57	**2019**	4034.11
1992	407.73	**2006**	1167.82	**2020**	1480.62
1993	4729.25	**2007**	1806.87	**2021**	1597.79
				2022	30.71
				Total	**59475.837**

Compensatory afforestation progress in Odisha

Year	Compensatory Afforestation Area (ha)	Extra Compensatory Afforestation (in ha)	Year	Compensatory Afforestation Area (ha)	Extra Compensatory Afforestation (ha)
1980	-	-	2001	1828.94	0
1981	-	-	2002	868.72	0
1982	2.80	0	2003	1833.38	0
1983	79.98	0	2004	861.98	0
1984	1223.51	0	2005	2814.69	0
1985	485.60	0	2006	1486.63	0
1986	537.00	0	2007	1655.35	0
1987	1477.38	0	2008	798.74	0
1988	1127.98	0	2009	2317.88	1675.00
1989	2103.23	0	2010	804.84	0
1990	3571.37	0	2011	870.79	0
1991	1.00	0	2012	1810.23	0
1992	444.74	0	2013	7090.67	0
1993	5483.48	0	2014	3615.26	966.77
1994	407.00	0	2015	1651.41	370
1995	279.16	0	2016	1027.66	0
1996	1607.25	0	2017	1084.96	84.37
1997	1453.52	0	2018	3475.41	0
1998	6451.22	0	2019	4468.16	0
1999	778.50	0	2020	522.00	0
2000	1922.41	0	2021	424.89	0
			Total	**70749.85**	**3096.14**

2022: CA Target of 6130.82 ha is under Progress

Afforestation Interventions

In Odisha the following afforestation interventions are carried out under Compensatory afforestation

1. Artificial Regeneration (AR)

Artificial regeneration serves to increase the relative sustainability of forest ecosystem and also to rejuvenate the natural forest where the vegetation has been lost and new areas for afforestation. To make the greenery in the large gaps inside forest, the block plantations (AR) are under taken in the absence of feasibility of natural regeneration. Different need-based models of AR plantation are adopted considering field situation i.e., 1600 Plants/Ha and 1000 Plants/ha.

Chanditala Block Plantation 9.037 ha (Cuttack Forest Division) -1st Row
CA Block Plantations in Keonjhar Division -2nd Row

2. Augmentation of Natural Regeneration (ANR) with Gap Planting

The ANR is an activity of rehabilitating denuded forest by taking advantage of trees already growing in the area. It is aimed to strengthen the resilience of natural forest. This involves the following activities: tending of existing indigenous tree species, maintenance, and augmentation planting and protection in the gaps along with essential Soil and Moisture Conservation works. There are gap plantation and the silvicultural interventions required to enhance the density of the forest. The gaps so created are primarily due to biotic interference, repeated fire, grazing and encroachment and various other anthropogenic factors. Such forest blocks contain enough potential and sufficient root stocks for natural regeneration which if tended and protected could be converted in to high forest. The natural forest blocks which are included in Rehabilitation working circle as per working plan prescription are usually taken for ANR interventions. Different models of ANR activity are proposed considering extent and frequency of gaps and site suitability.

3. Augmentation of Natural Regeneration (ANR) without Gap Planting

This intervention is carried out in degraded forest Blocks having supressed forest growth, still having sufficient but rudimentary root stock of indigenous species. Cleaning, tending operations with required protection measures and fire protection is taken up for a period of at least 10 years to rejuvenate the existing species to a good forest cover. Soil and moisture conservation work is essentially taken up to improve the moisture regime of soil which induces good growth of available stock.

ANR at Raogaon in Berhampur Division

ANR at Birabarpali in Berhampur Division

4. Bald Hill Plantations

Some of the hill blocks in Odisha had lost their greenery over the years due to various natural and anthropogenic factors and lying completely devoid of vegetation. Many such forest blocks in higher slopes of above 30^0 slope have become bald beyond recovery. Loss of vegetation subsequently caused soil erosion resulting to deterioration of edaphic condition and completely devoid of root stock. It has been decided to embark on massive bald hill

plantations under CAMPA by adopting special techniques for restoration of green cover in open/shrub forests in different Forest Divisions. infusing foreign soil in the pits during planting of seedling and three tier fencing (two tier green plant fencing and one dry fencing) of the plantations to safeguard from biotic interference. Intensive soil and moisture conservations to enhance moisture regime is also essential component.

Bald Hill Plantation 72.035 ha (Cuttack Forest Division)

Mahavinayak Bald Hill Plantation in Cuttack Division

Sindhekala Bald Hill plantation 10ha in Balangir Division CAMPA 2021-22

5. Tall Tree Plantation

Under this category tall trees are planted in vacant places against the trees felled during diversion of linear project. Since tall seedlings are planted, this plantation ensures green canopy within short period to compensate the green cover. Apart from block plantations, the avenue plantations along the roads and canals are also being carried out.

6. Urban Plantation

This intervention is carried out in and around the urban area to reduce impact of loss of green tree cover due to diversion of nearby forest land. The plantation improves the micro climate around the urban site and is of aesthetic touch for the residents.

Avenue plantation (single row) along rural road in Berhampur Division

Urban Plantation

7. Safety Zone Plantation and 1.5 times Safety Zone Plantation:

Safety Zone Plantation is taken up in case of mining projects to provide a green stretch around the operational area in a prescribed width all along and at a larger width near the rivers and human habitations around the mining areas. Such plantations are most often created and maintained at the cost of the project proponents and is often a challenge to the foresters. Apart from acting as a safety stretch in the periphery, it improves the greenery over the area.

Safety zone plantation in iron ore mines in Bonoi Division

8. Dwarf Tree Plantation

To enhance the green cover below the High Tension powerlines, the dwarf tree species are mainly planted all along. These species having multiple NTFP value add to the income of the local inhabitants and to maintain biodiversity of the site.

9. Avenue/Canal Bank Plantation

Plantation in suitable species are carried out along canal bank and road sided to create greenbelt all along. Mostly fruit bearing trees and NTFP and ornamental species are planted which improves the climatic condition and to the benefit the local resident communities.

Implementation Strategy

Odisha Forest Department has taken following strategies to implement the Compensatory Afforestation in the state.

1. Identification, Demarcation & Mapping of Revenue Forest Land and creation of land bank for CA.

State Government have taken proactive steps by involving revenue and forest officials to identify and demarcate the forest land under control and records of Revenue department. Such identification revenue forest lands helps in planting the blank patches available for site specific AR, ANR Plantations under various afforestation schemes including compensatory afforestation. Baseline data of blank and open forest areas available at range level help in preventing further encroachments and allotting such areas for afforestation under compensatory afforestation against future projects.

2. Regular revision of cost norm for plantation models

Basing on the result of compensatory afforestation carried out during past years, site condition of selected areas, state level committee is engaged in designing plantation models, maintenance schedule and revision of cost norm in every 2 years.

Further, in order to overcome difficulties of revising the Compensatory Afforestation Schemes intermittently due to change in minimum wage rate till the completion of diversion process, the Odisha Forest Department has evolved a cost norm matrix which help in demanding

Matrix for Model-I A Conventional CA Plantation (AR) 1000 plants per Ha

In Rupees

Sl. NO.	Commencement Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	Total Cost (10 Years)
Base Norm		22300	95651	22301	15745	6857	6857	7837	6857	6857	6857	6857											
1	2021-22	22300	100434	24585	18226	8335	8751	10502	9648	10131	10637	11169											234718
2	2022-23		23415	105456	25814	19137	8752	9189	11027	10130	10638	11169	11727										246454
3	2023-24			24586	110729	27105	20094	9190	9648	11578	10637	11170	11727	12313									258777
4	2024-25				25815	116265	28460	21099	9650	10130	12157	11169	11729	12313	12929								271716
5	2025-26					27106	122078	29883	22154	10133	10637	12765	11727	12315	12929	13575							285302
6	2026-27						28461	128182	31377	23262	10640	11169	13403	12313	12931	13575	14254						299567
7	2027-28							29884	134591	32946	24425	11172	11727	14073	12929	13578	14254	14967					314546
8	2028-29								31378	141321	34593	25646	11731	12313	14777	13575	14257	14967	15715				330273
9	2029-30									32947	148387	36323	26928	12318	12929	15516	14254	14970	15715	16501			346788
10	2030-31										34594	155806	38139	28274	12934	13575	16292	14967	15719	16501	17326		364127

levies for CA works very nearer to the actual requirement. The matrix prepared during 2021 is given in following table Different matrix has been provided for different models of Plantation under CA

3. Planting of 18 months old Seedling in CA Work

Basing on experience and observation over the past years, the State Forest Department has made it mandatory to use 18 months old tall, sturdy, indigenous saplings for all plantations. So raising of seedlings has been scheduled in previous two years before plantation year as follows

Taking Plantation year as 2022-23 seedlings are raised as follows

1st Year PO Work	.....Jan, 2021 – Mar, 2021 (2020-21 FY)
2nd Year Maint.	.....Apr, 2021 – Mar, 2022 (2021-22 FY)
3rd Year Maint.	.....Apr, 2022– Jun, 2022 (2022-23 FY)

4. Adoption of 8-year Maintenance Schedule of CA

The CA Plantation area normally happens to be the most degraded sites most often close to the human habitatations in the area. Such circumstances increse local interference and biotic pressure. Extending the maintenance of such plantations through a few more years will improve close supervision and continuous cultural operation. The state Forest department is adopting maintenance of all plantations for 8 year subsequent formation planting.

5. Asset mapping under OFMS (Odisha Forest Management System)

All the plantation sites are mapped online with the forest department digital mapping system. The site details are being uploaded directly from the site by the field staff and digitally accounted in all such sites of different compensatory afforestation.

Success Story

The CA Activities in the State is encouraging, most of the CA plantations under different category are successful in achieving the objective.

"Successful implementation of Compensatory Afforestation Scheme work under CAMPA (APO 2020-21) at Champachuan of Th. Rampur North Range of Kalahandi South Division"

Against the Forest Diversion Proposal (FDP) of 1590.8673 Ha for the mining lease in Keonjhar District, An area of 1166.52 Ha of non-forest land in 7 nos. of villages was identified under Th. Rampur Tahasil of Kalahandi District.

On Approval of CA Scheme under CAMPA APO 2020-21 on First Phase an area of 54.951 ha. (in two patches) in village Champachuan under Th.Rampur North Forest Range of Kalahandi South Division under Bald Hill Plantation Scheme.

Site name	Champachuan patch no. I & ii
Name of the range	Th.rampur north range
Name of the section	Saisurni
Name of the beat	Melghara
Name of the scheme	Campa (CA)
Area in ha.	37.96ha & 16.99 ha
Plantation year	2020-21
Plantation type	Bald hill plantation@ 1600 plants/ha
Height of the plants	5 ft. (average)
Growth of the plants	Healthy and good.
Gps co-ordinate	N 19° 28' 6.96" E 83° 9' 23.76"

The Species like Amla (*Phyllanthus emblica*), Piasal (Bija) (*Pterocarpus marsupium*), Bada Chakunda (*Samanea saman*), Bamboo, Gambhar, Jamun, Cashew (*Anacardium occidentale*), Kanchan (*Bauhinia variegata*), Khaira (*Acacia catechu*), Karanj (*Pongamia pinnata*), Mahogany (*Swietenia mahogoni*), Neem (*Azadirachta indica*), Panasa (*Artocarpus integrifolia*), Amrut (*Psidium guajava*), Pahadi Sishu (*Dalbergia latifolia*), Sitaphala (*Annona squamosa*), Bali Sishu (*Dalbergia sisoo*), Dhala sirisa (*Alibizzia procera*), Kala Sirisa (*Alibizzia lebbek*), (*Phyllanthus emblica*) has been planted to the tune of 65236 Nos.

Different cultural Operations

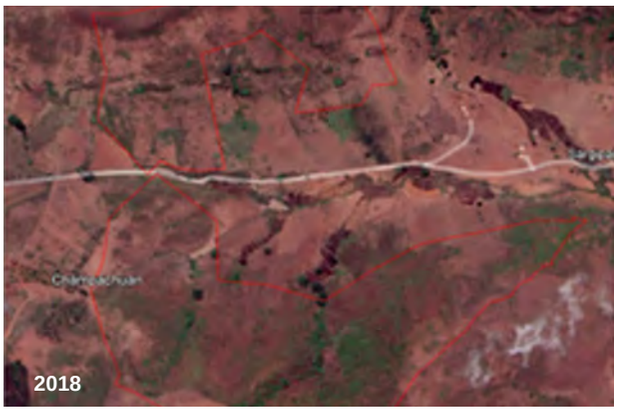
Manure application as basal dose before planting


Manure application as basal dose before planting



Carriage of seedlings and planting work done by Tribal Labours


SMC Work



Monitoring Operation

IMPACT

- The Fringe villagers of Champachuan got the opportunity to have continuous involvement in plantation activities with temporary employment increased their earnings and ensured good relations with the local forest personnel
- The local inhabitants were assured of socio-economic development for their livelihood by having fruit, fodder and NTFP species planted
- Due to intensive soil-moisture conservation, soil erosion in the bald hill site was reduced to greater extent
- Due to successful plantation the greenery of the locality and water regime of the village improved. The eco-development in the locality along with the plantation scheme was well perceived

"Successful implementation of Compensatory Afforestation Scheme over 40 ha in Khalpal RF in Mahabirod range, Dhenkanal during 2021-22."

Scheme Details: The CA scheme was taken up against the diversion of forest in respect of Katamati Iron Ore Mines of M/S TATA Steel Ltd. project approved vide moef F.No. 8-01/2018-FC dt 13.03.2019 The scheme was approved to accommodate 64000 seedlings in 40 Ha degraded forest land of Khalpal RF. The different components that were approved and the financial outlay for 10 year maintenance is as follows.

Sl. No	Description	Amount due in (Rs.)
1	Cost of Block Plantation @ 1600 per Ha with per Ha 18 Month old seedling over 40 Ha @ 3,10,117 Per Ha with 10 years Maintenance	12404680
2	Cost of Solar Fencing with 10 years maintenance per Ha over 40 Ha.	6477920
3	Cost of SMC measures over 40 Ha @ Rs. 35,633/- per Ha	1425320
4	Cost of Solar & Drip system watering @ Rs. 2,02,327 /- per Ha over 40 Ha.	8093080
5	Cost towards Entry Point Activities/ Incentive to VSS	756400
	Total	**29157400**

Location Details: The plantation is done inside Khalpal RF. The RF is located in Parjang Block, Kamakyanagar Subdivision of Dhenkanal District. With respect to forest administration the RF falls in Mahabirod range and Dihadol section. NH 200 passes through the RF dividing the RF into two blocks. The RF lies adjacent to Brahmani river. The Rengali Left Branch canal also passes through the RF. The RF is surrounded by villages: Khalpal, Paramahanspur, Kualo and Kulei.

Forest of Khalpal RF: The RF is 688.8 ha notified vide 44009941 D-2F 189 (M/20/59) dt 22/12/1959. The main forest type in Khalpal RF is **Northern Indian Tropical Moist Penisnsular Sal Forest**. However, at several places the forest is degraded and the pole size sal crop is restricted to only 60% of the area. The main cause of degradation is excessive felling of poles by the adjacent villages for fuel wood resulting in erosion and degradation of the soil. Some of the area seems to have been under encroachment for cultivation in the past and since then had remained without tree cover. Within the existing vegetation 39 species of trees were identified. The degraded patches were dominated by Sidha, Kurum, Khaira and Kasi. The soil type is sandy loam soil with good drainage in majority of the area. However, calcareous clayey soil is present at some of the degraded sites. With respect to wild life the forests are seasonally visited by Elephant groups of upto 30 nos during cropping season.

Species planted:

Sl. No.	Species	% of total seedlings	Age of seedlings (months)
1	*Azhardiracta indica*	30	18
2	*Pongamia pinnata*	25	18
3	*Dalbergia sisoo*	0.5	18
4	*Dalbergia latifolia*	2	18
5	*Careya arborea*	1	18
6	*Pterocarpus marsupium*	1.7	18
7	*Emblica officinalis*	6	18
8	*Syzygium cumini*	6.5	18
9	*Terminalia bellerica*	0.5	18
10	*Anogesus latifolia*	8	18
11	*Mimusops elengi*	1	18
12	*Pterospermum xylocarpum*	1	18
13	*Swtenia sp*	0.5	18
14	*Terminalia arjuna*	6	18
15	*Albizia lebbeck*	0.5	18
16	*Limonia acidissima*	3	18
17	*Aegle marmelos*	3	18
18	*Artocarpus heterophyllus*	3.5	18
19	*Ficus bengalensis*	0.1	18
20	*Ficus religiosa*	0.1	18
21	*Dendrocalamus strictus*	0.1	18

Objective of the plantation:

- To achieve forest cover in the open degraded area of Khalpal RF.
- To arrest soil erosion and further soil degradation.
- To decrease runoff and siltation in adjacent crop lands.
- To provide NTFP to Kualo village adjacent to the plantation.

Chronology of works executed:

Sl.No	Items	Period of work
1	Site survey and demarcation	February 2022
2	Site clearance & Pillar posting	March 2022
3	Pitting	March 2022
4	Planting commencement	July 7th 2022
5	Plantation completion	July 30th 2022

Importance of the plantation:

The plantation is taken up in the open degraded areas of Khalpal RF adjacent to the village Kualo. The area was under encroachment for cultivation in the past. Therefore, the plantation will restore the forest cover of the RF and also obviates any further encroachments. The villagers of Kualo can also harvest NTFP from the plantation in the future. A sizable number of neem trees and Karanj can be exploited in extraction of oil seed cake and oil. Amla and Terminalia bellerica can yield fruits of medicinal value. Artocarpus fruits can satisfy the dietary needs of the villagers.

Conclusion

The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) were established to encourage afforestation and regeneration activities as a means of compensating for forest land diverted to non-forest uses. CAMPA is in charge of administering compensatory afforestation funding as well as any other money that may be recovered. The manifold activities under Compensatory Afforestation are being carried out in the State to compensate the loss of greenery.

The progressive achievement of Compensatory Afforestation under CAMPA in Odisha is well visualized in the reflective report of ISFR-2021. On way forward to the success of various activities of Compensatory Afforestation, the State CAMPA has taken sincere effort to create land bank to ensure quick allotment of CA lands. Prior to implementation of Compensatory Afforestation in the field the forest cover record was properly monitored and field situation was verified by the implementing divisions.

The success of all plantations are monitored by third party monitoring in addition to Department verification. All the activities are reviewed by e-green watch by the State Authority. Odisha State CAMPA has steadily progressed since its inception from 2009 and the remarkable achievements are AR, ANR, Bald hill and Avenue plantations. The loss of forest cover due to diversion of forest land by different non-forest activities has been well addressed and its reflection has been noticed remarkably.

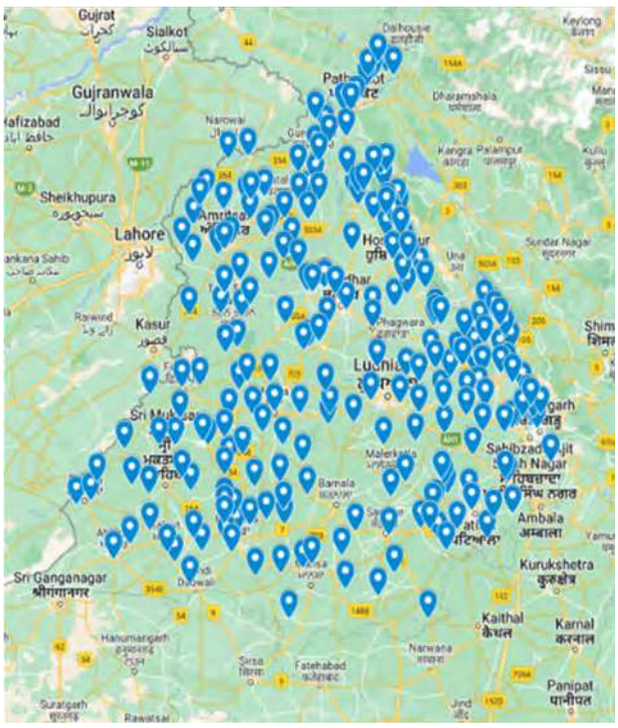
Contribution: Chief Executive Officer, Compensatory Afforestation Fund Management and Planning Authority, Odisha

PUNJAB

1. FOREST NURSERY MANAGEMENT IN PUNJAB

Forest Nursery is a back bone of forestry. Punjab has developed 244 nurseries across the state. These are created in such a way to make the availability of plants in every 5-7 kms. These nurseries across the state developing high Quality Saplings of more than 50 different native indigenous species In lieu of Campa funds allotted for Nursery raising to cater the plantation under compensatory afforestation. The saplings for plantation require good root shoot ratio with minimum height of 5 feet, as linear plantation is prone to more biotic pressure. As Punjab faces extreme weather conditions such as high summer temperatures and frost prone severe winters, The nurseries are managed with proper planning and timely execution of Nursery activities.

The Forest Nurseries are located in compact areas along the linear strips. The location is as chosen considering the important factors of open space, sufficient sunlight, Water availability, Proper Drainage, Employment generation of Local communities especially women, catering the supply needs for planation as well as public demand. The Forest Nurseries in Punjab are equipped with good irrigation system for continuous water requirement, inbuilt Vermicompost pit for manure, Store room for seed storage and tools, First aid kit for Labour requirements.



Locations of 244 Nurseries across Punjab

The Site for raising of saplings under CAMPA is earmarked with separate layout plan

For Quality seed collection Range wise mapping of plus trees with location and season for collection is maintained. The Seeds after collection are carried to the seed store and treated before sowing for better germination. The Nursery Beds are prepared with deep ploughing for good aeration followed by adequate watering and then Sowing is Done. It is followed by timely filling of nursery bags for pricking in case of bed germination and direct dibbling for root sensitive species.

Assout Nursery, Sri Mukatsar Saheb- Faridkot

Vermicompost Pit at Amloh Nursery

Covering of Neem saplings in Winter

Preparation of P bags for sowing.

Planting stock in Nursery

Seed collection in Various Nurseries of Punjab

In Punjab, Shisham is propagated from Root shoot cutting and sowing of seeds in raised seed beds. The sowing of shisham seeds in raised bed is carried out in march-April and stumps are prepared and transplanted in poly bags before Jan end. Shisham saplings of about 5ft height is available for planting for plantations under CAMPA, during the plantation season.

Nursery beds are continuously monitored for diseases and pest attack hence proper Seed dressing before sowing, Regular foliar spray for defoliation and leaf spots are done at scheduled intervals. Nutrient management is done with timely application of well decomposed FYM, regular Weeding to prevent competition and application of Fertilisers.

The native species such as Khair, Shisham, Kikar, *Acassia modesta*, Neem, Bamboo, Ber, Mango, Amla, Jhand, Pipal, Bhor, etc., are given priority to raise in forest nurseries. Further Grading of seedlings are carried out to have a proper treatment and care for developing of good planting stock for CAMPA plantations.

The Forest Nurseries also excel at inventory management and record keeping. The nursery registers are prepared annually scheme wise with separate lay out plans and stock management including the expenditure done in the Financial Year.

Shisham raising from stumps in Mangewal Nursery, Patiala



Raising of Shisham from Stumps in Mangewal Nursery, Patiala Forest Division, Punjab

Spraying of insecticide at Bagichi Nursery, Patiala


Pongamia pinnata Saplings

Azadirachta indica (Neem)

Neolamarckia Cadamba (Kadam)

Cassia fistula (Amaltas)

Delonix regia (Gulmohar)

Graded Bed of Terminalia arjuna at Khanauri Nursery, Sangrur Forest Division, Punjab

2. LINEAR PLANTATIONS UNDER CAMPA IN PUNJAB

Punjab has 3084 sq.km area of recorded forest area. Of which major portion of the Forest area lies along the strip forest such as Road, Canal, Drain and Rail notified vide Notification *No.1122-Ft-58/1195 dated 05.05.1958* as Protected Forest. Due to increased biotic pressure with increasing urbanisation the Linear strip forests are under threat of degradation over recent years. In Punjab, maximum proposals of diversion under FCA 1980 falls under strip Forests along roads as highway widening is more often inevitable for the development.

The Punjab Forest Department capitalising it as an opportunity to revive and restore the degraded strip forests carry out linear plantation along Canal, Drains and Railways proposing twice the diverted area for Plantation under Compensatory Afforestation and plantation of tall plants under Additional Compensatory Afforestation in lieu of CAMPA Funds allotted to the State. The main aim of plantation under compensatory afforestation is to restore the degraded forest land with long rotation Native indigenous species to increase Biodiversity.

As Linear strips run along various villages, the established forest plantation positively impact the micro climatic zone of the area and in addition the linear plantation along canal, drains and Bundh act as shelter belt against wind erosion there by protect the drains, canal from silt deposition. The plantation along linear strips plays a major role in employment generation of local communities of the villages where the linear strips passes, by engaging skilled, semi-skilled and unskilled labour.

CANAL FOREST STRIP:- BHAKHRA MAIN LINE RD 270-320 RHS
PLANTATION YEAR:- 2018-19
PLANTATION SCHEME:- COMPENSATORY AFFORESTATION (CA)
GPS COORDINATES:- 30°14'49.481" N, 76°14'34.194" E,
FORSET DIVISION:- PATIALA FOREST DIVISION, PUNJAB

CANAL FOREST STRIP:- UBHYA MINOR RD 0-TAIL B/s
PLANATION YEAR:- 2018-19
PLANTATION AREA:- 7 HACTARE
PLANTATION SCHEME:- COMPENSATORY AFFORESTATION (CA)
FOREST DIVISION:- SANGRUR FOREST DIVISION, PUNJAB

Site Selection for Compensatory Afforestation:

The site-specific linear plantation in degraded open forest land along canal, drain and Railway excluding roads (as maximum diversion being taken up in road strips) are proposed under Compensatory afforestation against diversion cases under Forest Conservation act 1980. The plantation targets under

Compensatory Afforestation (CA) are proposed in the Annual Plan of Operations after the final approval of the respective Diversion cases under FCA, 1980. The plantation under Compensatory afforestation is carried out after approval of Annual Plan of Operations (APO) for the corresponding financial year. On approval of Annual Plan of Operations (APO), Division wise, range wise further beat wise targets are conveyed to start the plantation activities

DRAIN FOREST STRIP :- Matewal Drain RD Chamka to Ram Diwalipul B
PLANTATION YEAR :- 2019-20
AREA :- 7.23 HEC
PLANTATION SCHEME:- Compensatory Afforestation (C.A.)
GPS COORDINATES :- 31.424681332, 75.102881632
FOREST DIVISION :- Amritsar Forest Division, Punjab.

as per the advance planning done during the preparation of Annual Plan of Operations (APO) of that relevant year. This provides a foundation in plantation success.

Linear Plantation under Compensatory Afforestation (CA):

The pre plantation activities include site preparation such as site clearance, alignment, advanced earthwork is completed by March of that particular year for proper aeration of pits making it suitable for plantation. For ensuring supply of good quality saplings to the plantation site, nursery bed wise, species wise, nurseries are mapped and earmarked with the plantation site through advance planning, based on that, quality planting stock requirements are done in coordination of Nursery in charge and Beat In charge who has the plantation under CAMPA.

The plantation activity is carried around June end coinciding with the start of Monsoon. The earmarked nursery stock is carried from the respective Nursery to the plantation site. The pits are reopened to maintain the depth followed by refilling with good earth and application of adequate FYM, nutrients which is then followed by planting. The Weeding and 10% replacement are taken up alongside to ensure 100% survival of plants. On completion of the plantation, the maintenance is carried out with Hand watering at regular intervals on need basis, the nutrient management is carried out with scheduled application of FYM and Fertiliser at regular intervals and Foliar spray for pest infection is done for disease management.

Protection plays an important role in survival of Linear Plantation, as strips are more prone to biotic pressure such as grazing, trampling by cattle. The plantation site is fenced with Barbed wire fencing based on the necessity of the site and information boards are installed at plantation site with project description for transparency.

The Department is keen on Record maintenance and documentation, a well-informed plantation journal is prepared parallel to the plantation activities recording the site description including details such as location, soil type, Existing stock and proposed species, GPS coordinates of the site, KML file, lay out plan, Segment wise species data, with monthly progress of plantation activity as photographs and details of expenditures.

Contribution: Chief Executive Officer, PUNJAB State Compensatory Afforestation Management and Planning Authority

3. TRANSLOCATION OF TREES IN PUNJAB: BEST PRACTICES

Trees are an indispensable part of living kingdom. Globally, it is a well accepted fact that trees are indispensable for sustenance of life, a healthy environment, a stable climate & a check against global warming and air pollution. At the same time development and urbanization are also an inevitable part of living today. Road infrastructure development is requirement of every State, but this comes at the cost of losing green cover thus depriving citizens of much needed Ecosystem services which is one of the prime and vital public utility.

Background:

In Punjab which is an agriculturally predominant state with a meager tree cover of about 6% it assumes a larger significance. Most of the forest areas in plain area of our state are strip forests. Trees grown on forest areas are required to be removed for various development activities like widening of roads, canals, railways etc. Though, the rules envisage, plantation of double the number of trees against trees required to be felled but the plant takes a long time to grow and establish as a tree there by it creating a void in environment locally. Tree translocation is really looked to as an opportunity to address this issue. To overcome this issue, trials are being carried out by both foresters and other agencies to relocate those trees which are required to be felled. Though little success has been achieved in this field in our country but there is a strong need to standardize and mainstream this activity in the forest working.

An Opportunity:

This activity requires heavy machinery and so far it has not been mainstreamed into working of forest department. The present reported survival rate in our State and Country is poor and hence the need to standardize and improve the technique. These constraints, limited experience and absence of a proper and standard technique prompted State Forest Department to constitute a committee in year 2020 to conduct a work study to formulate Standard Operating Procedures (SOP) to translocate trees**.** The Committee after conducting a field study had framed SOP guidelines to implement this activity in field by giving recommendations on technique, favorable season and probable species. During field study on 35 trees of 17 different species with different girth classes a survival rate of about 60% has been observed after one year of translocation which is quite promising and encouraging. Encouraged by these results this activity has been taken up across the state on pilot basis by State Forest Department and another 2221 trees of Shisham, Teak, Pipal , Jamun, Amaltas, Tun, Mango and Arjan have been translocated recently, whereby a survival rate of approximate 66% has been achieved. Results are quite promising where soil texture is favorable for earth ball preparation and its transportation.

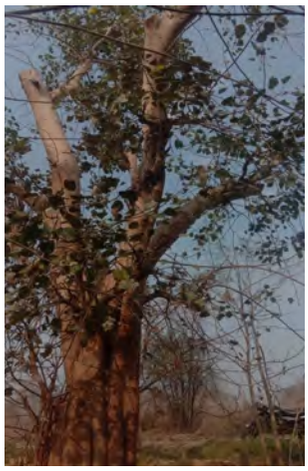
Various steps involved in translocation of trees are enumerated below

Step 1:- Tree Selection

Species : Mango
Girth : 186 cms
Location : Main Branch Lahore Canal, Amritsar.

Step 2 : Pruning

Species : Pipal
Girth : 235 cms
Location : Main Branch Lahore Canal, Near Village Bhoru (Amritsar)




Step 3 : Trenching

Species : Lasuri

Species : Pipal

Girth : 117 cms

Girth : 84 cms

Location : Main Branch Lahore Canal, Near Village Bhoru (Amritsar)


Step 4 : Earth Work/ Digging of Pits at Translocation Site

Location : Main Branch Lahore Canal, Near Village Bhoru (Amritsar)


Step 5 : Earth ball preparation and uprooting of tree

Species : Shisham

Girth : 117 cms

Location : Main Branch Lahore Canal, Near Village Bhoru (Amritsar)

Species :- Drek

Girth :- 65 cms


Step 6 : Transplanting of tree

Species : Arjun

Girth : 156 cms

Location : Kasur Branch Lower Canal, Near Village Tarpur (Amritsar).

Step 7 : Transportation of tree

Species : Tun

Girth : 94 cms

Location : Main Branch Lahore Canal, Near Village Bhoru (Amritsar)

Step 8:- Post transplanting care

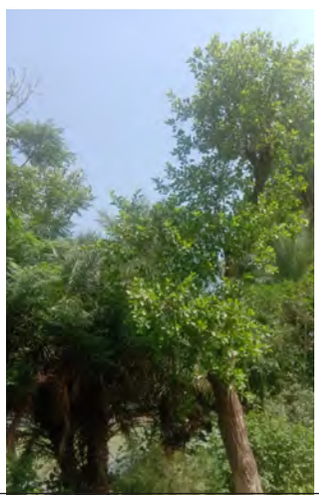
Species : Shisham

Girth : 135 cms

Location : Main Branch Lahore Canal, Near Village Bhoru (Amritsar)

Trees pictures after translocation:






Important Tips Learnt

- Time needed for various operations and survival would vary with soil conditions. Earth ball preparation in Loose sandy soils would be impossible and in sandy loam it will be challenging and tedious. Hard soil will take more time as compared to medium and soft soils..
- The route to be used for transportation and quantum of enroute traffic is also to be considered. Heavy traffic areas may require special assistance for road clearing.
- Due care and consideration is to be given to all the underground facilities like drinking water / drainage / gas lines, cables, RCC construction or hard rock while doing tree selection and while selecting sites for their transplantation.
- While doing operations of pruning, uprooting, loading, unloading and transplanting all the safety precautions like, wearing helmet need to be taken. Spectators may be kept at safe distance.
- Translocation site should be strips other than roads or block forest areas.

LIMITATIONS

- It will be practically impossible to go for translocation in sandy and sandy loam soils as earth ball preparation and especially its transportation with an intact would not be possible.
- Present survival rate of 66% in the first attempt is quite encouraging and can be further improved with proper choice of species and further experience after replication of this activity in the field. It will not be possible in Bouldry/rocky areas.
- Manual translocation being seasonal so it can be taken up on a very limited scale as it is confined to period from month of October to mid Febuary . However it can be scaled up considerably if taken up in a mechanized manner for crop upto 80 cm diameter in case of species like Shisham, Arjun, Mulberry, Teak, Amaltas, Bohar, Pipal and Pilkan. Mechanised Translocation needs to be tried in Monsoon season.
- As developmental projects are time bound and further given the fact that this activity is seasonal so user agency is ready to wait for much time which restricts the scope of this activity. Way out would be advance planning of the project and taking up this activity in zero year.

Contribution: Chief Executive Officer, PUNJAB State Compensatory Afforestation Management and Planning Authority

RAJASTHAN

1. COMBATING DESERTIFICATION

The new Compensatory Afforestation Fund Act, 2016 is effective in the entire country from 30th September, 2018 along with the Compensatory Afforestation Fund Rules, 2018 to guide the States and the National Authority on various fronts of implementation of CAMPA activities.

Rajasthan CAMPA has successfully implemented the mandated site-specific activities of Compensatory Afforestation, fulfilling other 'specified' conditions in cases of forest land transfer along with activities pertaining to protection of Forests & Wildlife under the component of NPV, Soil and Water Conservation and promotion of natural regeneration among others, have been a key focus area of Rajasthan CAMPA to enhance the sustainability of forests.

To increase the forest cover in the state, planting has been done over the forest area under different models by which the forest cover of the Rajasthan State is continuously increasing (57 sq. kms. - as per FSI Report 2019 & 25.4 sq. kms. - as per FSI Report 2021).

Roughly three-fifth of Rajasthan lying North-west of Aravalis falls within the limit of arid zone and it comprises the 12 western districts of Rajasthan namely Barmer, Bikaner, Churu, Ganganagar, Jaisalmer, Jalore, Jodhpur, Pali, Sirohi, Jhunjhunu, Sikar and Nagaur. Arid areas are characterized by acute ecological imbalance.

With the intention of combating desertification in Bikaner and Jodhpur Forest Circles of Rajasthan, following plantation activities have been undertaken thorough CAMPA during the year 2011-12 to 2021-22 :

CAMPA (2011-12 to 2021-22)		NFL Planting		DFL Planting		ANR Planting		Silvi pastoral Planting	
S. No.	Name of Division	Planting (In Ha.)	Exp. (Rs.in Lacs)	Planting (In Ha.)	Exp. (Rs.in Lacs)	Planting (In Ha.)	Exp. (Rs.in Lacs)	Planting (In Ha.)	Exp. (Rs.in Lacs)
1	DCF BIKANER	15.18	8.72	357.48	226.36	0.00	0.00	0.00	0.00
2	DCF IGNP ST II BIKANER	52.25	42.70	53.00	21.08	0.00	0.00	0.00	0.00
3	DCF IGNP ST I CHHATTARGARH	19.38	11.25	162.16	116.76	200.00	83.97	0.00	0.00
4	DCF CHURU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	DCF SRI GANGANAGAR	0.00	0.00	3.20	1.26	0.00	0.00	0.00	0.00
6	DCF HANUMANGARH	3.70	3.79	9.99	8.89	50.00	25.93	200.00	86.82
7	DCF BARMER	20.00	22.14	548.18	431.17	200.00	77.50	200.00	94.74
8	DCF JAISALMER	3185.61	3490.27	564.36	409.83	0.00	0.00	100.00	44.02
9	DCF IGNP ST II JAISALMER	1502.37	1479.97	3.30	1.54	0.00	0.00	0.00	0.00
10	DCF JALORE	1.10	1.09	266.48	221.78	1645.00	904.29	200.00	94.75
11	DCF JODHPUR	61.36	57.37	405.58	222.54	830.00	341.78	35.00	25.45
12	DCF PALI	0.00	2.67	740.00	641.20	2850.00	1322.39	100.00	47.39
13	DCF SIROHI	55.69	47.14	1085.84	758.00	1700.00	742.84	0.00	0.00
	TOTAL	**4916.64**	**5167.12**	**4199.57**	**3060.40**	**7475.00**	**3498.69**	**835.00**	**393.17**

CA-DFL Plantation at 2 CHD in Chhattargarh Division (Year 2021-22)

ANR (Assisted Natural Regeneration) Plantation in Sirohi Division (Year 2021-22)

Silvipastoral Plantation in Hanumangarh Forest Division (Year 2020-21)

2. INFRASTRUCTURE FOR FRONTLINE STAFF

The new Compensatory Afforestation Fund Act, 2016 is effective in the entire country from 30th September, 2018 along with the Compensatory Afforestation Fund Rules, 2018 to guide the States and the National Authority on various fronts of implementation of CAMPA activities.

Rajasthan CAMPA has successfully implemented the mandated site-specific activities of Compensatory Afforestation, fulfilling other 'specified' conditions in cases of forest land transfer along with activities pertaining to protection of Forests & Wildlife under the component of NPV, Soil and Water Conservation and promotion of natural regeneration among others, have been a key focus area of Rajasthan CAMPA to enhance the sustainability of forests.

The CAMPA funds are being used to strengthen the field staff by construction of Forest Guard chowkie and Office-cum-residence for Range Forest Officer.

The details of the infrastructure for frontline staff constructed under Rajasthan CAMPA during 2009-10 to 2021-22 are as follows :

Year	Forest Guard Chowkies (nos.)	Office-cum-residence for Range Forest Officers (nos.)	Expenditure (in Lacs)
2009-10	0	0	0.00
2010-11	27	7	116.07
2011-12	20	9	132.81
2012-13	18	8	156.96
2013-14	18	8	171.34
2014-15	39	14	329.84
2015-16	40	9	273.97
2016-17	21	4	160.28
2017-18	15	3	105.24
2018-19	26	7	213.64
2019-20	25	7	116.01
2020-21	13	6	218.28
2021-22	24	8	208.35
Total	**286**	**90**	**2202.79**

Construction of Forest Guard Chowkie at Base WL Sanctuary (year 2020-21)

Construction of Office-cum-Residence at Jaswantpura, Jalore Division (Year 2020-21)

Construction of Forest Guard Chowkie at Todgarh, Rajsamand Division (Year 2020-21)

Construction of Office-cum-Residence at Bundi Division (Year 2021-22)

Construction of Forest Guard Chowkie at Koleshwar, Dausa Division (Year 2021-22)

Construction of Office-cum-Residence at Sikarai in Dausa Division (Year 2021-22)

Maintenance of Naka Wadakheda Building in Sirohi Division (Year 2021-22)

Maintenance of Naka Jedaraveer Building in Sirohi Division (Year 2021-22)

3. SOIL AND WATER CONSERVATION WORKS

The new Compensatory Afforestation Fund Act, 2016 is effective in the entire country from 30th September, 2018 along with the Compensatory Afforestation Fund Rules, 2018 to guide the States and the National Authority on various fronts of implementation of CAMPA activities.

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The objective of soil and moisture conservation works is to minimize the amount of water loss from soil through evaporation and transpiration. Apart from helping in ground water re-charge preserving soil-moisture is important to maintain the necessary water.

SMC works are also beneficial not only for wealth of landscape but also useful for improvement of water level around the forests. Following this principle many anicut type III, II & MPTs have been constructed in and around forest areas. To improve water retention in the forest areas and availability of water to the wild animals, total 753 soil and water conservation structures have been constructed specially in wildlife prone areas.

The details of the soil and moisture works undertaken through Rajasthan CAMPA during 2009-10 to 2021-22 are as follows :

Year	Anicut Type III (nos.)	Anicut Type II (nos.)	MPT (nos.)	Expenditure (in Lacs)
2009-10	0	0	0	0.00
2010-11	16	15	0	146.93
2011-12	11	13	0	119.38
2012-13	15	14	0	134.41
2013-14	4	19	0	99.87
2014-15	22	30	0	235.84
2015-16	0	0	0	0.00
2016-17	0	0	0	0.00
2017-18	0	0	0	0.00
2018-19	22	11	0	164.38
2019-20	37	44	0	304.60
2020-21	31	60	223	632.71
2021-22	33	68	65	496.30
Total	**191**	**274**	**288**	**2334.42**

Soil & Water Conservation Works through Advance Action of ANR Plantation in Jhalawar Division (Year 2021-22)

Construction of Talai (Year 2020-21) in Ramgarh Vishdhari Sanctury, Bundi

Watershed View of 2 Anicut type II, Malutana, Range Thanagazi, Alwar (Year 2021-22)

Construction of Anicut in Jaisamand Sanctury, Udaipur (Year 2020-21)

Anicut Ishwana Range Rajgarh, Alwar

Anicut Banka type III Bhilwara (Year 2020-21)

Anicut Nandri at Dausa Division (Year 2021-22)

Anicut Bhamra Wala Beda at Pratapgarh Division (Year 2021-22)

4. VOLUNTARY RELOCATION OF VILLAGES FROM PROTECTED AREAS

The new Compensatory Afforestation Fund Act, 2016 is effective in the entire country from 30th September, 2018 along with the Compensatory Afforestation Fund Rules, 2018 to guide the States and the National Authority on various fronts of implementation of CAMPA activities.

Rajasthan CAMPA has successfully implemented the mandated site-specific activities of Compensatory Afforestation, fulfilling other 'specified' conditions in cases of forest land transfer along with activities pertaining to protection of Forests & Wildlife under the component of NPV, Soil and Water Conservation and promotion of natural regeneration among others, have been a key focus area of Rajasthan CAMPA to enhance the sustainability of forests.

The human habitation inside the protected areas specially in core areas of tiger reserves create a lot of biotic interference through the activities like illicit felling, grazing, fire, encroachment etc. In order to reduce these hazards some villages has been relocated through Voluntary Village Relocation Programme under Rajasthan CAMPA.

Three villages and 435 families have been completely relocated since 2016 from Protected Areas since 2016. Besides this, some families of 15 other villages have also been relocated in Rajasthan State.

The year-wise details of the amount spent from Rajasthan CAMPA for "Voluntary Relocation of Villages from Protected Areas" since 2016 are as given in the table below :

Sr. No.	Year	Amount Spent (in Lacs)
1.	2016-17	331.81813
2.	2017-18	475.96603
3.	2018-19	5.73175
4.	2019-20	230.75000
5.	2020-21	505.77560
6.	2021-22	2451.78700
TOTAL		**4001.82851**

Voluntary Village Relocation Works in Tizara, Alwar (Year 2020-21)

Set up of Azolla beds for livestock to increase milk production

Mustard crops ready for harvesting

Villagers grading and packing harvested brinjals from their fields

House settlements ("Chula" for cooking purpose and mawa production) with agriculture fields

Cattle shed set up post relocation

Settlements of relocated Gujjar Communities in Tijara

Rabi crop (Wheat) pre harvesting

Rabi crop (Wheat) harvesting

Bajra cultivation

Plantation drive in Maujpur in collaboration with ICICI Foundation

Maujpur house settlements with water facilities

Cemented Road for better transportation

Relocation survey of Loj village for Proper documentation

Active relocation of villagers to Tijara with their goods

Initial stage of relocation of LOJ people in Tijara

View of relocated colony in Behror

House construction in Behro

Contribution: Chief Executive Officer, Compensatory Afforestation Fund Management and Planning Authority, Rajasthan

SIKKIM

CREATION OF ORCHIDARIUM UNDER BIODIVERSITY CONSERVATION PLAN




Location : Golitar, Fambonglho Wildlife Sanctuarym, Total cost : Rs.10.00 lakhs, Year : 2020-21

Sikkim one of the 36 biological hotspot of the world houses over 500 of the total 1200 species of Orchids found in India. The wild orchids viz., *Calanthe biloba, Pholidota imbricate, Bulbophyllum caulifloreum, Cymbidium pendulum, Eria spicata, Coelogyne barbata, Rhynchostylis retusa etc.,*which were mostly removed from the project affected areas are collected and housed in the Orchidarium. This will benefit conservation of different species of orchids found in the state and will also generate awareness amongst the local people and will also act as perfect reContribution center for the researchers and students to gather more information on various types of indigenous orchids found in the state.

Construction of Dry-Stone Wall Fencing at Zoom Reserved Forest in West district of Sikkim under Net Present Value (NPV) scheme

The creation of stone wall fencing carried out in Soreng District (erstwhile West Sikkim),Sikkim has been able to demarcate the forest land from the adjoining private land and has helped stopped encroachment. Furthermore, the fence has acted as a barrier for wild animals and hence prevents man animal conflict in the region drastically. This has also acted as a firelines/barrier against spread of forest fires in the fire prone area of Zoom RF predominantly covered with Sal,Teak and its associate species.

Location : Zoom Reserved Forest, Soreng district, Sikkim, Year : 2020-21, Total cost : Rs. 9.55 lakhs, Length 1 km

Construction of Sausage Wall at Bop Forest Nursery area in North district of Sikkim under Net Present Value (NPV) scheme

Bop Nursery under Chungthang Territorial Range, is one of the only nursery that caters to propagation and distribution of broadleaved species in various afforestation sites in the region. Considering its importance for the department, the sausage wall was constructed in order to protect the nursery from further deterioration from landslide and other natural calamities, Furthermore,the protective wall all along the lower portion of the nursery has helped in protection of seedlings from grazing by wild animals and stray cattle as well.

Location : Bop nursery, North Sikkim, Year : 2020-21, Total cost : Rs.8.41 lakhs, Physical target : 100 m^3

Construction of water storage tank at Nayabazar (Soreng) in West District under Net Present Value (NPV) Scheme

The water tanks in the state have basically been constructed in the low-lying fire prone districts of Sikkim in order to store water both for control of the forest fire incidences and firefighting as well as for supply of water to various nurseries and quarters wherever possible. The water tanks also serve to act as reservoir for refilling of forest fire tenders.

Location : Nayabazar (Soreng), West district of Sikkim, Year : 2020-21, Total cost : Rs.3.00 lakhs, Physical target : 1 no

Construction of Catch Water Drain after completion at Chandmari in East District

Chandmari is one of the landslide trouble spot located above Gangtok District and has been under constant state of erosional hazards owing to number of rivulets/streams generating from catchment areas from the forest land situated above. The flow of water when channelized by duly constructing catch water drains helps avoid gully/soil erosion and subsequently landslides.

Location : Chandmari, East district of Sikkim, Year : 2020-21, Total cost : Rs. 11.87 lakhs, Physical target : 250 m^3

Erection of boundary pillars at Tsingthang Reserved Forest, West district of Sikkim

West district is one of the most populous districts in Sikkim wherein a majority of land holding are adjacent to Reserve Forest or Protected Areas.. Due to constant anthropogenic pressure the necessity to demarcate the boundaries of forest and private land by way of erecting boundary pillars are being carried out. The pillars are normally constructed of the size 2.5'x2.5' (height and width) with angle iron fixed in between pointing towards the next pillar for easy identification of the boundary line which helps the forest managers to easily ascertain the boundaries of the forest/private land. The angle iron post mounted in square shape with CC base of size 2.5'x2.5' are erected along the boundaries of Reserved Forests whereas triangular cement concrete base is erected for demarcating the compartment boundary lines.

Location : Tsingthang Reserved Forest, West District of Sikkim, Year : 2020-21, Total cost : Rs. 20.00 lakhs, Physical target : 93 no

Contribution: Chief Executive Officer, Compensatory Afforestation Fund Management and Planning Authority, Sikkim

TELANGANA

1. SENSITISING OFFICERS ABOUT CAMPA ACTIVITIES

Municipal Administration and Urban Development Minister KT Rama Rao wanted the Ministry of Environment, Forest and Climate Change to consider announcing national level rankings on net zero as was being done in Ease of Doing Business.

This would promote States to work more effectively towards ensuing net zero emissions. Prime Minister Narendra Modi had already announced grand plans and targets on net zero emissions. Announcing rankings would lead to healthy competition between State Governments, he suggested.

Addressing at the national workshop on Effective Implementation and Monitoring of Forestry Activities with Special Emphasis on Campa here on Friday, the Minister appealed to the Ministry to explore possibilities of setting up demonstrative farms to train young officers in forest department on tree survival rate and extensive plantations.

These could be set up on the lines of Agriculture department's Krishi Vignan Kendras. There are six different types of soils in Telangana alone and there could be more types across the country. Establishing demonstrative farms would help in effective training of department personnel, he stressed.

Highlighting Telangana Government's meausres in leveraging NREGA funds in executing different works, including Multi Level Avenue Plantation, the Minister said there was need to incentivise performing States.

Even before the Central Government announced policies on drones, Telangana government had promoted use of drones in different sectors. Forest department used drones for dropping seed balls and other departments were using drones for supplying medicines to remote areas under the Medicine from Sky initiative, he pointed out.

He specifically wanted the forest department to be more pragmatic in its approach towards development works proposed by State Government's. Telangana has developed urban infrastructure and also leads in increasing green cover in the country, he said adding" We have to balance all the aspects and there should not be conflict of interest,".

Appreciating the MAUD Minister's proposal to announce ranks on net zero performances, Director General of Forests, Chandra Prakash Goyal said the proposal would be taken up with the Ministry and come up with plans.

KTR pitches nat'l-level green ranking for zero emission goals

EXPRESS NEWS SERVICE
@ Hyderabad

JUST as how states are ranked on 'Ease of Doing Business', on a national level, 'Green Ranking' of states must also begin, suggested IT and Industries Minister KT Rama Rao while addressing a national-level workshop to train forest officers on 'Effective implementation and monitoring of forestry activities with special emphasis on CAMPA' in Hyderabad on Friday.

"If we could rank states on Ease of Doing Business, and make them compete, why can't we introduce a program where states compete for COP's Net Zero goals? Why can't we compete in achieving Net Zero by 2070, as PM Modi has called for," KT Rama Rao said to senior Central government forest officers who were present at the event.

He also appealed to the forest department to not work in isolation and collaborate with industries and MA&UD departments and make strong policies to achieve COP goals. "Telangana has ranked first or second in 'Ease of Doing Business' ranking and also first in increasing green cover, which shows the two can go together," said Rao, adding that the forest ministry should be pragmatic and practical in it's approach and provide permissions for flyovers and other projects as they reduce carbon emissions and not just think about the 200-300 odd trees lost. "Cities need more support from the forest department in terms of legislations, acts and practicality in terms of growth oriented planning," added KT Rama Rao. The Minister for Forest Indrakaran Reddy also highlighted Telangana's efforts in improving green cover by planting nearly 130 crore saplings and improving the green cover from 24% to 31.7%.

The 2-day national workshop will include field visits by the various forest officers to Telangana's success stories in various forestry activities.

CAMPA, forest officials on a field trip

HYDERABAD

CEO of the National Compensatory Afforestation Fund Management and Planning Authority (CAMPA) Subhash Chandra and forest officials from various States who were here for the national workshop, were taken on field trip on Saturday, during which they visited the urban forest park at Kandlakoya, Outer Ring Road, avenue plantations and other locations.

State's urban parks impress CAMPA officials

EXPRESS NEWS SERVICE
@ Hyderabad

ON day two of the national workshop on 'Effective utilisation of Compensatory Afforestation Fund Management and Planning Authority (CAMPA) funds', senior officials from the Ministry of Environment, Forests and Climate Change (MoEFCC) conducted field visits to observe the work being done in Telangana.

The officials visited oxygen parks, urban forest parks and the ORR lines to see the various ways in which the Telangana government had utilised the CAMPA funds. The officials were especially impressed by the State's efforts in setting up urban forest parks all across the GHMC limits which was crucial in cutting down carbon emissions generated in the city. "CAMPA funds have been innovatively utilised by the State government. Activities which are important but often do not find a lot of financing options have been taken up under CAMPA. The urban parks here are a typical example of how compensatory afforestation needs to be done. It is worthy of being followed by other States as well," said Subhash Chandra, National CAMPA CEO.

Other senior officials were also impressed by the involvement of private parties and their funds for urban forestry. "Miyawaki Method has been used very well here and we have also seen how they have got in private funding for the work which can be replicated elsewhere as well," added Sanjay Srivastav, PCCF and CEO CAMPA Uttar Pradesh.

The officials were also taken to visit the greening efforts undertaken by HMDA in the ORR region. The team was taken around an area of 70 km where they saw the various drip irrigation systems, green management in interchanges.

ఇలాంటి వసతులు.. ఎక్కడైనా ఉన్నాయా?

రాష్ట్రంలో అడవుల నిర్వహణ, పచ్చదనం పెంపు భేష్

- కంపా నిధుల సక్రమ నిర్వహణలో మంచి ఫలితాలు
- ఇతర రాష్ట్రాలకు ఆదర్శంగా తెలంగాణ
- జాతీయ సదస్సులో భాగంగా క్షేత్రస్థాయి పర్యటనలో కంపా నేషనల్ సీఈఓ, ఇతర రాష్ట్రాల పీసీసీఎఫ్‌లు

పచ్చదనంలో రాష్ట్రాల మధ్య పోటీ పెంచాలి

అటవీశాఖ జాతీయ సదస్సులో మంత్రి కేటీఆర్

Rank states for green efforts: KTR

Times News Network

Hyderabad: Municipal administration and urban development minister **KT Rama Rao** on Friday urged the Union ministry of environment and forest to consider announcing national-level rankings for states' progress towards net-zero emissions.

At the national workshop on 'Effective Implementation and Monitoring of Forestry Activities with Special Emphasis on CAMPA' in the city on Friday, KTR referred to PM Narendra Modi's commitment to bringing India's carbon emissions to net zero by 2070 and said: "Why can't we start a ranking system for states and create a challenge between state governments to achieve that ranking."

He also urged that the central government should incentivise states achieving top rankings towards net-zero goals.

"Telangana is ahead not only in Ease of Doing Business but also in increasing our green cover according to the recent Indian Forest Survey. When we can have a balance in managing economic and environmental goals, other states too can do the same," Rao told forest officials.

KTR said that forest officials should not operate in isolation, but have a collaborative approach with industries by participating in forums such as CII and FICCI across states.

తెలంగాణలో అడవుల నిర్వహణ భేష్

• క్షేత్రస్థాయి పర్యటనలో ఇతర రాష్ట్రాల పీసీసీఎఫ్‌లు

Telangana Today

"Telangana's afforestation programmes impressive"

Director General of Forests **Chandra Prakash Goyal** says Telangana's afforestation programmes are impressive. Speaking to **S Sandeep Kumar** on the sidelines of a national workshop on Effective Implementation and Monitoring of Forestry Activities with Special Emphasis on Campa, Chandra Prakash Goyal said other States can take a cue from the programmes implemented in Telangana.

Afforestation programmes

Telangana's Haritha Haram programme, Green Fund and Green Budget initiatives are a game-changer. The best thing is people's participation in Haritha Haram.

We have been discussing these initiatives and takeaways during the workshop so that they could be implemented in other States. All the Principal Chief Conservator of Forests are participating in the workshop and will bring to the notice about these programmes to their respective State governments. Will also take up Industries Minister KT Rama Rao's request for net-zero rankings with the Ministry of Environment, Forest and Climate Change (MOEFCC).

Forestlands survey and disputes

Forest and Revenue Departments are two custodians of the land. There are disputes when Revenue and Forest Department lands have common boundaries.

To address these issues, we'll reconcile the forest maps with the Revenue Department maps. The data will be linked to the Parivesh portal, which accepts applications for environment and forest clearances for a project.

We have a mandate from the MOEFCC to complete the reconciliation exercise in six months. Already, a few States, including Madhya Pradesh, Odisha and to a large extent Karnataka have completed this exercise. The Central government will bear the expenditure for this exercise, but if required, we will speak to the State governments as they own the forest lands.

Roads and underpasses

Conservation is important but one cannot ignore development. There has to be a balance and synchronization between conservation and development. Wildlife mitigation depends on case to case and based on feasibility, underpass or tunnels are proposed.

Based on the WII's recommendations, clearances are accorded in concurrence with National Board of Wildlife approvals and the best model is permitted. An elevated road is being proposed to cover a portion of the Ganeshpur to Dehradun project and the Shivalik landscape and Rajaji landscape will be practically merged. This will be a win-win situation as vehicular traffic will not be halted and wild animals can move freely beneath the elevated road. Before approving a project, including laying a road, railway line etc the best model will be explored considering WII's recommendations. These models, including roads, underpasses, elevated roads etc vary from site to site and feasibility at ground level, besides being cost-effective.

అటవీ అద్భుతం!

అడవుల నిర్వహణలో తెలంగాణ ఆదర్శం

అన్ని రాష్ట్రాల అటవీ అధికారుల ప్రశంసలు

గ్రీన్ ర్యాంకులివ్వాలి

నేషనల్ ఫారెస్ట్ వర్క్ షాపులో మంత్రి కేటీఆర్

Telangana Today

State's urban parks initiative draws praise

STATE BUREAU
Hyderabad

Compensatory Afforestation Fund Management and Planning Authority (CAMPA) National CEO Subhash Chandra appreciated State Forest Department's initiatives to develop urban parks and greenery along Outer Ring Road (ORR). The CAMPA National CEO along with Principal Chief Conservator of Forests (PCCF) of different States on Saturday visited Oxygen Park, Kandlakoya and inspected the greenery on ORR.

CAMPA National CEO Subhash Chandra and PCCFs of di[...] States at Oxygen Park in Hyderabad on Saturday.

They were here as part of the national workshop on "Effective implementation and monitoring of Forestry activities with special emphasis on CAMPA" held on Friday. Telangana Forest Department's efforts to develop urban forest parks and extensive plantations by making effective use of CAMPA funds was commendable. In the present circumstances, the creation of green lung spaces amidst concrete jungles was need of the hour, CAMPA National CEO Subhash Chandra said.

Uttar Pradesh PCCF Sanjay Srivastava said rapid urbanisation was leading to scarcity of lung spaces. Telangana's initiatives of developing urban forest parks were worth replicating in other States, he said. Manipur PCCF Aditya Joshi too was impressed with Telangana's urban forest parks and said efforts would be made to develop s[...] parks in Manipur. Lat[...] team travelled for ab[...] km on ORR and insp[...] the newly set up drip [...]tion system for wateri[...] saplings and trees alo[...] expressway. Briefin[...] team about the me[...] taken for increasing [...]ery, HMDA Urban Fo[...] Director B Prabhak[...] formed that in a wee[...] drip irrigation syste[...] be covering 160-km o[...]

27/02/2022 Hyderabad Pg 05

sunday pioneer
HYDERABAD | SUNDAY | FEBRUARY 27, 2022

Other states' forest officials laud Telangana's greening initiatives

The Haritha Nidhi and Greenfund are also laudable and the TS Forest Department is doing a good job in keeping the state green, he added.

2. FOREST REJUVENATION ACTION PLAN IN TELANGANA

1. Objective

As a part of "Telangana Ku Haritha Haram", (a state flagship program since 2015 to increase the green cover up to 33% of the geographical area of the Telangana state), Forest Rejuvenation Action Plan (FRAP) has been prepared by Telangana CAMPA for all Reserve Forest Blocks with appropriate forestry interventions on saturation basis to improve the degraded Forest landscapes to increase forest cover, biodiversity, carbon sequestration, land degradation neutrality, hydrology and well-being of people for the benefit of present and future generation.

Forest Department, Government of Telangana, India

2. Strategy/methodology

- Clear vision/goal
- Wider consultation with International Agencies, National institutes and Organizations, Experts and Field Officers
- Scientific & Technological Inputs
- Training to all forest field officers
- Collection of data of all Forestry interventions on a saturation mode
- Field inspections by Senior Officers
- Preparation of Forest Rejuvenation Action Plan (FRAP) for all Reserve Forest Blocks in the state
- Sensitization of concerned District Officers including forest frontline officers about FRAP
- Involvement of Public representatives, District Officials & other stakeholders
- Incentivisation of meritorious works of forest frontline officers on forestry activities

Forest Rejuvenation: Wider Consultation

3. Forestry Interventions

The basic forestry interventions which could positively act against the drivers of forest degradation & deforestation like encroachments, illicit fillings, fire, invasive species, grazing, soil degradation etc., were discussed with all stakeholders in various workshops and appropriate forestry activities are identified forest canopy density wise on saturation basis after extensive field exercise in all Reserve Forest Blocks in Telangana which could protect and develop the forests & wildlife in Telangana and at the same time improve the ecological parameters as required to meet the national & global commitments.

Forestry interventions have been identified in all Reserve Forest Blocks as per the requirements,

- Across all Forest Canopy Density classes
- Areas between 0 to 0.1 Canopy density (Artificial Plantation Zone)
- Area Between 0.1 to 0.4 Canopy Density (Assisted Natural Regeneration Zone)
- Area Between 0.4 and above Canopy Density (Conservation Zone)

3.1 Interventions across all Forest Canopy Density class areas in a Reserve Forest Block and done since 2014-15 up to 2021-22 under CAMPA

- RF Boundary Trench/ Fencing along RF boundaries with interface to Revenue land and Trench Mound stabilization (Bio fencing): Protection from Biotic interference, improve natural regeneration & existing rootstocks
- Soil & Moisture Conservation : Prevent further soil/ land degradation
- Water Harvesting (PA + NON PA) : Prevent further soil/land degradation & improve water availability for forests & wildlife
- Plantation inside and on mounds of Staggered Contour Trenches : Prevent further soil degradation, improve ground level canopy & biodiversity
- Fire Lines : Prevent further degradation due to damages from Fire
- Bamboo Plantation along streams, nalas, water bodies: Improve forest cover

RF Boundary Trench & Gachakaya Plantation under CAMPA-NPV


Narsapur


Mahaveer Vanasthali


Sangapur- Gajwel-Siddipet

RF (Urban) Boundary Protection Structures under CAMPA-NPV : 640 km

Fire Lines Creation : 23066 km




Soil & Moisture Conservation Works: Staggered Contour Trenches-342000 nos



Water Harvesting Works under CAMPA NPV : Check Dams : 1170

Water Harvesting Works under CAMPA NPV : Percolation Tanks: 4848

3.2 Interventions in areas between 0 to 0.1 Canopy density (Artificial Regeneration Zone)

- Artificial Regeneration (Plantations): Improve forest cover

Priority Areas:

- Replacement of Seed origin old eucalyptus plantations – To improve Biodiversity
- Encroachment retrieved areas : To improve forest cover & Biodiversity

Type:

- Semi Mechanical Method (SMM)
- Labour Intensive (LI)
- Emphasis : Timely Planting - Good seedling stocks - Critical watering - mix of more native species for biodiversity


Nurseries under CAMPA (CA & NPV)




Plantations under CAMPA -CA : 18270 ha


Plantations under CAMPA -NPV : 31200 ha

3.3 Interventions in areas between 0.1 to 0.4 Canopy Density (Assisted Natural Regeneration Zone)

- Assisted Natural Regeneration (ANR)
- Cultural Operation: Improve natural regeneration, existing rootstocks & Biodiversity
- Seed Broadcasting/Dibbling : Improve natural regeneration & Biodiversity
- Gap Planting : Improve forest cover
- Removal of invasive species : Improve natural regeneration & Biodiversity

Silvi-Cultural Operation under CAMPA - NPV : 131880 ha

Before Weed Removal

After Weed Removal

Regeneration of Teak

Regeneration of Maredu

Removal of Invasive Species : 34100 ha

3.4 Interventions in areas above 0.4 Canopy Density (Conservation Zone): Grid based approach

- Wildlife Habitat Improvement & Protection: To reduce Human -Animal conflicts
- Water Augmentation
- Grassland Development

Wildlife : Natural Water Contributions
Gaur, Spotted deer and Sambar at the same Water Contribution

Artificial water augmentation under CAMPA - NPV : 4250 nos

Grassland Development under CAMPA - NPV : 2324 ha

Grassland Development under CAMPA - NPV : 2324 ha

4. Preparation of Forest Rejuvenation Action Plan

- For each RF Blocks and abstract for Beat, Section, Range, Division, District & State level
- Each officer from Beat level to state level having information in one page only for all forestry activities for total requirements, done upto previous year, funds (all Schemes) tied up for current year and balance
- Excellent data base for planning and funding purpose

5. Sample plots & Control plots and Data Collection

- Sample plots & Control plots have been put in place throughout the forest area in the State to study the change in ecological parameters.

6. Strong Institutional Arrangements at State & District Level for Implementation & Monitoring

- Review by Forest Department : PCCF/ CF/DFO
- Review by District Collector : Forest Dept, Panchayati Raj & Rural Development & others, Appointment of Special officers for RF Block Clusters
- Review by the State Government

Forest Rejuvenations : Strong Institutional Arrangements at State & District Level for Implementation & Monitoring

7. Involvement of Public representatives, District officials & Other stakeholders

Mandatory for field officers to invite Hon'ble Ministers, MLAs, MLCs and other public representatives to showcase the forestry activities being done inside forest areas and explain about Forest Rejuvenation with RF Block map and data.

Forest Rejuvenations : Strong Political will & Participation

8. Certificate of appreciation and cash awards to Forest Frontline Officers of Rs. 10000/- each for following activities, District Wise on 26th Jan Public Function

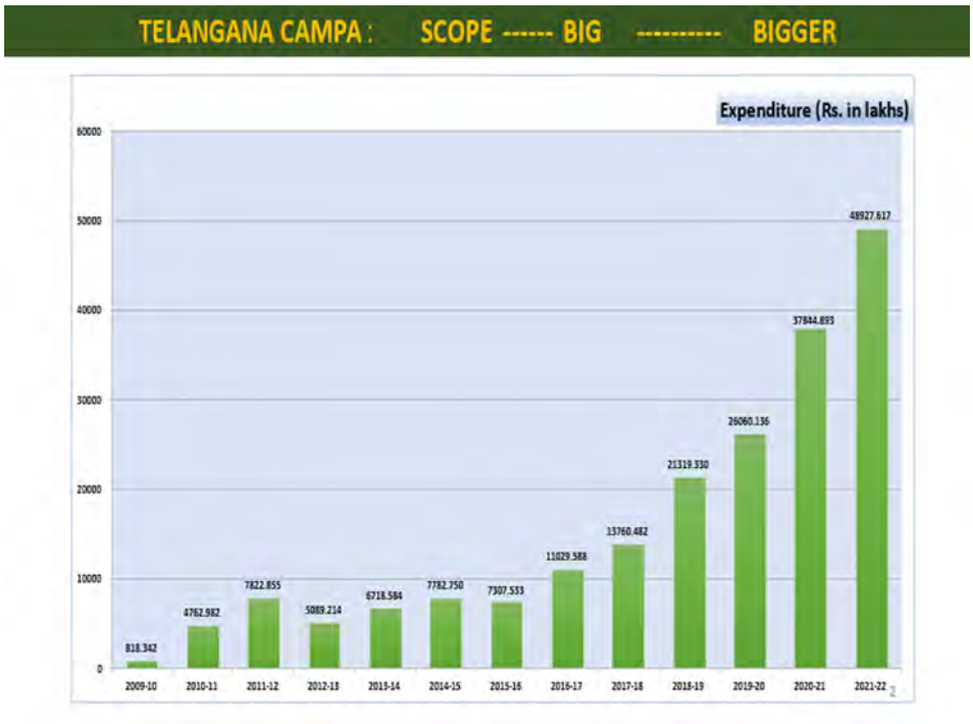
- Best Plantation (Avg. height, survival, species mix etc.)
- Best RF Block protection done {% of CPT, Gachakaya completed, impact (Biotic pressure, Natural regeneration etc.)}
- Best RF Block {SMC/WHS saturated (% SMC/WHS saturated, impact etc.)}
- Best RF Block {% of Fire Protection (Fire line saturated, impact, Fire incidence etc.)}
- Best RF Block Wildlife Habitat / Grass land development done.
- Best RF Block Rejuvenation done (No. & % of forestry activities taken, % of area saturated, Impact etc.)

Forest Rejuvenations : Cash Awards to Frontline Officers

To Motivate & bring healthy competition among Frontline Officers

9. Telangana CAMPA : Major Contribution

Telangana CAMPA has spent an amount of Rs. 1740 crs since 2015 and almost 85% of the CAMPA funds are being utilized every year for forestry interventions for protection, conservation and development of forests and wildlife in Telangana.



Outcome of Forest Rejuvenation interventions in Telangana

- Increase in forest cover : isfr 2021 (+632 sq.km : 364 sq.km. Inside rfa + 268 outside rfa)
- Increase in carbon sequestration: isfr 2021
- Increase in forest cover in all canopy density areas (of, mdf, vdf): isfr 2021
- Improvement in sdg-15 ranking: 9th to 5th rank : 2020-21 niti aayog report
- Increase in biodiversity & water availability inside forest area

3. INTEGRATED WILDLIFE MANAGEMENT: KAWAL TIGER RESERVE

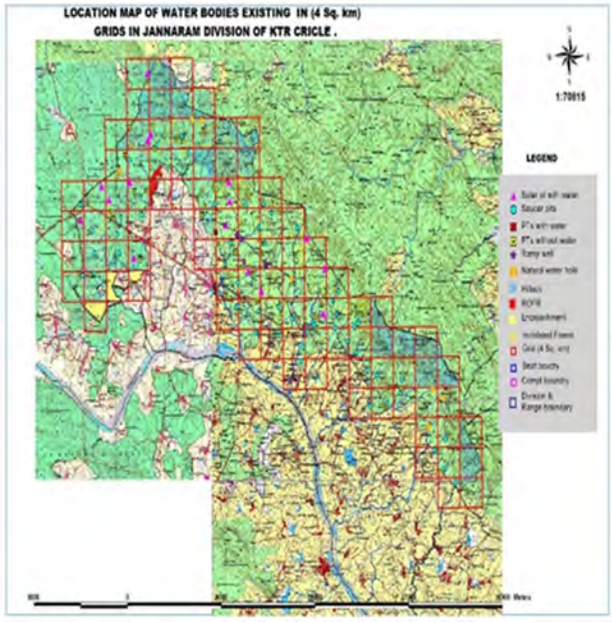
The main aim of Integrated Wildlife management is ***"to sustain and support the wildlife by way of providing all the reContributions and management of the same for posterity of wildlife"***. The habitat, which supports wildlife should adequately possess the compliment of welfare factors such as food, cover and water which are essential for sustenance of the wildlife population. Efforts are made to ensure that, these attributes are well dispersed, so that the habitat has a fair degree of interspersion. The habitat should be able to provide a variety of all indigenous species along with adequate cover. In areas of degradation compensatory development activities are taken up and habitat is once again made viable. The limiting factors are identified and they have to be overcome by suitable measures for making the habitat congenial to support the wildlife population.

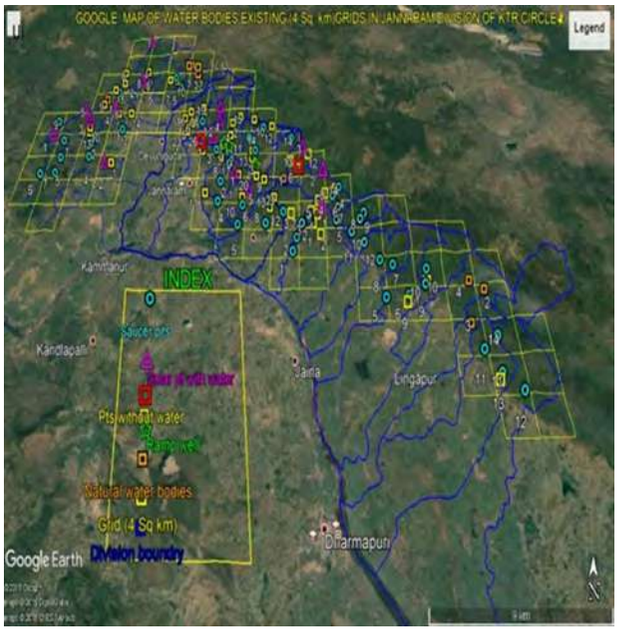
The various integrated wildlife management measures taken up under the CAMPA are as follows:

1. Water reContribution management
2. Grassland management
3. Weed removal
4. Planting of Wild fruit species

1. Water Recontribution Management:

The water reContribution is one of the main component of the habitat management. Saturation level water management planning is done by conducting Water reContribution survey to ensure water availability at every 4 Sq. Km in TR & PA and 9 Sq. Km in other forest areas. For this purpose the forest area is divided in to grids of 4 & 9 Sq. Km and water availability either by way of natural or artificial reContribution is assessed. In the grids where there is no water Contribution, action is taken to create natural or artificial water Contribution.





The natural water Contributions such as perennial percolation tanks, streams, Rivers, Chelmas/Springs are identified. Artificial water Contributions provided are Saucer wells, Solar bore wells, Percolation tanks, Check dams etc.,

Grids adjoining the habitations are identified and on priority, water Contributions are provided to mitigate the man-wildlife interface issues.

Saucer Pit

Natural Spring

Percolation Tank

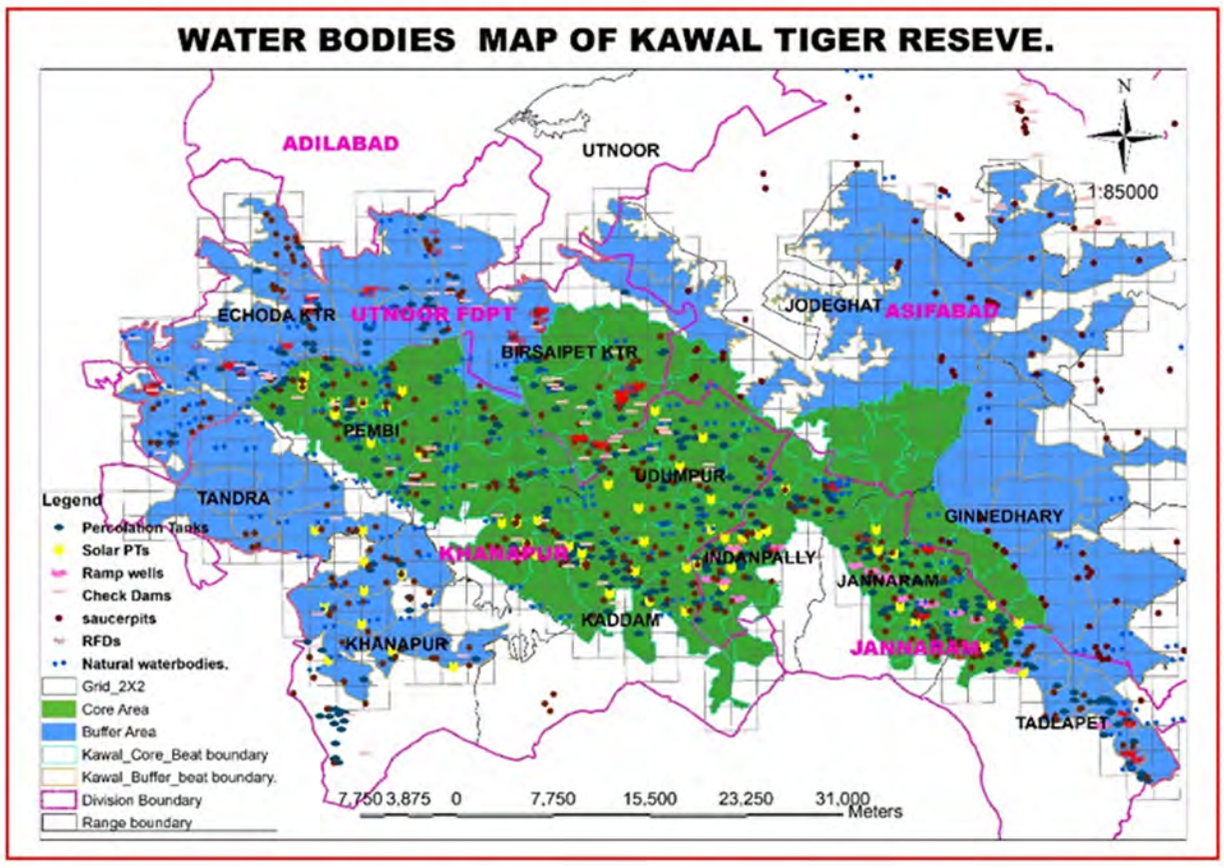
Solar Operatated Borewell

Checkdam

Cleaning of Natural Water Hole

The water reContributions developed and managed in Kawal TR are as follows:

District	Saucer pits	PTs	CDS	Solar operated	Natural water holes
Adilabad	64	75	32	9	39
Nirmal	189	201	44	30	90
Mancherial	98	280	51	18	20
KB Asifabad	289	194	77	24	85
Total	**640**	**750**	**204**	**81**	**234**



Result of Holistic Water Recontribution Management :

1. Availability of water Contribution for every 4 Sq. Km in TR during summer.
2. Reduction of Man-Wildlife interface issues-Reduction in incidents of wildlife entering in to villages during summer for water.
3. Reducing competition WL & local cattle for water in summer.
4. Reduction in road kills.
5. Now developing Grasslands around Solar operated borewell sites and also palatable grass around Saucer pits.
6. Developing resting places around the natural and artificial water bodies.

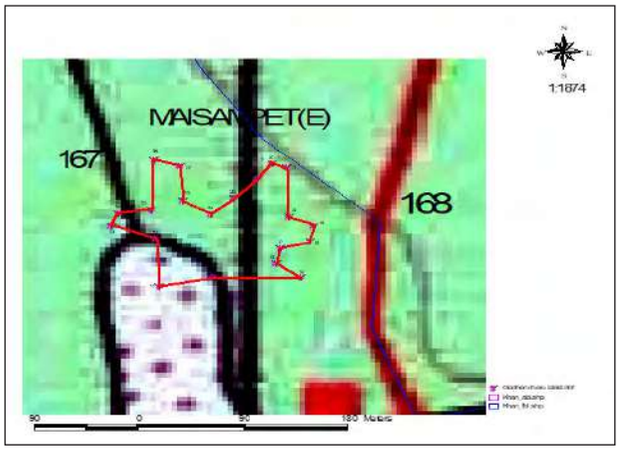
The details of expenditure on WHS during the past 05 years is as follows:

YEAR	Exp Rs. in Lakhs
2017-18	23.24
2018-19	33.968
2019-20	**120.05**
2020-21	157.601
2021-22	439.041
Total	**773.90**

2. Fodeer / Grassland Management:

About 48 grass species are identified in the Tiger Reserves of Telangana. Efforts are made to identify the main wild grass species in Tiger Reserves of Telangana including the weeds, wild fruits and browsing species. They are suppressed due to weed invasion, closure of canopy, biotic pressure, occupation of areas by woody species and other reasons. Efforts shall be made to remove / control the retardants for the grassland to develop. The grassland management is mainly funded under CAMPA scheme. The main activities taken up are:

1. Natural Grassland Management
2. Fodder Plots with Native /Wild Palatable Grass Sps.
3. Wild Grass Seed Collection & Grass Seed Plots.

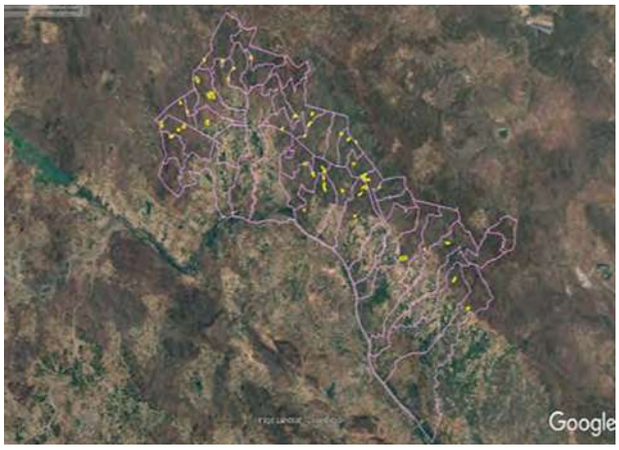


Geo-Mapping of GL

The various steps followed for development and improvement of natural grasslands in Telangana State in field are as follows:

1. Identification of Grass Land - areas with some grass rootstock of wild grass species.
2. Soil Analysis as Grasses are site specific
3. Geo-Mapping of grasslands
4. Brushwood Management- Pruning of branches / Canopy lifting /removal of woody species
5. SMC Works- RFDs / Brushwood dams/ SCT or CCTs
6. Weed Eradication - 3 times ie June-July / September – October / Nov.
7. Grass Species Identification
8. Identification of Legumes – Retention of the same.
9. Browsing Species
10. Grassland Enrichment – Sowing grass seed in blanks by scraping soil / Seed Balls.
11. Firelines & Inspection Paths
12. Management – 04 Years i.e. 1st Year raising & 03 years Maintenance.
13. Grassland Management Register

The area of grasslands developed district wise under



Grassland Loction in Jannaram DIV

CAMPA in last 03 years are as follows:

DISTRICT	GRASSLAND AREA
Adilabad	318 Ha
Nirmal	342 Ha
Mancherial	527 Ha
KB Asifabad	280 Ha
TOTAL	**1467**

Weed Removal

Sowing of Wild Grass Seed in Weed Uprooted Areas

Grassland Developed in KTR

Grassland Developed in KTR

Biomass Management

Wild Grass Seed Collection

The details of expenditure on grassland management during the past 03 years under CAMPA are as follows:

YEAR	Phy in ha	Exp Rs. in Lakhs
2019-20	494.5	51.087
2020-21	445	66.844
2021-22	528.370	67.641
Total	**1467.87**	**185.572**

3. Weed Removal

The weed removal by uprootal is taken up in Kawal Tiger Reserve and other forest areas over an area of 1722 Ha. The weeds are suppressing the development of wild grass in the forest areas and thereby reducing the fodder grass to wildlife. The weed is also affecting the germination of the wildlife browsing species like *Cassia fistula, Hardwickia binate, Mitragyna parviflora , Bauhinia Sps,. Etc.*,. The main species of weeds are *Hyptis suaveolens* (Mahaveera), *Cassia tora*, *Cleome viscosa, Sida cordifolia, Parthenium hysterophorus.*, etc., Lantana is also noticed in some patches in Kawal Tiger Reserve. These weeds generally invade the fertile portions in the area not allowing the natural germination and also suppress grass development. The details are as follows:

a. The interior forest areas invaded by weeds with less than 0.1 canopy density are selected for weed removal.

b. Weed removal is done by uprootal of weeds along with the roots.

c. It is done during July- September before flowering of the weed species.

d. Methodology:

i. Weed removal is done by uprooting the entire weed when soil is moist in July- September.

ii. The uprooted weed is brought out of the treatment area and placed upside down i.e. with roots upside for decomposing which will add to soil fertility.

iii. Immediately on uprootal, the wild grass seed like Iseleima, Dicanthium, Seteria, Themeda etc., species collected from forest areas are sown in disturbed soil.

WEED REMOVAL AREA IN KAWAL BEAT OF INDANPALLY RANGE
(KAWAL TIGER RESERVE, JANNARAM DIVISION)

Weed Removal in Khanapur Division

e. Impact/ Result:

i. The removal of weeds resulted in development of palatable grasses.

ii. Resulted in controlling of weeds germination / invasion as they are removed before flowering.

iii. The sowing of grass seed in uprooted areas resulted further control of weed invasion and augmentation of wild grass.

iv. Grass species encouraged to compete successfully with the weed which were not allowed to invade.

v. Resulted in development of good palatable grasslands for wildlife.

vi. Also noticed retention of moisture due to grass development due to weed removal.

vii. Also noticed effective soil and moisture conservation in the areas of weed removal and grass development.

The details of expenditure on weed removal during the past 04 years under CAMPA are as follows:

Year	PHY in Ha	Exp Rs. in Lakhs
2018-19	563.6	19.44
2019-20	630	25.376
2020-21	203	5.795
2021-22	1061.25	46.459
Total	**2457.85**	**97.07**

4. Planting of Wild Fruit Species:

The Wild fruits are important in the forest areas for the wildlife as they provide rich nutrients to the wildlife. Ensuring availability of wild fruit species is very important and efforts are made under CAMPA for planting the following local wild fruit species :

a) Ficus racemosa *b) Eugenia jambolana*

c) Emblica officinalis *d) Cordia dichotoma*

e) Diospyros melanoxylon *f) Ziziphus mauritiana*

g) Ziziphus oenoplia *h) Terminalia chebula*

i) Mohwa flower *j) Cassia fistula*

Planting of Wildfruit Bearing Species

Planting of Wildfruit Bearing Species

The details of expenditure on planting of wild fruit bearing species under CAMPA during the past 03 years are as follows:

Year	Phy in Ha	Exp Rs. in Lakhs
2019-20	50	5.033
2020-21	172	19.787
2021-22	583	32.674
Total	**805**	**57.494**

Conclusion:

Telangana CAMPA has been including habitat management as a key activity for Biodiversity conservation of protected areas in Telangana and every year an amount of approximately Rs. 30 crores are earmarked in the Annual Plan of Operation. This has helped in improvement of water reContributions both natural and manmade, increase in Grasslands and availability of fodder to wildlife, decrease in invasive species and availability of Plants of Wild fruit species for wildlife to reduce the man- animal conflict as well as in improving the habitat congenial to the growth of wildlife and specially herbivores to cater the needs of Carnivores and specially to increase the population of Tigers.

Contribution: Chief Executive Officer, Compensatory Afforestation Fund Management and Planning Authority, Telangana

UTTAR PRADESH

1. ROLE OF CAMPA
BRINGING BACK WATER AND GLORY TO BUNDELKHAND

Bundelkhand

Regions in India like Bundelkhand have reasons to be concerned about climate change. Their large populations depend upon climate-sensitive sectors like agriculture and forestry for their livelihoods. Any adverse impact on water availability due to a decrease in rainfall and increased flooding would threaten food security, pose risk to the natural ecosystems including species that sustain the livelihood of rural households, due to such increased extreme events.

Bundelkhand region comprising seven districts of Uttar Pradesh and six districts of Madhya Pradesh is one of the most backward regions of the country. Bundelkhand is a hard rock area with limited or inadequate groundwater reContributions, lacks infrastructure and access to improved technologies. The region being largely rain fed is perturbed with variable precipitation trends. Drought conditions are frequent in the region. The continuous drought years in Bundelkhand have severely affected agriculture productivity and subsequently weakened the livelihood systems. The Bundelkhand region is rocky and, mainly constitutes not readily cultivable. The region is broadly divided into four sub-regions: Bundelkhand Plain in the North, Bundelkhand Upland in the center and south; Sagar and Damoh (Vindhyachal) plateaus in farther south. It is bounded by Vindhyan plateaus in South to river Yamuna in North, river Ken in East and river Betwa and Pahuj in West. The topography consists of mild ravines to leveled plains near the Yamuna. Broadly there are four types of soils in the region namely (i) red sandy soils (ii) shallow black soils (iii) mixed red and black soil and (iv) alluvial soils. Red sandy soil is shallow, has gravel texture, is extremely porous with low organic matter, poor water holding capacity, prone to erosion and are thus not much suitable for agriculture.

Bundelkhand experiences a hot and semi-humid climate. Usually, the hottest days are during summer months especially in May and the coldest days in December or January. In summer, the mean temperature range around 30°C and can rise beyond 40°C in May - June.The mean annual precipitation varies from 850 mm to 1044 mm, with around 901 mmbeing the average (Contribution: Niti Ayog). Around 75% of the rain falls in three months (July to September) and the total amount is highly variable and erratic. This uncertainty is responsible for a large number of famines, droughts and deluges experienced in the region since time immemorial.

Rainfall

The annual rainfall in the Bundelkhand region in the present century has been about 95 cm. Of this, nearly 85 cm falls over just four months - June to September, that too, in about 40 effective rainy days. The remaining 10cm falls in another 6 days distributed within the remaining eight months. This means, some months remain completely rainless and some rainy days get heavy downpours. Thus, the rainwater in Bundelkhand, like the rainfall in the humid tropics elsewhere, has little time to penetrate into the soil for recharging the groundwater.The CAMPA project aims to resolve the above problem. In view of this RF pattern, the vegetation cover is shrinking, agriculture income is coming down and encroachment in forest area resulting in cascading effects in changing micro-climate leading to desertification, lifestyle changes- law and order issues.

Water ReContributions

For most of the year, the residents of Bundelkhand experience acute scarcity of water for irrigation and even for drinking. Water Contributions are varied and often seasonal, ranging from ponds, tanks, lakes and streams to open wells, bore wells and irrigation canals radiating out from large-scale dams. In the forest area construction of check dams and other Rain Water Harvesting structures are made to conserve water. Water reContributions may be utilized for gap plantation as well as critical irrigation for new plantations.

High Water Stress

Sensitivities in Bundelkhand are aggravated further due to water stress in the region. It ismainly due to inadequate and erratic rainfall, high run-off rates and poor water retention capacity of the soil. Loss of traditional water management practices and insufficient water harvesting structures have further added to the stress. The region witnessed continuous meteorological, hydrological and agricultural drought for six years in the period 2003-2009.

Increasing temperatures have also led to high evapotranspiration rates which when greater than the received precipitation leads to loss of soil moisture and reduction in groundwater recharge and surface water levels. The vulnerability assessment of the region reveals that the region is also facing the brunt of depleting groundwater reContributions. Drying up 70% of the tanks, ponds, dug-wells and falling groundwater table in the region clearly indicated the hydrological drought situation. About 44% of the net sown area (NSA) is irrigated by canals, dug wells, shallow tube wells, lift irrigation and other flows. A major portion of this, i.e. 31.7% of NSA is irrigated by groundwater. Irrigation heavily relies on the availability of water through rainfalls which further increases the sensitivities to climate change.

CAMPA

CAMPA project is meant to promote afforestation and regeneration activities as a way of compensation for forest land diverted to non-forest uses. Soil and water conservation and afforestation are the important activities to enhance the forest cover in all climatic conditions of general and arid and semi-arid conditions in particular. These activities not only protect and promote the vegetation cover in the forest but also contribute to benefit the resident of forest fringe areas. Public reContributions are limited, hence, the Government of India has been spending money to implement such programs which not only helps in the conservation of land, water and plant reContributions but

also improves livelihood security. Public investment is considered justified only if it generates significance and desirable sustainable benefits for targeted beneficiaries. The soil and water conservation measures and plantation activities are considered as a significant investment for protecting and increasing forest vegetation.

Soil and Moisture Conservation (SMC) Activities

Water is a scarce natural reContribution and essential to life, livelihood, food security and sustainable development. India has more than 18% of the world's population but has only 4% of the world's water reContributions and 2.4% of the world's land area. Above all soil and water conservation is an important issue in the Bundelkhand region of Uttar Pradesh, which often faces climate severities. The Bundelkhand region, located in Central India encompasses seven districts of Uttar Pradesh viz. Banda, Chitrakoot, Hamirpur, Jalaun, Jhansi, Lalitpur and Mahoba. The region falls under the semi-arid zone and is amongst the most degraded ecosystems characterized by undulating and rugged topography, highly eroded and dissected land, poor soil fertility and low water holding capacity, scarce groundwater reContributions, erratic distribution of rainfall, lack of assured irrigation facilities, heavy biotic pressure on forests, inadequate vegetation cover and frequent crop failures, resulting in scarcity of

food, fodder and fuel. The 56% area of the Bundelkhand region comes under the soil, which is characterized by coarse gravelly and light-textured with poor water holding capacity. Therefore, the establishment of woody perennials is very difficult without soil and water conservation (SMC) measures, particularly in the red soils of the region. The remaining 44% area comes under black soil which is low lying and suffers from inadequate drainage, cracking and shrinking when dry thus possess problems in forest regeneration.

Under the UP CAMPA, the details of important works were carried out Soil and Moisture Conservation works in the last years are as follows:-

- Survey and demarcation work
- Construction of Bandhi/Bunds
- Construction of Dry check dams/ Pucca Check dams
- Construction of Contour bunds/ trench
- Construction of ponds
- ANR Works

GIS Based SMC

Work for Better Efficiency

To minimize the above said problem, Uttar Pradesh Forest Department applied GIS based watershed management principles, both mechanical and biological measures in a Ridge to Valley concept, to mitigate drought through groundwater recharge and retention of rainwater by construction of various rainwater harvesting structures under the CAMPA Project. Thematic outputs are generated by GIS, are important for rational and scientific planning with local villagers for identifying potential SMC works and site identification for the effectiveness of the works. By using GIS technology in a watershed drainage, lines are selected, the watershed boundary is demarcated, streams are classified into primary, secondary and tertiary orders, watershed activities are finalized with possible interventions in the ridge, middle and valley area as per gradient, drainage line etc. and treatments are prescribed along with dimension. During the preparation of a DPR, criteria like site slope, land use and land cover, drainage characteristics, soil type and soil profile, catchment area characteristic, geology, water level etc. are taken into account for better selection of SMC activities. During the preparation of a GIS based DPR for SMC activities tools and maps like Google Earth pro, Bhuvan, Globber mapper, Cadastral map, Quantum GIS (QGIS), Composite Landscape Assessment and Restoration Tool (CLART), Note CAM are used for the collection of Biophysical information of a proposed field. Bhuvan state portal depicts the map of drainage, water bodies, canal, land use and land cover, wasteland, soil erosion, structural geology (lineaments), groundwater prospects, existing NRM assets map of an area.

These SMC structures are here to remain and benefit the community and wildlife for years to come. The restoration treatment of forests is imperative for the sustainable supply of forested ecosystem services. The Forest and Landscape Restoration Mechanism (FLRM) has been established to support fulfilling the needs of both people and the environment in a sustainable manner. The expected outcome of the SMC activities is improved resilience, productivity and socio-economic value from restored forests and landscapes benefiting human wellbeing, local livelihoods and the environment. It aims to seek a balance between restoring ecosystem services and productive functions of land for agriculture and related uses that provide food, energy and other products and services for sustainable livelihoods. The other important objective is to reduce man-animal conflict by creating permanent drinking water Contributions and forage reContributions for wildlife in the forest area itself. The main motive was to increase and conserve faunal and floral diversity by creating a regular moisture regimes, checking soil erosion and water harvesting. The intended project is helping in creating inspiration among the forest fringe population and forest dependent community in the protection and conservation of forest ecosystem through harvested water, forage reContributions and other minor forest produce. Crop productivity is also increasing due to the regular availability of water in ponds, wells and check dams. This is also resulting in the increased water column in duged-out wells which is helping farmers to pump water for irrigation. The intervention is also reducing the drudgery of village women in fetching water from far-flung places and they are able to attend their toddlers and carry out domestic chores. After these interventions, beneficiaries in fringe villagers are now busy in cultivating crops on regular basis, which resulted in employment generation within the village and reduced the menace of distress migration.

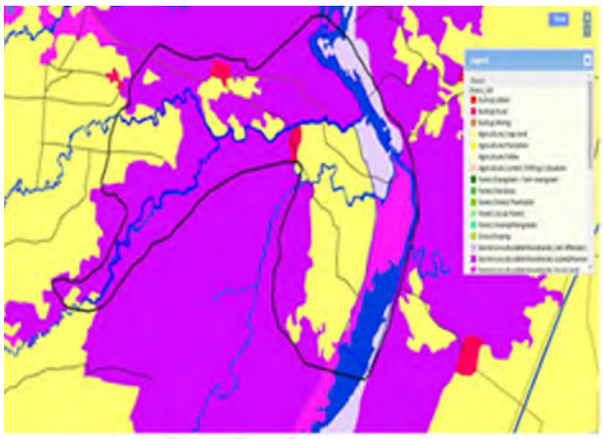
These kinds of interventions have to be carried out on regular basis covering entire forest fringe areas so that more rainwater can be checked and harvested resulting in rejuvenating the declining groundwater reContribution. This will also help forest fringe villagers and tribal to live happily. It will help them to cope with rapid climate aberrations and adapt themselves to unforeseen situations. The Forest department had won the aspirations and heart of the public and wildlife in most of the areas through these interventions.

Tools/maps for Spatial Information

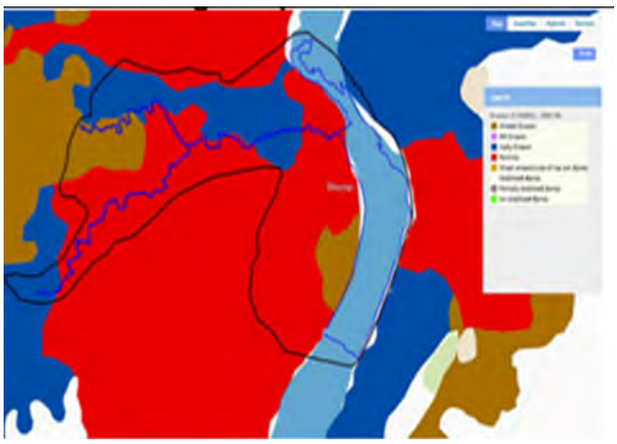
- Google Earth pro

- Bhuvan (depicts map of drainage, water bodies, canal, land use, land cover, wasteland, soil erosion, structural geology, groundwater prospectus, existing NRM assets map)
- Globber mapper (for contour mapping)
- Cadastral map
- Quantum GIS (QGIS)
- CLART (Composite Landscape Assessment and Restoration Tool)

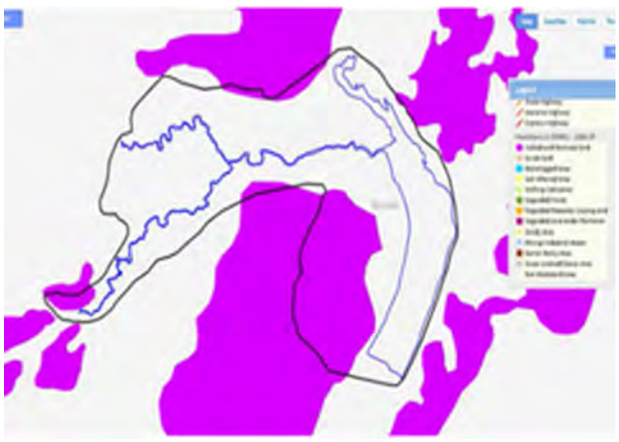
Drainage Map



Land use land cover map



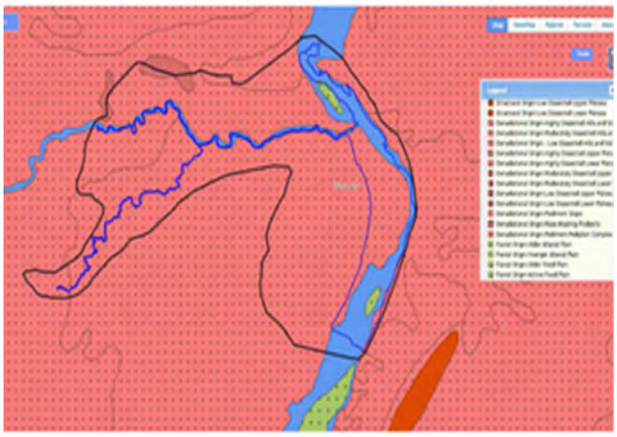
Soil Erosion Map



Waste land map

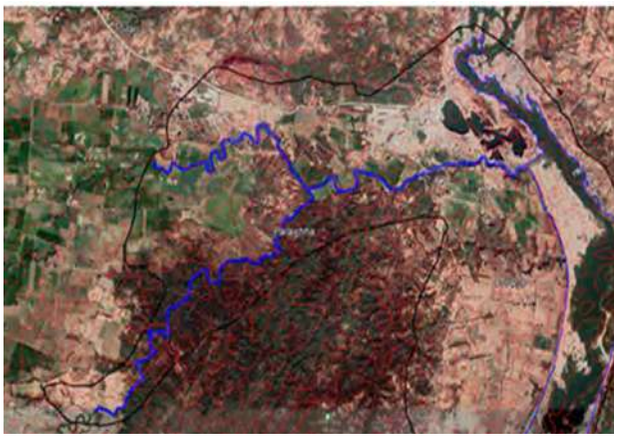
Groundwater Prospecting

Salt Affected

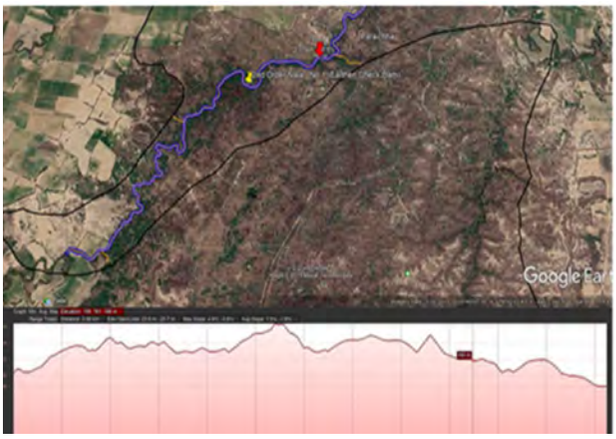


Geomorphology

Structural Geology map (lineaments)



Contour line



Slope Map

- Note CAM etc.

Structures Created for SMC Work

Construction of Continuous Contour Trench (CCT)

Construction of CCT helps to stop the soil loss. Constructing CCT reduces the rate of runoff and thus results in increase in percolation rate. Due to construction of CCT, increase in the ground water level has been noticed. Increase in groundwater level helps in increase the green cover over the area and soil quality.

Contour Trench (CT)

Contour trenches of cross section of about 60 cms. breadth, 45 cms. depth, 3 meters long with a break of 30 cms. are dug in lines, the lines being 3.5 meters apart. These are continuous trenches of the above cross section of about 15 to 18 meters intervals. The trenches are kept unfilled for all areas having soil containing appreciable proportion of clay. For sandy soils half filled trenches are used. In case of unfilled trenches the excavated soil is piled on the hill side of the trench. Seed sowing is done in three lines i.e. on the piled soil, on half filled soil and on the bottom of the trench. Sowing of seeds is completed by June 2015. Resowings are also done if after the first shower there is a break in the monsoon. Construction of CT helps to stop the soil loss. Constructing CT reduces the rate of runoff and thus results in increase in percolation rate. Due to construction of CT, increase in the ground water level has been noticed. Increase in ground water level helps in increase the green cover over the area and soil quality. The seeds sown on the trenches have a better germination rate due to the porosity in the dug soil and moisture availability in the trench.

Contour Bunds

Contour bunds (also known as contour bunding) are a form of micro-catchment technique and are a very simple and cheap form of water control. The bunds are created with several dikes, closely spaced and placed along the contour lines. There are also small earth ties, perpendicular to the bunds, that subdivide the system into micro-catchments. Contour bunds aims to slow down runoff and improve water infiltration in the soil. For this reason, contour bunds are often associated with the cultivation of crops, fodder or trees between the bunds. Contour bunds also help to control soil erosion. Contour bunds for tree planting is suitable for arid and semi-arid areas with rainfall rates between 200 and 750 mm. It

can be applied on slopes up to 5% but it requires even terrains, without the presence of gullies or rills. The soil should preferably be 1.5 or 2 m deep in order to ensure proper root development and water storage.

Gully Plugs

Gully plugs can be defined as local stones, clay and bushes placed across small gullies and streams running down the hill slopes carrying drainage to tiny catchments during rainy season, so as to capture nutrients, silt and moisture. Stones are often embedded into the upper surface of spillway aprons and wells to provide support for the next layer. The principle is to capture runoff from a broad catchment area, thus transferring low rainfall into utilizable soil moisture, and to prevent soil erosion. Slowing of the flow of water helps in settling down organically rich soil. A well maintained gully plug creates a flat, fertile and moist field, where high value crops and trees can be grown.

Percolation Pond

Percolation pond is an artificially created surface water body, submerging in its reservoir a highly permeable land so that surface runoff is made to percolate and recharge the ground water storage. The percolation ponds are mostly earthen dams with masonry structure only for spillway. Percolation pond should be constructed preferably on second to third order steams, located on highly fractured and weathered rocks, which have lateral continuity downstream. The recharge area downstream should have sufficient number of wells and cultivable land to benefit from the augmented ground water. The purpose of the percolation ponds is to recharge the ground water storage and hence seepage below the seat of the bed is permissible.

Cement Concrete Check Dams

Cement concrete check dams can hold water for a longer time than most of the other structures it creates a barrier in the flow path of a passing waterway such as a channel, stream etc, which helps to collect water in that particular place. This storage of water increases infiltration of surface water through rainfall to groundwater and also reduce the effect of erosion while trapping transported sediments and preventing downstream transport.

Earthen Check Dams

Large earthen check dams or Earth fill dam covers a large area and are built up by compacting successive layers of earth, using the most impervious materials to form a core and placing more permeable substances on the upstream and downstream sides.

Panwari Van Block, Year 2021-22, Urban CD Large

Panwari Van Block, Year 2021-22, Urban CD Large


Panwari Van Block, Year 2021-22, Urban CD Large


Panwari Van Block, Year 2021-22, Urban CD Large

Lalitpur Division, Pucca Check dam

Lalitpur Division, SMC Work (N24 57 10.3, E078 22 59.0)


Hamirpur Division, SMC Work

Lalitpur Division, SMC Work
(N24 23 54 48, E78 23 06 88)

2. WORK STUDY OF CAMPA ACTIVITIES IN SOIL AND MOISTURE CONSERVATION

Department of Environment, Forest and Climate Change, Uttar Pradesh commissioned CAFRI, Jhansi for socio economic ecological impact assessment/ evaluation of various interventions done by the department under the CAMPA. Impact evaluation, measures the impact of the programme on intended stakeholders in comparison to suitable counterfactuals. The scope of the project is limited to impact assessment of soil and water conservation measures and plantation work and documentation of these impacts in the form of report. The reference period of the study is from April, 2019 to September, 2021. The field enquiry/Survey was conducted during the, July 2021 to September, 2021. The team visited selected sites in all seven Forest Divisions of the Bundelkhand Forest Zone.

Methodology

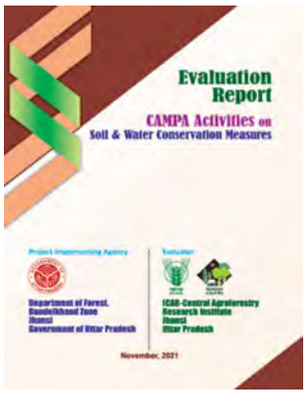
The present study is a type of retrospective evaluation in which, base line data were not collected prior to project implementation. The data were generated from treated area and comparison groups' only after completion of the project (ex-post). The important impact evaluation question is, what would have happened to those receiving the intervention, if they had not received the program. An evaluation concerned with establishing the counterfactual, which is a comparison between what actually happened and what would have happened in the absence of intervention. Hence, the selection of counterfactual is very crucial, because information generated through impact evaluation can lead to scaling-up of the project and overall ethical investment of public reContributions.

Sampling Framework

The evaluation study covered seven forest divisions of Uttar Pradesh. The study was limited to sites where interventions was made by forest department in Bundelkhand circle under CAMPA Scheme. The study is based on primary and secondary data collected from various Contributions including farmers, forest officials, and literature survey. Well-structured schedule was prepared prior to site visit for data collection (Appendix 1). The details of data collection given below;

Primary Data:

By using separately designed formats for different components and subcomponents, first-hand information



was obtained in relation to core and non-core activities. All the data collection formats are furnished in Annexure.

Secondary Data:

Secondary data related to various activities undertaken in CAMPA were collected from the CCF, Divisional Offices and Range Offices, with the aid of pre- designed format and check lists.

Focus Group Discussion:

FGDs with forest officials and farmers were conducted in order to evaluate people's perception and participation level in implementation of CAMPA activities in a given locality.

Key Informant Interview (KII) and Consultation with Forest Officials:

KII and consultation was undertaken with a range of forest officers involved at various stages- planning and decision making, implementation, monitoring and evaluation. This included Chief Conservator of Forest (CCF), Conservator of Forest (CF), Divisional Forest Officer (DFO), Ranger Officers (Rangers), Foresters and Forest Guards etc.

Field Observation:

At the treated sites and nearby areas, field observations like measurements of SWC structures, locational suitability, ANR activities, regeneration status of plants, tree fauna and flora, activities of village people were noted, which provides strong basis for the entire evaluation process.

For the data collection stratified random sampling was adopted. First, forest ranges from each forest division

(district), and then, treatment sites from each forest ranges were selected randomly. Two sites, preferably separate forest block, from each forest range have been selected on the basis of highest soil and water conservation works done/area covered under the project. From each selected site, one nearest adjacent site was selected for comparison as check. One Focus group discussion (FGD) was conducted in the each selected site. Focus group discussions deliver qualitative data, insights into needs, expectations, attitudes, perceptions, beliefs and feelings of participants concerning ecosystem services. The social interaction in the focus group enables participants to discuss and respond to the perspectives of others and much of their implicit knowledge. The group mainly comprised of at least 10 members including male and female, who are old-age, knowledgeable, long- time residents of fringe villages from various socio economic status. As per sampling framework the team covered all the ranges of seven forest divisions of Bundelkhand region.

Key findings of the impact evaluation

Assessment of the project interventions on ground water level, water availability for wild life, vegetation, domestic use, irrigation and livestock in treated and fringe area of forests;

1. Almost all the water harvesting structures were found with stored water. Storing of water increases the opportunity time for infiltration and ultimately helps in recharging of groundwater.
2. Water harvesting structures are serving as a Contribution for drinking water to the wildlife, livestock.
3. Some residents of forest fringe area directly pumping the water for irrigating rabi crops.
4. Water level increased upto 0.5- 1.5 m in open wells located nearby the interventions.
5. Due to increased ground water availability pumping hours and irrigation intensity also got increased at farmers' field located in forest fringe areas.

Assessment of the impact of soil and water conservation measures on floral and faunal biodiversity in treated area of forest;

1. Availability of soil moisture for longer time helped in natural regeneration and increased vegetation cover in the treated areas.
2. In all the forest division of Bundelkhand region, soil is mostly red and characterized with coarse texture and low water holding capacity. Therefore, soil and moisture conservation measures improves the establishment and survival of the plants.
3. Increased floral species diversity. Species such as Butea monosperma, Anogeissus, Dalbergia sissoo, Acacia catechu, Acacia nilotica etc. showed good natural regeneration.
4. The visits of the wild animals and birds increased substantially.
5. The rain water harvesting structures have now developed as a habitat for aquatic life especially lentic and lotic ecosystem such as algae, rooted and floating leaved plants, invertebrates such as crabs, shrimps, etc, amphibians like frog and reptiles like water snakes.
6. Increased favorable microclimate nearby areas of rain water harvesting structures.

Assessment of the impact on crop productivity in fringe area of forests;

1. Some of the water harvesting structures were located in deep forest area, therefore no effect on crop productivity was observed in such areas.
2. However, some of the interventions benefitted the farmers in fringe areas in terms of increased water availability for irrigation of rabi crops. Availability of water increased the crop productivity at farmers' fields.
3. Some of the farmers in the fringe area shifted from low water requiring crop such as chickpea and mustard to high water requiring crop like wheat due to increased water availability.
4. Area under cultivation increased because land which were lying fallow since decades brought under the cultivation of crops.
5. Pumping hours and irrigation intensity increased which resulted in better crop productivity as compared to untreated area.

Assessment of the impact on conservation of natural reContributions;

1. Due to water harvesting structures, soil loss, runoff loss and nutrient loss reduced drastically in the treated area.
2. Gully and rill erosion in treated area got stabilized upto some extent.
3. Soil and moisture conservation is widely believed to be the most cost-effective and environmentally sound way of reducing the ill effect of drought on the flora and fauna in the forest areas.
4. Small contour trenches were observed very effective in conserving soil moisture and trapping soil sediments.
5. Biodiversity conservation in terms of increased vegetation and visits of wildlife in the treated area.

Assessment of the availability of forage reContributions for livestock and wild animals; and

1. Man-animal conflict decreased in forest fringe area as wild animals were getting the drinking water in the treated area.
2. Stray animals (Anna pratha) problem reduced in the forest fringe area where drinking water and fodder increased for animals due to water harvesting interventions.
3. Farmers of the forest fringe area also benefitted due to increased availability of drinking water and fodder for their livestock.

To estimate the impact on livelihood security and socio-economic conditions of the people in forest fringe.

1. Works carried out under the project have generated lot of employment opportunities for the residents of the forest fringe areas.
2. Focus group reported that productivity of the milch animal increased due to increased availability of the palatable grasses and tree fodder during lean period.
3. Harvested water also used for drinking purpose, animal bathing etc.
4. Drudgery in drinking water collection and irrigation reduced significantly. Due to increase in ground water level, pumping hours increased which reduces the time required for irrigation of rabi crops.
5. The cost of cultivation also reduced due to drudgery reduction.
6. Man-animal conflict got reduced in the forest fringe area.
7. Based upon interaction with residents of forest fringe area, it was noticed that crop diversification increased considerably due to inclusion of vegetables and other profitable crops.
8. Soil and water conservation not only improved and stabilized the food production system in forest but also reduced the impact of climate variability and rainfall irregularities, thereby improving household resilience.

Suggestions and recommendations

All the seven forest division of the Bundelkhand (U.P.) region successfully implemented the project activities to mitigate water scarcity and adaptation against climate change, water retention, ground water recharge and for reduction in soil and water erosion. Large area also covered under the plantation to increase the vegetation in the forest. However, some important and pertinent issues needs to be addressed for any such type work in future.

1. Collection of baseline data is essentially required for implementation of such type of project in future. These datasets shall help in proper project implementation as well as to identify counter factuals in the impact assessed area.
2. The water harvesting structures should be designed in such a way that they should aim at high-water storage efficiency, low seepage losses.
3. All the earthen structures should have provision of pucca drainage outlet or water surplusing system so that longevity of these structures will increase and serve the purpose for longer time.
4. The main goal of the intervention in the forest fringe area should be the increased forest vegetation as well as increased crop productivity at the farmers' fields.
5. Stay animals not only also crumpled the vegetation but also damage the earthen structures. Therefore treated area should be protected from stray animals particularly coming from fringe areas.
6. Some good pucca harvesting structures were found in the Lalitpur forest division which were serving the purpose well. These type of structures should be replicated to other forest division also in future.
7. Before implementation of the project, soil and water conservation engineer and residents of fringe areas should be consulted for effective site selection and for getting maximum efficiency of interventions.
8. Social fencing has to be encouraged among the stakeholders.
9. Detailed study needs to be carried out for valuation of ecosystem services generated during entire life from soil and water conservation, which will be helpful to estimate the return from the investment in term of Net Present Worth, Benefit-Cost ratio and Economic internal rate of return.
10. Intangible benefits generated through interventions needs holistic estimation and added with tangible benefits during process of valuation shall helping in prioritizing for investments and societal welfare.
11. This study has viably taken on various nature-based routine in the project area through CAMPA interventions.
12. Overall quality of life of local residents have improved with at social, economic and ecological paradigm.

Special Comment

Excellent and appreciable soil and water conservation works such as construction of check-dam, gully plugs, ponds, contour bunds and trenches, assisted natural and artificial regeneration programmes, and establishment of plantations have been seen on various sites.

Contribution: Chief Executive Officer, State CAMPA, Uttar Pradesh

UTTARAKHAND

1. BEST PRACTICES

The Himalayan State of Uttarakhand is bestowed with a great range of floral and faunal biodiversity. With over 71% of its geographical area under forest, there are about 12000 species of plants and animals found in Uttarakhand (ENVIS, 2013). A number of floral and faunal species are under threat of extinction due to various factors including climate change. The Uttarakhand State Forest Department, with the support of CAMPA funds, has taken the initiative of conserving some precious non-flowering and non-seed bearing plant forms like bryophytes & mosses, lichens, ferns, palms etc., collectively called cryptogams, by establishing dedicated conservation parks/gardens. Similar conservation areas have also been established for conservation of Orchids, Ficus, aromatic & medicinal plants and some of the important aquatic plant species. A unique initiative of spreading awareness about various pollinators, a pollinator park has also been established in the State. The implementation of these activities has been undertaken by the research wing of the department.

Under CAMPA funded projects, various new plant species have been discovered in state of Uttarakhand and findings of the same have been published in some of the most prestigious national and international journals. The new species include Orchid species such as *Liparis Pygmaea*, *Cymbidium lancifolium, Cephalanthera erecta* var. *oblanceolate, Calanthe alpina* and an insectivorous plant species *Utricularia furcellata*. A brief note on some of the above initiatives undertaken in Uttarakhand are as given below: -

Moss Garden, Nainital

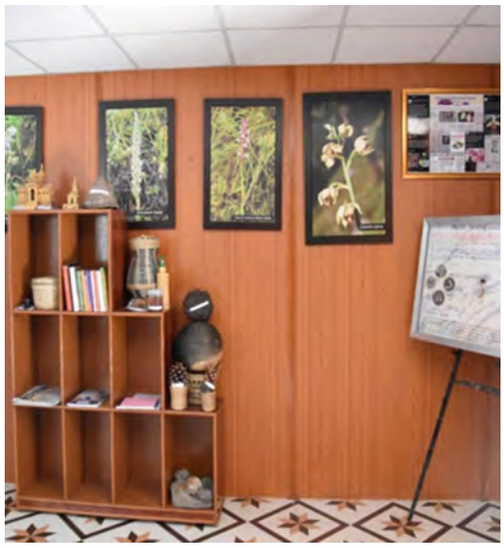
A moss garden has been established in Khurpataal area of Nainital district, in an area of around 10 Hectares. It is first Moss garden of country and one of very few moss gardens of world developed outside Japan. The garden has sixty different species of moss and other Bryophytes including liverworts and hornworts, with each and every species identified by its scientific name. Moss garden has an interpretation centre where interesting scientific, ecological and historical information about moss has been displayed which include use of *Sphagnum* Moss in First World War to treat wounded soldiers, moss ornaments used in Japan, Mossrium and other interesting facts about moss. Dinosaurs Models have also been displayed to underline existence of moss since Jurassic era. A moss trail of around 1200 meter has also been developed giving a view of picturesque Khurpataal lake.

Lichen Park, Munsiyari

A lichen park has been established at Munsiyari, one of the most picturesque location of Kumaun Himalayas amidst Panchachuli Peaks, in an area of one hectare. This park hosts around 80 different species of Lichen which has been identified with help of lichenologists. This particular location was selected because of being naturally rich in lichen species. This is first such exclusively dedicated park for lichen species in world. The park has an Interpretation Centre also in which various types of lichen have been displaced along with history of Lichenology and ecological importance of lichen species. In the park, information boards has been displaced regarding use of lichen as spices in popular dishes, perfumes, natural dyes, medicines and in estimating the age of rocks. Various models have also been displayed to highlight importance of lichens as main Contribution of food for wild life in high altitude areas during extreme winter and also its existence since Jurassic era.

Orchid Conservation Centre, Mandal

First Orchid conservation centre of North India has been established in beautiful Mandal valley of Chamoli district which is known for its bio-diversity and high rainfall content. This centre spread over an area of around 3 acres hosts around 70 different Orchid species, both epiphytes and terrestrial which includes many threatened and endangered species of orchids. It also has an orchid trail and an interpretation centre, providing information about history of orchids, threat and measures to protect it. It also displays beautiful poems about orchids. A nursery has been developed for facilitating the propagation of various orchid species. The centre being established with cooperation of Van Panchayat and hence, efforts have been made to train local people also in conservation of this beautiful species.



Aromatic Garden, Lalkuan

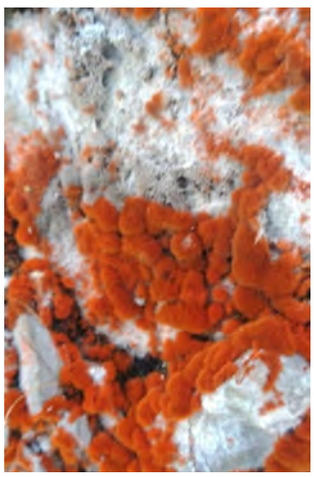
An aromatic Garden has been established in Lalkuan in an area of about 5 acres. This garden has around 150 different species of aromatic plants making it largest in the country in terms of number of aromatic species. It has different sections based on particular aromatic parts of plants, and includes section on aromatic grasses, ginger, Jasmin species and also a Tulsivatika which has around 20 different tulsi species from around the world. It has also collection of aromatic trees like *Parijat, Neem Chameli, Chandan, Champa, Kapoor,* Canonnball tree and Agarwood.

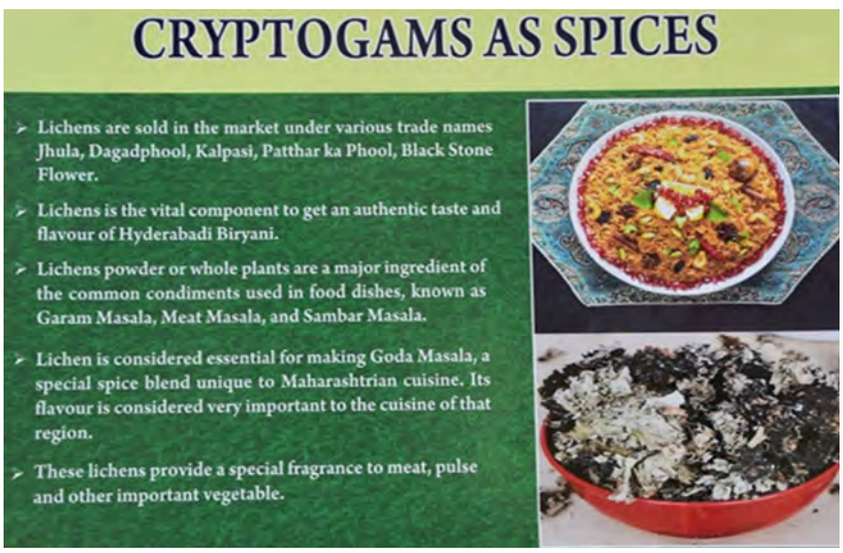
Fernery, Ranikhet

An open air fernery has been established at Ranikhet in an area of around 4 acres and it hosts around 150 different fern species, which is largest such collection in any open air fernery in the country. This fernery displays various interesting information about ferns including their ecological, ornamental, medicinal and nutritional value. Consisting mostly of native ferns of Himalayas, this fernery has some rare species of Fern including Tree Fern *(Cyathea Spinulosa)* which has now very few plants left in wild and is in existence on this planet even before Jurassic era. This fernery has also medicinal species of fern like *Hansraaj* which are very important in both Ayurvedic and Tibetan system of medicine. This fernery also displays information about Victorian era fern-mania and reference of 'seeds' of ferns in poems of Shakespeare, when its propagation through spores was not known.

Cryptogamic Garden, Deoban

India's first crytogamic garden has been established at a place called Deoban (Forest of gods) in Chakrata region of Uttrakhand in Dehradun District at an altitude of 9000 feet. Cryptogams are those ancient groups of lower plants which reproduce by spore, without seeds on flowers. This crytogamic garden hosts around 70 different species of cryptogams which includes various types of lichens, ferns, Moss, Liverworts, algae and fungus. The garden has beautiful display boards and interesting facts highlighting the pioneer role of these species in eco system and also their use as food items, pollution indicators, medicine and in preventing soil erosion. This location was chosen, in view of this area being pollution free and naturally rich in cryptogams.





Ficus Garden, Lalkuan

A Ficus garden has been established in Lalkuan in an area of around 10 acres. It hosts more than 100 different species of Ficus and is largest Ficus Garden of the country in terms of number of species. The species preserved here are from different parts of country and also from different ecosystem including plains and mountains. The garden has display boards highlighting role of Ficus species as key stone species; importance of Ficus species in various religions and use of various Ficus species as National/State symbols.

High Altitude Herbal Garden, Mana

India's highest altitude herbal garden has been set up at Mana, near China boarder in Chamoli district. Located at an altitude of around 10500 ft., it displays more than more than 50 different species found in high altitude areas of Himalayas including species of Alpine regions. It has a dedicated section of species associated with Lord Badrinath including *Badri Tulsi (Origanum Vulgare), Badri Ber (Hippophae Rhamnoides), Badri Vriksha (Juniperus Meeboda) and Bhojpatra (Betula Utilis).* It also conserves various high altitude rare and threatened medicinal species like *Kutki (Picrorhiz Kurroa), Baalchad (Arnebia Benthamii), Choru (Angelica Glanca), Atees (Aconitum Heteroplyllum) and Meetha Vish (Aconitum Balfourii).* Experiments are also going on on various Sausurrea species and *Sausurrea Costus and Sausurrea Graminifolia* have shown promising results.

Grass Conservatory, Ranikhet

A grass conservatory, first of its kind in country, has been established in Ranikhet in an area of around 3 acres. It conserves and displays around 100 different types of grass species, predominantly drawn from Uttarakhand. It displays various types of medicinal grasses, fodder grasses, aromatic and soil binding species of grass. The conservatory also highlights important ecological roles of grassland in Carbon sequestration as compared to forests/ woodland. It also displays information about ecological role of grasses and grasslands in soil and moisture conservation, as habitat of specific group of fauna and their importance as agricultural grains and food items.

Pollinator Park, Haldwani

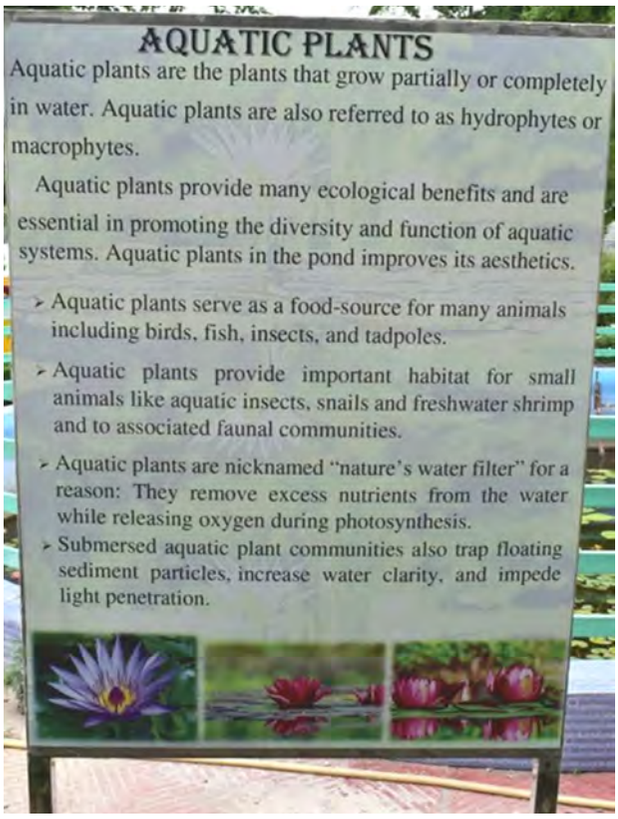
A pollinator park, a first of its kind in India, has been established in Haldwani in an area of around 4 acres, to highlight and educate people about importance of various types of pollinators in sustaining our life system and food requirements. The park hosts around 60 different types of pollinator species as recorded from time to time, which includes various types of butterflies, birds, honeybees and insects. For this purpose a large number of nectar bearing and native host plants suitable for these species have been planted and area has been made completely free from use of any type of chemicals including insecticides, pesticides or chemical fertilizers. Information has been displayed not only about various type of butterflies/pollinators and their host plants but also about their ecological importance.

Palm Garden, Haldwani

A palm garden has been established in Haldwani in an area of around three acres, hosting around 90 different palm species many of which are threatened and endangered. This is largest such collection of Palm species in entire North India.

Aquatic Garden Haldwani

An aquatic garden has been established in Haldwani in an area of around two acres which displays around 50 different aquatic species, including ornamental and edible species. It is first such collection of aquatic species in state of Uttarakhand.



Discovery of New Species

Under CAMPA funded projects, various new plant species have been discovered in state of Uttarakhand and findings published in most prestigious national and international journals. A new Orchid species *Liparis Pygmaea* was found in year 2020, in high altitude area of Chamoli District. This species was sighted in India after a gap of 124 years (last sighting being in year 1896 in Sikkim) and this discovery was published in prestigious French jouranal 'Richardiana'. Another new sub species of Orchid *Cephalanthera erecta* var. *oblanceolata* was discovered in Mandal Valley of Chamoli District, which was a new addition to list of Indian Flora and was accordingly published in 'Nelumbo' journal of Botanical Survey of India (BSI). In June, 2021, an another rare orchid species *Calanthe alpina* was recorded, which is a new distributional record of this species in Garhwal Himalays and this discovery was published in 'ENVIS' News letter of BSI. In September, 2021, Insectivorous species *Utricularia furcellata* was spotted for the first time in Western Himalaya and this discovery was published in prestigious Japanese Journal 'Journal of Japanese Botany' Recently another new orchid species *Cymbidium lancifolium* was found in Mandal Valley, which was first such sighting of this species in Western Himalaya.

Documentation of Floral Biodiversity of Uttarakhand

Since 2020, Research Wing of Uttarakhand has been publishing Annual Report of Plant species, conserved by it, on World Biodiversity Day 22 May. As per third annual report released on 22 May 2022, a total 1943 different plant species has been conserved, till date. Out of these species, 62 species are endemic and 80 species are threatened /rare/ vulnerable under IUCN/State Biodiversity Board/INVIS categorization. Out of these, 464 tree species, 166 herb species, 146 shrub species, 46 Bamboo species, 168 Fern species, 109 Orchid species, 83 Palm species, 106 grass species, 49 aquatic species, 42 Moss species and 255 Cactus & Succulent species have been conserved with complete details of family, scientific name, conservation status, native region, usage and location and various nurseries and experimental sites. This report is uploaded on website of Department also, for the information of general public and in interest of transparency.

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पृथ्वी पर बिना बीज के ही संवर्धित होने वाली प्राचीनतम वनस्पति प्रजातियों में से एक क्रिप्टोगेमिक प्रजाति के बारे में लोगों को जागरूक करने हेतु देववन, देहरादून में देश का पहला क्रिप्टोगेमिक उद्यान स्थापित किया गया है।

Translated from Hindi by Google

The country's first cryptogemic garden has been set up in Devvan, Dehradun to make people aware about the cryptogemic species, one of the oldest plant species to be grown without seeds on earth.

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hindustantimes

COUNTRY'S FIRST

Forest department develops lichen park in Munsiyari

Neeraj Santoshi

A lichen specie at the lichen park in Munsiyari. HT PHOTO

DEHRADUN: The forest department has developed the country's first lichen park in Kumaon's Munsiyari area. The park is spread over 1.5 acres with over 80 species of lichens collected from across the Himalayan state.

Considered the most significant bio-indicator of ecosystem fluctuations as they are more sensitive towards habitat and climate changes, lichen species are facing many threats and continue to decline from some areas of Himalayan regions because of overexploitation of natural resources, mounting pressures of urbanization, habitat destruction, deforestation and increasing pollution, according to forest officials.

Sanjiv Chaturvedi, Conservator of Forests (Research Wing) Uttarakhand, said lichens, found in the Himalayas up to 5,000 metres, are important species as they are the best bi[...]

pollution levels.

"Lichen need pure air to grow. If pollution levels increase in a certain area, the lichen species decline there. So, it serves as a natural indicator of pollution levels in an area. And they are important to study in the Himalayas, given various threats to Himalayan environment and ecology."

Chaturvedi said two former senior principal scientists from National Botanical Research Institute (NBRI), [...] of Lichenology Society of India (LSI) and Dr Sanjeeva Nayak, secretary LSI- provided technical guided to the state forest department in the entire Lichen Park project as it was first of its kind in the country.

In July last year HT had reported that the state forest department had approved research project for studying lichens in the Himalayan state. The project aims to study the distribution of different lichen species, their [...] and physiological aspects, surveying and literature review, the establishment of species, current threats to their habitat including anthropological and climatic factors, and coming up with suitable conservation strategies and protection strategies.

Chaturvedi said these Jurassic-era lichen species are used in food, perfumes, dyes and traditional medicines.

"Our aim of developing this Lichen Park is to create awareness among people here about their importance in the overall Himalayan ecology and how to link livelihood of these locals with these species and check their incriminate exploitation. One of the lichen species called Jhula Ghas is used as a flavouring agent in Hyderabadi biryani and some non-vegetarian dishes in North Indian cuisine. Their potential for antibiotics and sunscreen chemicals is also being explored by researchers. Some species can also [...]tion and can be used as biological sensors that give us information about the environment", said Chaturvedi.

"We chose Munsiyari area for the park as it has a rich diversity of lichen species. Over 120 lichen species are found in this area. So it was easy for us to develop the park here", he said.

According to experts, Uttarakhand has more than 600 species of lichens followed by Himachal Pradesh and Jammu and Kashmir with 503 and 386 species, respectively.

In Uttarakhand lichens are found in Chamoli, Champawat, Pithoragarh, Nainital, Dehradun region.

A lichen is a composite organism that arises from algae or cyanobacteria living among filaments of multiple fungi species in a mutualistic relationship. They come in many colours, sizes and forms. The properties are sometimes plant-like but lichens are not plants. Lichens may have tiny, leafless bran[...]

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Uttarakhand opens biodiversity park in Haldwani to encourage conservation

The state's rich botanical heritage is facing threats from climate change, degrading landscapes, habitat loss and development activities

Hindustan Times

Forest dept dedicates India's first moss garden to public

[H]T Correspondent

[le]tters@htlive.com

[H]ALDWANI: Uttarakhand forest [de]partment on Friday dedicated [th]e newly built Moss Garden to [th]e public, claiming it to be the [co]untry's first such garden in [N]ainital district.

Spread across 10 hectares, the [m]oss garden was inaugurated by [W]ater Man of India Rajendra [Si]ngh. Singh said it is a good ini[ti]ative by the forest department [a]nd will go a long way in mend[in]g the relationship between [...]

The moss garden developed by Uttarakhand forest department in Nainital district. HT PHOTO

CAMPA scheme was develope[d] under a project approved in July 2019, with the aim to conserve various species of moss and other bryophytes and to make general people aware of ecological significance of moss.

"Moss gardens are very popular in Japan and are a craze there but in India, we have neglected this so far," he said. "It has an interpretation centre in which different aspects of moss are displayed through models. There is also a dinosaur model showing the existence of moss since [...]

अनुसंधान वन महकमे ने पहली बार की घास प्रजातियों के संरक्षण की पहल

महफूज रहेंगी घास की 185 प्रजातियां

केदार दत्त • देहरादून

- पहले चरण में रानीखेत के हाशी पौधालय में रोपी की गई है घास की 25 प्रजातियां
- मंशा ये है कि राज्य में मिलने वाली सभी घास प्रजातियां भविष्य के लिए रहें सुरक्षित

हाशी में रोपी गई प्रजातियां

लव, कुश, किकुई, नेपियर, बाबिला, गिन्नी, दोलनी, गुच्छी, सीता, ऑस, कांस, कुमरिया, दूब (दुर्बा), लेमन, किट्टू, नलिका, गोहिया, राई, जूम, चित्रा, झिंगोरा, जंगली कोदो, मसाण, जेई व गुड़्ना।

पारिस्थितिकी के संरक्षण में अहम भूमिका निभाने वाली घास प्रजातियों को महफूज रखने की दिशा में उत्तराखंड वन महकमे ने पहली बार बड़ी पहल की है। इसके तहत राज्य में मिलने वाली घास की 185 प्रजातियों का संरक्षण किया जाना है, ताकि ये भविष्य के लिए सुरक्षित रह सकें। इस कड़ी में महकमे की अनुसंधान शाखा ने रानीखेत के हाशी पौधालय में प्रथम चरण में घास की 25 प्रजातियों का रोपण किया है, जो वहां ठीक से फलीभूत हुई हैं। वन संरक्षक अनुसंधान वृत्त संजीव चतुर्वेदी बताते कि इनमें उच्च हिमालय से लेकर तराई के मैदानी क्षेत्र तक पाई जाने वाली घास प्रजातियां शामिल हैं। धीरे-धीरे इस मुहिम को प्रदेश के अन्य क्षेत्रों में भी फैलाया जाएगा।

जैव विविधता के लिए मशहूर 71.05 फीसद वन भूभाग वाले उत्तराखंड में वन महकमा पेड़-पौधों के साथ ही जड़ी प्रजातियों के संरक्षण को तो कदम उठाता आया है, मगर पहली मर्तबा उसका ध्यान घास प्रजातियों के संरक्षण की तरफ गया। वन संरक्षक अनुसंधान वृत्त संजीव चतुर्वेदी के अनुसार घास को अभी तक उपेक्षित समझा गया था, जबकि पारिस्थितिकी के संरक्षण में इसकी सबसे अहम भूमिका है।

घास का संबंध मनुष्य के संस्कारों से लेकर पर्यावरण के संरक्षण एवं संतुलन के साथ ही भूमि व मिट्टी को क्षरण से बचाने और भूमि की उर्वराशक्ति बढ़ाने तक है। आइएफएस चतुर्वेदी बताते हैं कि देशभर में घास की 1235 प्रजातियां पाई जाती हैं, जिनमें 185 उत्तराखंड के मैदानी क्षेत्र से लेकर उच्च हिमालयी क्षेत्रों तक मिलती हैं। इनमें कई ऐसी भी हैं, जो विलुप्ति के कगार पर पहुंच चुकी हैं। उन्होंने बताया कि इस सबको देखते हुए घास की प्रजातियों के संरक्षण का निर्णय लिया गया। जायका परियोजना से इसे संबल मिला और प्रथम चरण में अनुसंधान शाखा के रानीखेत स्थित हाशी पौधालय में पिछले वर्ष जुलाई में राज्य के विभिन्न क्षेत्रों से घास की 25 प्रजातियां लाकर रोपी गईं। जिसके उत्साहजनक परिणाम सामने आए और सभी प्रजातियां बेहतर ढंग से उगी हैं। इस वर्ष हाशी में अन्य प्रजातियों के रोपण के साथ ही धीरे-धीरे राज्य के अन्य हिस्सों में भी घास की प्रजातियों का संरक्षण किया जाएगा। कोशिश ये है कि यहां पाई जाने वाली घास की सभी प्रजातियां सुरक्षित रहें, ताकि भविष्य में वे किसी क्षेत्र से विलुप्त भी हो गईं तो इन्हें फिर से वहां लौटाया जा सके।

WORLD, ASIA - PACIFIC

India opens largest aromatic garden in Himalayan region

With over 140 fragrant plant species, garden is country's biggest such facility, claim forest officials

Ahmad Adil | 09.11.2021

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RICHARDIANA

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Liparis pygmaea (Malaxideae, Orchidaceae), a new distributional record from Western Himalaya, India with notes on Typification

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Abstract

Liparis pygmaea, restricted to Himalayan region, is reported here as a new distributional record from Western Himalaya. Its detailed description, taxonomic note, photographs and conservation status are provided.

Résumé

Liparis pygmaea, restreint à la région himalayenne, est signalé ici comme un nouvel enregistrement dans la partie occidentale de l'Himalaya. Une description détaillée, une note taxinomique, une illustration et l'état de conservation de l'espèce sont fournis.

Keywords: Chamoli, New record, Orchid, Uttarakhand.

Mots clé : Chamoli, Nouvel enregistrement, Orchidée, Uttarakhand.

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Manoj SINGH[1], Harish NEGI[1] and S.K.SINGH[2,*]: ***Utricularia furcellata* (*Lentibulariaceae*)—A Rare Species Newly Recorded from Western Himalaya, India**

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(Accepted on February 14, 2022)

Summary *Utricularia furcellata* Oliv. (*Lentibulariaceae*), a rare carnivorous species, was recorded from Chamoli, Uttarakhand, Western Himalaya, India. It shows resemblance to *U. striatula* Sm., but can be distinguished easily by corolla with 4-lobed lower lip, seeds tangentially attached to placentum, and lateral hilum without glochidia which are confined to distal portion only. Description and photoplates are provided here to facilitate its future identification.

Utricularia L. is the most diverse genus of the carnivorous family *Lentibulariaceae*. The members of the genus are commonly known as bladderworts. They are semi-aquatic, terrestrial, lithophytic or epiphytic (Gyeltshen and Dema 2020) and widely distributed in tropical and subtropical and a few in temperate regions of the world (Janarthanam and Henry 1992). Taylor (1989) in his monumental monograph of the genus *Utricularia*, recognized 214 species. According to recent estimate the genus is represented by 220 species in the world (Mabberley 2017). In India, the genus is represented by 40 species (Janarthanam and Henry 1992, Yadav et al. 2000, 2005, Naveen Kumar et al. 2018) with preponderance in hills of Western Ghats and Northeast India. Of these, 14 species are endemic to India and

Sardesai & S.P.Gaikwad, *U. lazulina* P.Taylor, *U. malabarica* Janarth. & A.N.Henry, *U. naikii* S.R.Yadav, Sardesai & S.P.Gaikwad, *U. nayarii* Janarth. & A.N.Henry, *U. praeterita* P.Taylor, *U. purpurascens* J.Graham, *U. smithiana* Wight, *U. subramanyamii* Janarth. & A.N.Henry, *U. sunilii* Naveen Kum. & K.M.P.Kumar, *U. wightiana* P.Taylor, while two species *U. furcellata* Oliv. and *U. subulata* L. are endemic to Northeast India.

During survey and exploration of remote localities of Garhwal Himalaya, we collected a few specimens of *Utricularia* from Mandal Valley, Chamoli dist. Uttarakhand, September 2021. A thorough scrutiny of literature (Oliver 1859, Clarke 1884, Joseph and Joseph 1986, Taylor 1989, Janarthanam and Henry 1992) and comparison with known species of Western Himalaya, the specimens were identified as *U. furcellata*, a rare species, known to occur in Meghalaya, Sikkim and West Bengal (Darjeeling), China, Malaysia, Thailand and Bhutan (Gyeltshen and Dema 2020) but hitherto unrecorded from the Western Himalaya. It is interesting to note that after Joseph and Joseph (1986) this species could not be collected from any parts of India. Thus, this species is described and illustrated with the help of photomicrograph in the present paper. The

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Cephalanthera erecta var. *oblanceolata* (Orchidaceae): A new record for the Flora of India

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सिफलान्थेरा इरेक्टा प्रभेद ऑब्लांसिओलाटा (आर्किडेसी): भारत के फ्लोरा के लिए एक नवीन अभिलेख

मनोज सिंह, हरीश नेगी, जीवन सिंह जलाल एवं दिनेश कुमार अग्रवाला

सारांश

Abstract

Cephalanthera erecta (Thunb.) Blume var. *oblanceolata* N. Pearce & P.J. Cribb [Orchidaceae-Epidendroideae-Neottieae] is reported for the first time from India based on specimens collected from Uttarakhand in North-Western Himalaya. A brief description, photographs, along with information on phenology, habitat and distribution have been provided to facilitate its identification. Its relationship with the variety proper and justification for its varietal status has been discussed. The threat status has been accessed in Indian perspective by applying the IUCN guidelines.

Keywords: Chamoli, Western Himalaya, Uttarakhand, Taxonomy, Conservation

INTRODUCTION

Cephalanthera Rich. (Orchidaceae-Epidendroideae-Neottieae) represents a small group of terrestrial orchids with about 19 taxa (Chase & al., 2015; Govaerts, 2021), mainly distributed in Europe, N. America and temperate parts of Asia. So far the genus is represented

(Mill.) Druce and *Cephalanthera longifolia* (L.) which are confined to the Himalayan region (Singh & al., 2019). During a floristic exploration in the Chamoli-Garhwal region of Uttarakhand, a population of *Cephalanthera erecta* var. *oblanceolata* N. Pearce & P.J. Cribb could be located. These terrestrial orchids were found growing on the humus-rich soil of *Quercus-Rhododendron* Boreal forest at 1870 m. elevation **(Map 1)**.

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ILLINOIS NEWS LIVE

Tech

Uttarakhand's first orchid conservation center opened

danielkuhn July 30, 2021

Chamoli (Uttarakhand) [India], July 30 (ANI): The first orchid conservation center in Uttarakhand was opened on Friday in the state's Chamoli district.

Tweet

Prakash Javadekar
@PrakashJavdekar

I congratulate the Government of Uttarakhand for setting up India's First Moss Garden. This will not just go a long way, in conserving the various species Of Moss, but will also make people aware of it's significance in the Environment.
@PIBDehradun

UNB BN

India's first grass conservatory established in Uttarakhand's Ranikhet

Dhaka November 16, 11:33 AM UNB NEWS - UNB NEWS

PM At 11,000 Feet, India Opens Herbal Park in Uttarakhand - The Tennessee Tribune

The Tennessee Tribune

NATIONAL/INTERNATIONAL NEWS

At 11,000 Feet, India Opens Herbal Park In Uttarakhand

by zenger.news
August 23, 2021

Rare orchid species found in Western Himalayas for the first time

Prashant.Jha@timesgroup.com

Nainital: A rare orchid species — Liparis Pygmaea — has been sighted in the Western Himalayan Region for the first time after 10 plants were found growing at an altitude of 3,800 metres in Uttarakhand's Chamoli district. The flowers — a deep shade of purple — were spotted in the country after a gap of 120 years.

The species was sighted and photographed in Saptkund by Manoj Singh, a junior research fellow with the forest department, and range officer of Gopeshwar, Harish Negi, in June this year. The findings have now been published in the French journal 'Richardiana'.

"We were exploring the region when we found 10 mature plants of the orchid at a single location near Saptkund," said Singh. The duo photographed the plant and sent a sample to the Botanical Survey of India (BSI) lab in Pune. Tests confirmed the plant to be Liparis Pygmaea.

"Further research of the existing material on the orchid species showed that this was the first case of the sighting of the plant in the Western Himalayan region and therefore this has widened the distribution range of the species in the Himalayas," said Singh.

Jeewan Singh Jalal and Dinesh Kumar Agrawala, both scientists at the BSI, who also contributed to the study said the species was last recorded in India in 1896. According to Agrawala, the species had only been recorded in Sikkim, West Bengal, Nepal and China till now. "This is the first time its existence has been recorded in Western Himalayas," he said.

The researchers also noted that though no commercial exploitation of the species is known, its habitat faces "natural and anthropogenic threats" while adding that the "extent and quality of its habitat is continuously declining". "The fact that it was found to be growing along with medicinal plant Katuka or Kutki (Picrorhiza kurroa) which is highly exploited further threatens its habitat," Singh said.

The species – Liparis Pygmaea – was spotted in the country after 120 years

Hindustan Times

Nainital houses country's first pollinator park

Neeraj Santoshi
neeraj.santoshi@htlive.com

DEHRADUN: The forest department has dedicated the newly built pollinators park to the public, claiming it to be country's first such park, spread over 4 acres in Nainital district.

The park has more than 40 pollinator species with displays on the mechanism of pollination of over plant species by various species of butterflies, honeybees, birds, insects, moths, beetles, wasps, and small mammals. The park also has small water bodies for mud puddling of butterflies through which they take certain nutrients like salt and arrangement of ultra-violet light to attract night pollinators like moths.

The pollinators park, which took nearly a year to build, was inaugurated by noted lepidopterist Peter Smetacek from Butterfly Research Centre Bhimtal. Smetacek helped the forest

A view of the park in Nainital district. HT PHOTO

department in setting up the park. "Many pollinator species are in decline due to a loss in feeding and nesting habitats, pollution, overuse of pesticides and insecticides, disease, and changes in climatic patterns, are all contributing to shrinking and shifting of pollinator populations, thereby endangering our food security," said Smetacek.

Sanjiv Chaturvedi, chief conservator of forests (CCF) and incharge of forest research wing, said it was the country's first pollinator park. "Objective of setting up the park is to conserve various pollinator species, to create awareness among general public about their importance and promote further research on various aspects of pollination, including a threat to their habitat and impact of pollution, use of pesticides and relation between various pollinators and plant species," he said.

Talking about the importance of pollinators and why people should know about them, Chaturvedi said somewhere between 75% and 95% of all flowering plants on the earth need pollinators to reproduce. "Pollinators provide pollination services to over 180,000 different plant species. Without them, existing populations of plants will decline, even if soil, air, nutrients, and other life-sustaining elements were available. Pollinators affect nearly 35% of global land...

...flies, birds and moth species. There are also host plants to provide shelter to eggs, larvae and pupa, like curry leaf plant, citrus species, cassia species. Apart from this, to attract various bird and butterfly species, bird feeders and nests have been placed throughout the park, with food grains. Also, some cut fruits have been put in the park as certain butterfly species are attracted to such cut fruits," he said.

He said endemic species of honeybee "Apiscerana indica" have been reared in the park. "Their numbers have declined considerably..."

Hindustan Times

GREEN INITIATIVE | STATE HAS AROUND 250 ORCHID SPECIES

State's first orchid conservation centre opened in Chamoli's Mandal

Neeraj Santoshi

...Chamoli district.

GREEN TROVE

India's highest herbal garden in Uttarakhand


Locals and officials at inauguration of herbal garden ... village | EXPRESS

VINEET UPADHYAY @ Dehradun

INDIA'S highest herbal garden, located at an altitude of 11,000 feet, was inaugurated near Badrinath shrine in Uttarakhand on Saturday. The garden, located in Mana village of Chamoli district, has been developed by the research wing of state forest department on a three-acre land given by Mana Van Panchayat.

The garden, inaugurated by Mana sarpanch Pitambar Maulfa, has been developed in three years under the central government's Compensatory Afforestation Fund Management and Planning Authority (CAMPA) scheme. It displays around 40 species, including important medicinal herbs, found in the high-altitude alpine areas of the Himalayan region.

"We, as residents of the Himalayas, have a major responsibility to conserve our natural heritage and pass on its knowledge to the next generation," said the sarpanch.

Sanjiv Chaturvedi, who heads...

...Tree and the sacred tree of Bhojpatra.

The second contains Ashtavarga species, a group of 8 herbs found in Himalayan region: Riddhi, Vriddhi, Jeevak, Rishbhak, Kakoli...

Rare carnivorous plant found first time in western Himalayas: Forest dept study

Neeraj Santoshi

DEHRADUN: Uttarakhand forest department's research wing has found a rare carnivorous plant, Utricularia Furcellata, for the first time in western Himalayas in Mandal valley of Uttarakhand. The research paper, titled "Utricularia furcellata (Lentibulariaceae) – A Rare Species Recorded from Western Himalaya, India", has been published in June 2022 issue of the Japanese Botany...


Utricularia Furcellata, found in...

...developed plant structures for ... and the targets range from protozoa to insects, mosquito larvae and even young tadpoles ... operation is simply based on a mechanical process by creating a vacuum or negative pressure area, to draw prey inside the door. These plants are mostly in fresh water and wet soil," he said.

Harish Negi said during survey and exploration of the localities of Garhwal Himalaya in 2021, they had found this specimen of Utricularia in Mandal Valley. "With a thorough scrutiny of literature and comparison with known species of Western Himalaya, the specimens were identified with the help of Botanical Survey of India as Utricularia furcellata ... species, known to occur in Meghalaya, Sikkim and Bengal (Darjeeling), ... Malaysia, Thailand and ... but so far unrecorded from Western Himalaya."

In September 2020, Singh and Harish Negi, ... their Suptkund trek in Chamoli district at an altitude of ... metres, had also found a rare species of orchid, ... pygmaea, after a gap of 124 years in India. It was confirmed by orchid specialist Jeewan Singh Jalal from Botanical Survey of India. Pune while ... the rare status ...

उद्यान | क्रिप्टोगैम पादपों की प्रजातियों के सबसे पुराने समूह है गार्डन में शामिल, वातावरण को प्रदूषण मुक्त बनाने में कारगर है क्रिप्टोगैम

उत्तराखंड के चकराता में बना देश का पहला क्रिप्टोगैमिक गार्डन



देवबन में क्रिप्टोगैमिक गार्डन में लगाई गई पादप की प्रजातियां

प्रदूषण को नियंत्रित करने में कारगर

भोजन के रूप में होता है उपयोग

कास्मेटिक के निर्माण में

Forest dept grows 110 Ficus species in Nainital


(Above and below) Different Ficus species at a nursery in Lalkua area of Nainital. HT PHOTO

'Fernatum' to conserve fern species in Ranikhet

Prem Punetha



Some of the fern species are endangered due to over-exploitation, loss of habitat and due to anthropogenic factors

2. CONSERVATION OF BUGYALS IN UTTARAKHAND

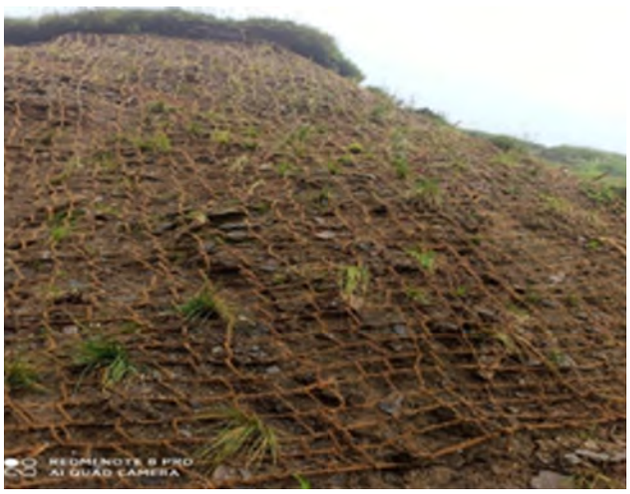
Bugyals are the alpine meadows, one of the unique features of the high-altitude mountains that possess high ecological significance. Bugyals can be seen at altitudes between 3000 to 5000 metres. Due to extreme cold at this high altitude, the vegetation like trees and shrubs vanishes and only beautiful grasslands can be seen. These high altitude grasslands in local language are called 'bugyal'. In some literature related to environmental forestry, such grasslands have been referred as alpine and sub alpine pastures. As per the forest classification given by Champion and Seth, bugyals have been categorized as 15/C-3. As per working plans of the various forest divisions, a total of 211 bugyals, of varied sizes, have been identified in 10 forest divisions and 3 protected areas of Uttarakhand. The total area under these bugyals is 8524 sq. km. Apart from grass species, bugyals provide suitable habitat for many high-altitude wild animals and precious plants of high medicinal value. For the natural beauty and other socio-economic reasons, these are visited by a large number of villagers, tourists, researchers and shepherds every year. Therefore, these natural abodes for a number of floral &faunal species are facing a threat of damage from various anthropogenic factors including cattle grazing, tourism, collection of NTFP etc and other environmental factors. Keeping in mind the ecological importance of bugyals in the State, a comprehensive drive for taking correctional measures is required. The hon'ble High Court of Uttarakhand, Nainital has also directed maintenance and augmentation of all the bugyals of the State in its decision dated 21/08/2018 in PIL no. 123/2014 pertaining to Auli-Bedini-Bagji Bugyal Conservation Committee vs. the State of Uttarakhand.

The following activities have been carried out in the State for protection and conservation of bugyals in 2020-21 and 2021-22 in different forest divisions: -

- Controlling grazing in bugyals through local committees.
- Soil erosion control and SMC works using mainly Geo Jute technique, maintenance of trekking routes and construction of shelters.
- Wildlife protection and regulating extraction of medicinal plants and controlling illegal exploitation.
- Solid Waste Management.
- Regulating eco-tourism through the eco development committees.
- Removal of invasive species and restoration of eroded slopes/stretches.

Following bugyals were covered for protection and conservation works during 2020-21 and 2021-22 in the State: -

Name of Forest Division	Name of Bugyal
Badrinath Forest Division	Saptkund, Chambe, Ghungabugyals
Uttarkashi Forest Divisio	Chachral, Dyara, Sattal, Devkundbugyals
Govind WLS Forest Division	Har ki Dun, Ishtiyar Gad bugyals
Kedarnath Wildlife Division	Madmaheshwar, Pandavsera bugyals
Nandadevi National Park	Auli, Bansinarayan, Damarsain, Delisera, Uniyani, Bandarpata bugyals
Gangotri National Park	Tapovan, Raktvan, Bujkharak bugyals
Rudraprayag forest division	Panwalikatha, Matiya bugylas



Contribution: Chief Executive Officer, Compensatory Afforestation Fund Management and Planning Authority, Uttarakhand

WEST BENGAL

GOOD PRACTICES

A. Catchment Area Treatment

1. What is CAT Plan:

CAT Plan targets towards overall improvement of the environmental conditions of particular area /region against execution of public project involving diversion of forest land. All the activities are aimed at treating the degraded and potential areas with severe soil erosion. The plan provides benefit due to biological and engineering measures and its utility in maintaining the health of eco system.

2. Objectives of CAT Plan

a. To demarcate the priority of watersheds for treatment on the basis of soil erosion intensity.

b. To treat the severe and very severely degraded area according to priority of sub watersheds rated through Silt Yield Index for getting an immediate check of the silt yield / soil erosion.

c. To stabilize various unstable areas using several engineering and bioengineering measures.

d. Biological measures include afforestation, pasture development, plantation of soil binding species to conserve soil and regulate flow of water.

e. Engineering measures include creation of Sausage wall, Crate wall, Catch water drain, Step drain, Belly benching etc.

f. To increase the life of the project by reducing the siltation in the reservoir.

3. Methodology:

The Methodology adopted for Catchment Area Treatment Plan preparation included interpretation and analysis as follows:

a. Satellite imagery if IRS -1B LISS -III data has been interpreted visually for preparation of various thematic maps.

b. Digital image processing of IRS ID-LISS-III data for band 1,2,3, and 4 has been carried out and the data was interpreted for demarcating land use pattern, drainage pattern, drainage density, vegetation cover etc.

c. SOI Toposheet (Scale-1:50,000) of the study area was utilized to prepare the base maps.

d. The maps viz. Drainage map, Watershed map, Drainage density map, Erosion intensity map, land use and land cover map, Watershed prioritization map, Watershed codification map, CAT plan have been modified by carrying out field checks and incorporation of secondary data available from concerned departments.

e. 'EASIPACE' and 'SPAN' software are used for calculation and analysis for various terrain parameters and thematic information.

f. The choice of species of trees and shrubs for plantation was done as per the soil types, climatic conditions and accessibility of the area.

g. Demarcation of degraded land for CAT has been finalized using sediment yield index method developed by All India Soil and Land use survey. It has been adopted to identify the critically degraded areas of the catchment of the instant project.

h. Detailed ground surveys were undertaken to fix the nature of the Biological and Engineering works as per the plan formulated in the catchment area.

4. TLDP-IV Project in a nutshell:

A proposal for diversion of 338.05 ha of forest land for construction of Teesta Low Dam Project Stage-IV (160 MW) in Darjeeling District of West Bengal was initiated in 2004 by National Hydro Electric Power Corporation Ltd. in-principle approval was accorded by MoEF (FC Division) for diversion of 338.05 ha of forest land for the said project vide their no.F.No.8-61/2004/FC, dtd.11.01.2005. Later MoEF accorded final approval vide their no.F.No.8-61/2004/FC, dtd.30.03.2006.

5. Catchment Area Treatment measures adopted:

Different methods such as Engineering, Biological and Bio-engineering measures have been suggested for catchment area treatment of TLDP Stage-IV project.

1. Engineering measures:

a. Sausage walls

b. Crate walls

c. C.C. walls

d. Catch water drain

e. Stepped drain

f. Angle iron barbed wire fencing

2. Biological measures:

a. Development of Nurseries

b. Plantation/afforestation

c. Soil binding species

d. Sowing and broadcasting

e. Pasture development

3. Bio-engineering measures:

a. Vegetative fencing

b. Belly benching (Palisade)

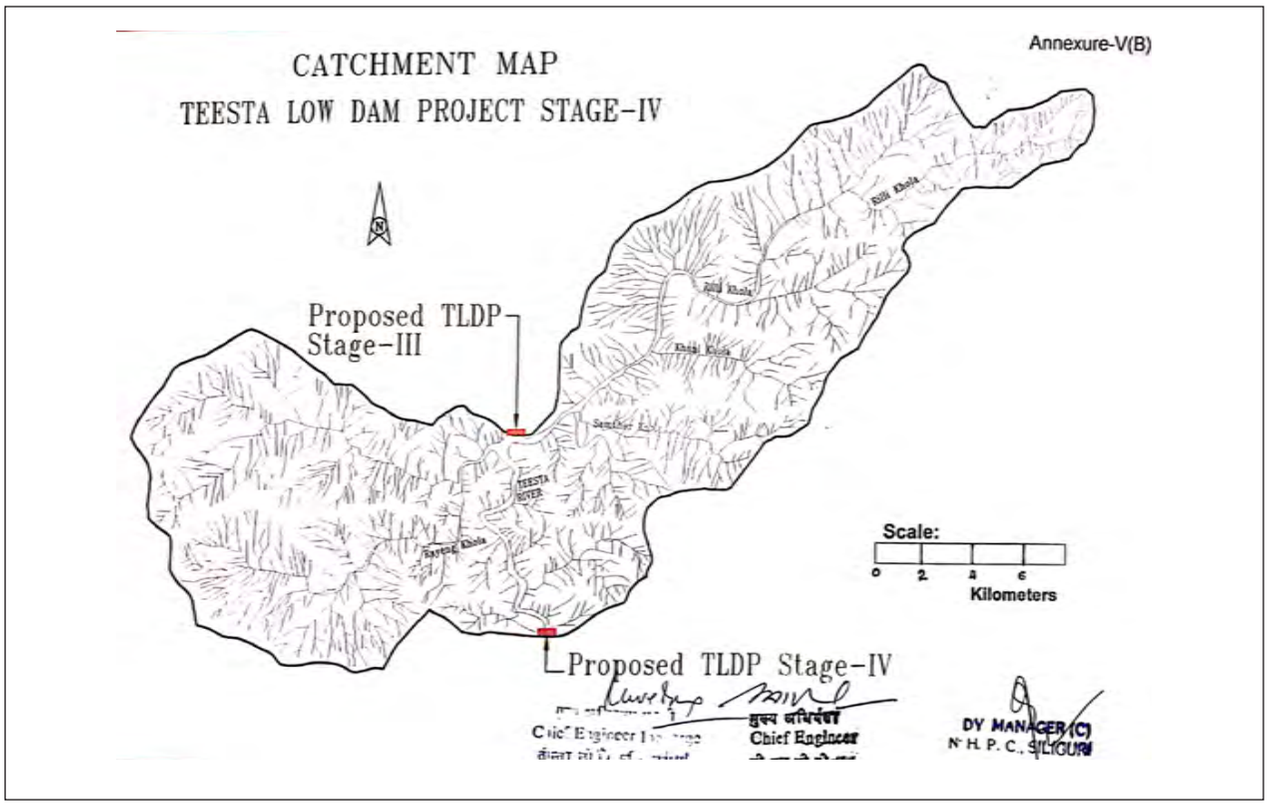
c. Vegetative barbed wire fencing

6. Forest Divisions involved:

Sl. No.	Name of Circle	Name of Division
1	Hill Circle	Kurseong Division
2		Kalimpong Forest Division
3	Soil Conservation North Circle	Kurseong Soil Conservation Division
4		Kalimpong Soil Conservation Division

7. Sub-Watersheds involved:

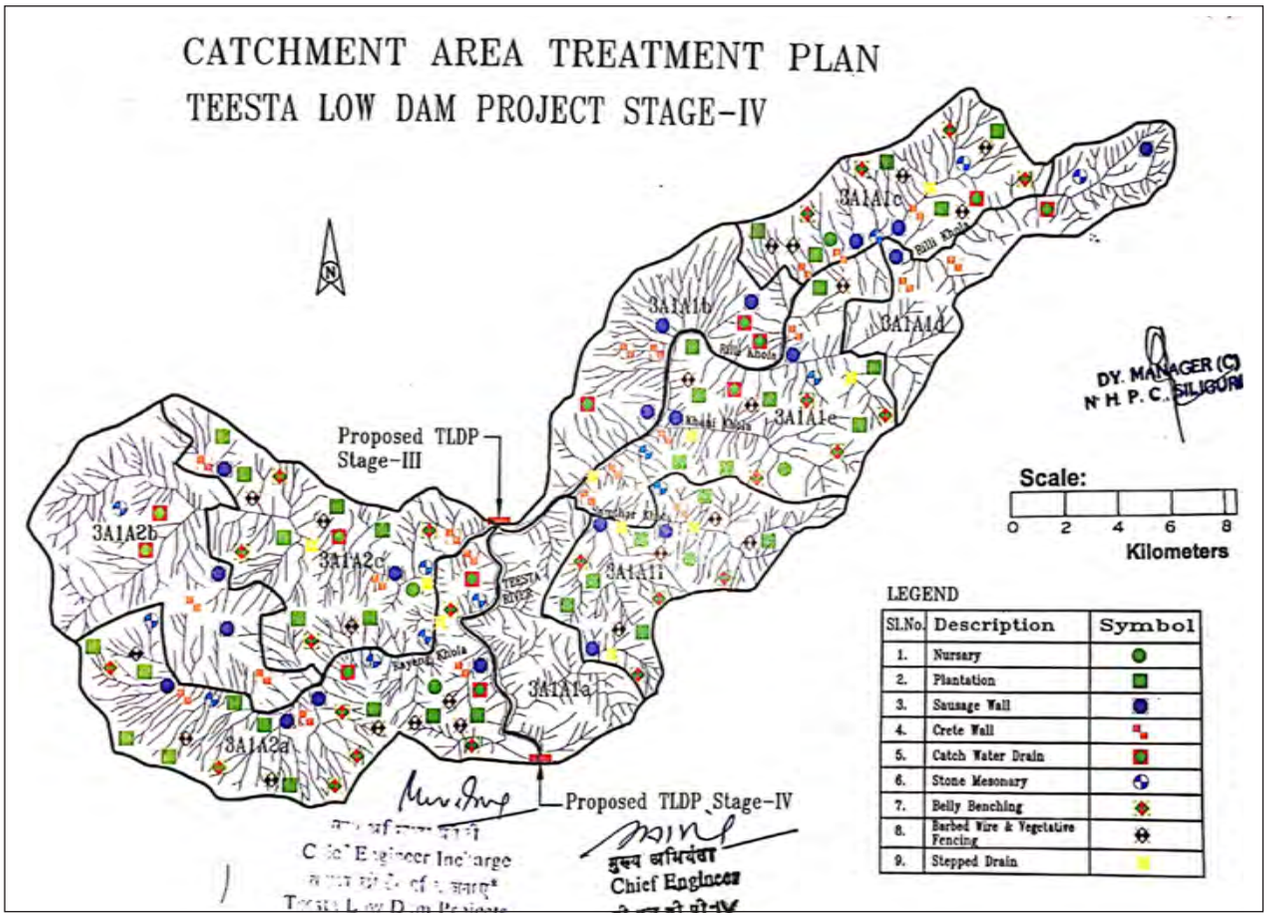
Sl. No.	Sub-Watershed code	Sub-Watershed area (in ha.)	Area for treatment (in ha.)
1	3A1A1a	2525.50	660.066
2	3A1A1b	3230.25	1157.94
3	3A1A1c	3078.25	1344.82
4	3A1A1d	2875.00	1015.52
5	3A1A1e	4493.50	1262.91
6	3A1A1f	3070.75	1343.62
7	3A1A2a	5491.25	1223.66
8	3A1A2b	4515.25	975.234
9	3A1A2c	4285.00	1304.66
	Total	**33,564.75**	**10,228.43**



8. Images of activities undertaken under TLDP-IV:

KURSEONG SOIL CONSERVATION DIVISION

Nature of Work	Project	Location: (Block/ Compartment)	Range	Volume	Date of Completion	GPS chord
Boulder Sausage Wall	TLDP-IV	MAHALDIRAM-II (Lower Section)	East Balason Catchment Range	150 M3	16.03.2020	N26°55'48.30" E88°25'42.71"




During Works


After Works

Nature of Work	Project	Location: (Block/ Compartment)	Range	Volume	Date of Completion	GPS chord
Bamboo Palisade	TLDP-IV	MAHALDIRAM-II (Lower Section)	East Balason Catchment Range	100 Rmt	16.03.2020	N26°55'48.30" E88°25'42.71"

Nature of Work	Project	Location: (Block/ Compartment)	Range	Volume	Date of Completion	GPS chord
DRM Wall	TLDP-IV	Motilal jhora Mongwa-1	Upper Teesta Catchment Range	25 M3	16.03.2020	N26°56'40.45 "E88°25'26.71"

Nature of Work	Project	Location: (Block/ Compartment)	Range	Volume	Date of Completion	GPS chord
Bamboo Palisade Wall	TLDP-IV	Seti Khola Forest Block	Upper Teesta Catchment Range	70 Rmt	16.03.2020	N26°55'48.30" E88°25'42.71"

B. Other activities:

1. Creation of CA plantation:

Year	Zone	Circle	Division	Scheme	Range	Beat	Location	Spacing	Area (Ha)	S% 1st Yr		GPS Reading		Date of Survey	W.C.	Final Score
										Sal	Misc	Over All	Latitude	Longitude			
2020	NB	BTR Circle	BTR East	Campa	SRD	SRD	Dhowla-2	2mx2m	12		91	91	26°34'28.8"	89°93'12.1"	04.01.21	Misc	97

Year	Division	Scheme	Range	Beat	Location	GPS Reading		Area (Ha)	Survival %
						Latitude	Longitude		
2018	Cooch Behar	Campa	Pundibari	Patlakhawa	Chhat Singimari	26°49'34.15"	89°35'93.08"	1.564	98

2. Gap Planting under NPV:

Gap filling plantation in Sal degraded forest with Sal and it's associates species under Artificial Regeneration at Khandari Beat under Panagarh Range of Burdwan Division

Gap filling plantation in Sal degraded forest with Sal, Division- Burdwan, Range- Durgapur, Beat- Gopalpur, Mouza- Sundiara

3. Wildlife Conservation Plan:

Purchase of Boat for patrolling and construction of Range office in Katwa Range

"Ganga Prahari" (FRP Patrolling Boat for Monitoring Gangetic Dolphin) of Katwa Range, Burdwan Division

Installation of Solar Lights to reduce Human Elephant Conflict in areas prone to Human Elephant Conflict in Jhargram Division

4. Other ancillary activities:

Supply of Agricultural Implements as JFM support activities

Supply of Power Tillers at Burdwan Division

Supply of Paddy Thresher Machine at Burdwan Division

5. Infrastructure of frontline staff:

New construction of Beat Office at Ausgram, Guskara Range, Burdwan Division.

Contribution: Chief Executive Officer, Compensatory Afforestation Fund Management and Planning Authority, West Bengal

Appeal by a Tree

I am a tree, this earth do I nourish,
with leaves, flowers and fruits, for you to cherish;
Protecting all, from extremes of climate,
amphibians, reptiles, birds and primate;
Take care of me and I shall return the favour,
in many different ways and many times over;
My roots bind the soil, for rain to percolate,
so that the rivers are full but never in spate;
My leaves give out oxygen, the elixir of life,
making it possible for you to survive;
Travellers, weary from the harsh sun, have made,
many-a-shelter in my dappled shade;
The birds build their nests in my branches and hollows,
while I wait for the hatchlings and the chirping that follows;
Without me, your present would be barren and your future dark,
no soil, no water, no food – these words, you should mark;
So don't take me for granted, come let's work together,
for the good of this earth-our life and our mother.

Meenakshi Negi, IFS

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National Authority,
Compensatory Afforestation Fund
Management and Planning
Authority (CAMPA)

Ministry of Environment,
Forest and Climate Change
Government of India