

List of Completed projects

S. No.	Title of the Project	Principal Investigator	Duration of the Project	Funding Agency	Project Status	Project objectives	Research findings
1	Impact of Harvesting on Soil Nutrients and Carbon Stock in Canal Side Plantations of Indira Gandhi Nahar Pariyojana (IGNP)	Dr. G. Singh, Scientist-G	April 2017 – March 2022	ICFRE Plan, AFRI, Jodhpur	Completed	To quantify harvested wood biomass and develop allometric equations based on tree growth parameters. To study the impact of harvesting on soil nutrients and carbon stock in canal side plantations of IGNP. Sustainable management of plantations in IGNP area.	The project conducted by AFRI, Jodhpur assessed the impact of harvesting on biomass production, carbon sequestration and soil nutrient dynamics in canal side plantations of <i>Eucalyptus camaldulensis</i> and <i>Vachellia tortilis</i> in the IGNP region of western Rajasthan. Permanent plots were established in Bikaner and Jaisalmer forest divisions for detailed measurements of tree growth, biomass and soil properties. Species-specific allometric equations were developed for accurate estimation of above ground biomass and carbon stock. The study revealed that <i>Eucalyptus camaldulensis</i> plantations stored about 150.13 Mg C ha⁻¹ while <i>Vachellia tortilis</i> stored 53.64 Mg C ha⁻¹, demonstrating their significant role in climate change mitigation in arid ecosystems. Soil carbon stock under plantations was substantially higher than in control plots, confirming the positive influence of plantations on soil fertility and nutrient enhancement. The research further showed that clear felling caused more than 50% depletion

							in soil organic carbon and nutrients within three years, indicating the sensitivity of desert soils to harvesting disturbances. Coppice regeneration of <i>Eucalyptus camaldulensis</i> exhibited higher carbon sequestration rates than the main crop, highlighting its importance for sustainable plantation management. The study recommended retention of some trees during harvesting, management of invasive species, and improved irrigation and fertigation practices for maintaining soil fertility and enhancing long-term carbon storage in IGNP plantations. The findings generated valuable scientific data for carbon accounting, climate resilience and sustainable management of plantation forests in arid Rajasthan.
2	Survey, Documentation and Conservation Planning of Flora and Fauna of Raj Bhawan Areas at Jaipur and Mount Abu, Rajasthan	Dr. G. Singh, Scientist-G	2019–2022	Raj Bhawan, Rajasthan & ICFRE–AFRI, Jodhpur	Completed	Survey, identification and enlistment of flora and fauna of Raj Bhawan areas at Jaipur and Mount Abu. Preparation of pictorial documentation of flora and fauna of both Raj Bhawans. Development of appropriate signages for important flora and fauna species. Publication of a coffee table	AFRI, Jodhpur conducted extensive biodiversity assessment and ecological documentation of Raj Bhawan areas at Jaipur and Mount Abu. The study recorded 412 plant species belonging to 81 families and 291 genera from both locations combined. Jaipur Raj Bhawan supported 215 plant species, whereas Mount Abu Raj Bhawan supported 293 species, indicating high floral diversity in urban green spaces of Rajasthan. The study documented 98 tree

					book with photographs and illustrations of important species available in these areas.	species, 115 shrub species, 117 herbaceous species, 40 grass species, 22 climbers, 11 lianas, 6 sedges and 3 fern species. Dominant families included Poaceae and Fabaceae. Diversity analysis showed Mount Abu to be richer in herbaceous and shrub diversity, whereas Jaipur exhibited greater tree diversity. The project also documented phenological behaviour, vegetation structure, species richness, Simpson dominance index and Shannon-Weiner diversity index across different ecological blocks. Important dominant species included <i>Polyalthia longifolia</i>, <i>Putranjiva roxburghii</i>, <i>Bougainvillea glabra</i> and <i>Tecoma stans</i> at Jaipur, while <i>Mallotus philippensis</i>, <i>Mangifera indica</i>, <i>Lantana camara</i> and <i>Dendrocalamus strictus</i> dominated Mount Abu. AFRI recorded 39 species of birds along with reptiles, butterflies and other fauna, demonstrating the ecological importance of urban green spaces for biodiversity conservation. The study identified several rare, endemic and vulnerable species such as <i>Anogeissus sericea</i> var. <i>sericea</i>, <i>Wrightia tinctoria</i> and <i>Dalbergia latifolia</i>, emphasizing the conservation significance of Raj Bhawan habitats. Invasive species such as <i>Lantana camara</i>
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3	National Programme for Conservation and Development of Forest Genetic Resources (FGR) – State Report (Gujarat & Rajasthan), Phase-I Documentation Cell	Dr. Tarun Kant, Scientist-G (Regional Coordinator) S.R.Baloch, Scientist-E (Principal Investigator)	2020–2025	ICFRE	Completed	Documentation of profile, distribution and regeneration status of Forest Genetic Resource (FGR) species in Rajasthan and Gujarat. Eco-distribution mapping of priority FGR species using GIS and remote sensing techniques. Collection, storage and conservation of seeds and germplasm of important FGR species. Development of tissue culture protocols and medium-term storage techniques for RET and economically important	AFRI, Jodhpur carried out extensive documentation, conservation and characterization studies on important forest genetic resources of Rajasthan and Gujarat under the National FGR programme. The institute surveyed and documented distribution, regeneration status and threats to around 119 priority species including <i>Tecomella undulata</i> , <i>Prosopis cineraria</i> , <i>Commiphora wightii</i> , <i>Capparis decidua</i> , <i>Salvadora persica</i> , <i>Boswellia serrata</i> and <i>Butea monosperma</i> . Eco-distribution mapping using GIS, remote sensing and MaxEnt modelling was conducted for identifying potential habitats and conservation priorities for 25

						species. Biochemical and molecular characterization of selected FGR species. Standardization of propagation and nursery techniques for important native species. Establishment of field gene banks and conservation measures for priority FGR species.	selected species. AFRI established seed and germplasm storage protocols and collected seeds from multiple populations for long-term conservation for 20 species. Tissue culture and in vitro regeneration protocols were standardized for important RET species such as <i>Commiphora wightii</i>, <i>Capparis decidua</i>, <i>Salvadora persica</i>, <i>Leptadenia reticulata</i> and <i>Boswellia serrata</i>. Biochemical characterization studies quantified important phytochemicals such as β-sitosterol, guggalsterones and boswellic acids in different populations. Molecular characterization using SSR markers revealed significant genetic diversity and population structure in <i>Tecomella undulata</i> and <i>Prosopis cineraria</i>. AFRI also standardized propagation and nursery techniques and established field gene banks at AFRI Ecology Field and Malajal Jasol Field for conservation and evaluation of priority species under arid and semi-arid conditions.
4.	Enhancement of Fodder Availability and Quality to Reduce Unsustainable Grazing in the Forest (AICRP-17)	S.R.Baloch, Scientist-E	2021–2025	All India Coordinated Research Project (AICRP)	Completed	Objectives: The objectives of this research proposal are as follows. 1. Standardising planting, management, protection and fodder sharing procedures for enhancing tree fodder	AFRI, Jodhpur conducted experiments at Idar (Gujarat) and Karahjodh, Jaisalmer (Rajasthan) under arid and semi-arid ecosystems for evaluating fodder tree and grass species. The study assessed survival, growth, biomass production and fodder potential of important

					availability in fodder scarcity regions of India 2. Improving nutritive value and fodder availability during lean period 3. Capacity building of local stakeholders in raising high-yielding fodder plantation	tree species such as <i>Ailanthus excelsa</i>, <i>Moringa oleifera</i>, <i>Prosopis cineraria</i>, <i>Ziziphus nummularia</i> and grasses including <i>Cenchrus ciliaris</i>, <i>Cenchrus setigerus</i>, <i>Lasiurus indicus</i> and <i>Panicum turgidum</i>. Results indicated that <i>Ailanthus excelsa</i> produced the highest biomass among tree species at both sites, showing excellent adaptation to local agro-climatic conditions. In Idar, Gujarat, cumulative biomass of <i>Ailanthus excelsa</i> reached up to 347 quintal/ha under 1 m × 1 m spacing, while <i>Moringa oleifera</i> produced up to 180 quintal/ha. At Karahjodh, Jaisalmer, <i>Ailanthus excelsa</i> also recorded superior biomass production up to 334 quintal/ha, whereas <i>Prosopis cineraria</i> and <i>Ziziphus nummularia</i> showed comparatively lower biomass. Among grass species, <i>Cenchrus setigerus</i> performed better than <i>Cenchrus ciliaris</i> at Idar with biomass production reaching about 260 quintal/ha, while <i>Panicum turgidum</i> showed the highest biomass production in the harsh climatic conditions of Jaisalmer with values exceeding 1100 quintal/ha. The study further revealed that closer spacing (1 m × 1 m) was superior to wider spacing for biomass production in almost all selected fodder species. AFRI
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4	Assessment of Water Requirement of Different Forest Tree Species and its Impact on Subsoil Moisture (AICRP-19)	Sharat Kothari, Scientist-B	2020–2025	AICRP–ICFRE	Completed	1.To quantify water requirement for transpiration of selected forest tree species commonly used for plantation by various state forest departments. 2. To quantify the cumulative effect of evapotranspiration and infiltration on subsoil moisture. 3. To develop correlation between transpiration rate and subsoil moisture status for species under study	The study quantified the water requirements and sap flow dynamics of four important forest tree species under arid and semi-arid conditions to support water-efficient afforestation and climate-resilient forestry. <i>Azadirachta indica</i> (Neem) exhibited the highest sap flow velocity and transpiration rate, indicating strong microclimate regulation potential but relatively high water demand. <i>Prosopis juliflora</i> showed the lowest water use, exceptional drought tolerance, and high water-use efficiency, making it highly adapted to moisture-stressed environments. <i>Anogeissus latifolia</i> demonstrated moderate water use with high biomass production efficiency, while <i>Tectona grandis</i> exhibited balanced water use and strong seasonal dependence on rainfall

						and soil moisture. Across all species, maximum water uptake occurred during the monsoon and post-monsoon seasons, with peak daily sap flow between 2:00 PM and 3:30 PM. Subsoil moisture played a critical role in sustaining tree physiological activity during prolonged dry periods, and deep-rooted species efficiently utilized deeper soil moisture reserves. The findings provide valuable scientific guidance for selecting suitable tree species, optimizing irrigation strategies, and developing water-efficient afforestation and sustainable forest management practices in arid and semi-arid regions.
5	Preparation of Forest Soil Health Cards under Different Forest Vegetations in all Forest Divisions of India(AICRP-22)	Bhawana Sharma, Scientist-E	2020–2025	CAMPA	Completed	To prepare forest soil health cards under different vegetations and adjoining degraded land in all the Forest Divisions to enhance deficient nutrients through sustainable management practices and making plantations more successful To diagnose forest soil fertility related constraints with the help of standard procedures, uniform sampling, data compilation and analysis thereof and to suggest divisional level management practices Research Findings/Achievements: Total 2943 soil samples were collected from 1142 different locations of forest area of Rajasthan, Gujarat and Dadra Nagar Haveli and Daman & Diu and analysed for 12 parameters (pH, EC, OC, N, P, K B, Fe, Cu, Mn, Zn) of soil fertility. Separate soil fertility standards developed for Eastern and Western Rajasthan, Gujarat and UTs. Total 66 Forest Soil Health Cards were developed all territorial forest divisions of all above states and UT. These

						To promote soil test-based nutrient management practices in different forest vegetations in the forest divisions for enhancing nutrient use efficiency To build capacities of officials / field level staff of SFD's for promoting nutrient management practices for effective plantations To strengthen the Forest Soil Testing Laboratories and develop a network with state owned soil testing laboratories. To launch a forest soil health card portal on website for easy access to the various stakeholders.	FSHCs will provide baseline information on forest soils and addresses soil fertility related constraints. Customized information for forest departments at division level for managing forest soils is thus available now through these cards. These serve as a ready reference to the foresters and provides correct dose of organic and inorganic fertilizers. The use of these cards will ensure better survival, recruitment and growth plants in the field. The soil health card will give a proper idea of which nutrients is lacking in the soil of a forest division as well as which fertilizers they require during raising plantations. The main objective of the project is to bring the soil quality of degraded forests at par to the good forests of the same state.
6	Combating Desertification by Enhancing Vegetation Cover and People Livelihoods in Degraded Drylands and Deserts of India (AICRP-24)	Bhawana Sharma, Scientist-E	2020–2025	CAMPA (AICRP-24)	Completed	Survey and selection of indigenous herbs/grass, shrubs, and trees species and their combinations for effective use in various restoration programmes People mobilization and development of live fencing around a cluster of farmer's	This project was focusing on combating desertification covering treatments of farmlands, community lands and degraded forest lands as well as restoration works. At initiation of project extensive survey done for selection of indigenous herbs/grass, shrubs, and trees species and their combinations

						fields for soil and water conservation to enhance farm production and people livelihoods. Restoration of degraded hills, hillslopes, sand dunes, ravines and saline areas through introduction of new genotypes/ varieties/ species and natural resource conservation in different landscape. Assessment of the impact of different species under afforestation/reforestation on vegetation recovery, soil health improvement and carbon storage. Popularization of ecological, environmental and economic benefits of improved practices of mitigation of the effect of land degradation and desertification among the local people.	for their effective use in various restoration programmes. Dominant and suitable species identified in hot desert and degraded area on the basis of survey. Major achievements of projects are Live fencing around farmer's fields established and maintained in 2 villages (Khet Singh Nagar and Chordiya) in Jodhpur through weeding, watering and soil working. Live fencing of <i>Senegalia Senegal</i> developed by planted seedlings and seed sowing. Under the objective restoration of degraded landscape like semi stabilized or reactivated sand dunes, degraded hills and degraded sandy plain areas was targeted and field trials established in total 37.00 ha area at various parts of Rajasthan(Degraded hill site 12 ha area at LumawasBhakar, Jodhpur, Degraded sandy plain site 15 ha at KarhJod, Jaisalmer and reactivated sand dune site 10 ha at Udasar, Bikaner). Average survival percentage recorded 68.23% at degraded sandy plain site, 46% at reactivated sand dune, 90.16% at
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							degraded hill, site. All sites showed good growth of planted seedling and additional species also recorded. Soil moisture conservation structures like trenches, half moon shape structures around plants (degraded hill Lunawas, Rajasthan) established at plantation sites for control of soil erosion. Seed sowing also done for soil moisture conservation and enhance green cover of degraded site. Plant diversity recorded two years after plantation showed wide variation among restored sites. The highest recovery was observed at the degraded hills of Jodhpur with 45 additional species, followed the degraded sandy plains of Jaisalmer (32 species). The reactivated sand dunes at Bikaner recorded 24 additional species. The inventory of newly observed species in plantations highlights the area's biodiversity ecological complexity and successful efforts of restoration programmes.
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	Study of Climate Driven Effects on Indian Forests through Long-term Monitoring	Shri S.R. Baloch, Scientist-E,	2020-2025	CAMPA (AICRP-31)	Completed	To study climate-driven effects on Indian forests through long-term ecological monitoring. To establish permanent observation plots for assessing changes in forest structure, biodiversity, ecosystem functioning, carbon sequestration, nutrient cycling, soil properties, phenology, invasive species and regeneration. To generate long-term scientific datasets for understanding climate change impacts on forest ecosystems and to support sustainable forest management and climate resilience planning.	AFRI, Jodhpur participated in the establishment and monitoring of permanent plots under Tropical Dry Deciduous Forest ecosystems, particularly at Sitamata Wildlife Sanctuary, Rajasthan. Detailed vegetation surveys and biodiversity assessments were conducted to evaluate species composition, forest structure and ecological dynamics under changing climatic conditions. The institute generated data on woody plant diversity, Importance Value Index (IVI), Family Importance Value (FIV), dispersion pattern and phytosociological characteristics of tree species in permanent plots as well as surrounding vegetation survey areas. AFRI also contributed to studies on invasive species, forest soil characteristics, phenology, natural regeneration, carbon stock estimation and microclimate assessment under long-term monitoring protocols. The project established baseline ecological datasets useful for understanding climate-induced changes in dry deciduous forests of Rajasthan. Long-term monitoring helped identify dominant species composition, regeneration status and ecosystem responses under varying climatic conditions. The findings are expected to support future climate adaptation
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							strategies, biodiversity conservation and sustainable forest management in arid and semi-arid forest ecosystems of western India.
7	Improvement of Survival Rate in Kair (<i>Capparis decidua</i>) under Field Planting Conditions by Architecting Root Biomass and In situ Moisture Management	Dr. Ilham Bano, Scientist-C	2021–2026	Rajasthan State Forest Department (CAMPA), Jaipur	Completed	To study the effects of container type and size on the quality of Kair seedlings. To study the development of root system of seedlings under various container sizes and types. To study the field performance of seedlings raised under various treatments.	The research focused on developing scientifically validated nursery and field plantation techniques through optimization of container type and size, enhancement of root biomass and taproot architecture, assessment of seedling age, and implementation of in situ moisture conservation measures. Extensive nursery and field experiments revealed that deep root trainer systems, particularly 500 cc root trainers fitted with PVC pipe extenders, significantly improved seedling quality, root development, biomass accumulation, and survival compared to conventional polybags. These containers promote deep, straight taproot development, balanced root shoot biomass, and produce sturdy seedlings that consistently exhibit higher survival in both nursery and field conditions. The study also established that for <i>Capparis decidua</i> under nursery conditions around 18 month old seedlings possessing well developed root systems exhibited better drought tolerance, field establishment,

							and long term survival under desert conditions. Subsurface irrigation through perforated PVC pipes proved highly effective for moisture conservation and enhanced survival up to nearly 70% during the critical establishment phase. The project successfully developed a practical, scalable, and cost-effective package of practices for raising and planting Kair in arid and semi-arid regions, which can be utilized for afforestation programmes, degraded land rehabilitation, sand dune stabilization, biodiversity conservation, and livelihood enhancement in Rajasthan and similar dryland ecosystems.
8	Monitoring and Evaluation of Plantation Work Executed under Various Schemes in Rajasthan (2013–14 to 2023–24)	Nodal Officers: Dr. Ilham Bano & Sharat Kothari	08.01.2025 – 31.01.2026	Rajasthan Forest Department	Completed	To evaluate the quantity and quality of plantation and associated works executed under different afforestation schemes. To assess plantation survival, growth performance, and impact on vegetation cover. To verify documentation, record keeping, and reports related to assets created. To assess the impact of plantation activities, including public	Achievements: The project successfully carried out Third-party monitoring and evaluation of plantation works executed across Rajasthan under schemes such as CAMPA, NABARD, RDF, State Plan, and externally aided projects. A total of 97 plantation sites covering about 3179 hectares across 13 forest divisions under Jodhpur and Bikaner circles were evaluated through systematic field surveys. The study assessed plantation survival, species diversity, natural regeneration, soil and water conservation measures, fencing and protection systems,

						participation under Joint Forest Management and Eco-development programmes. To identify gaps and recommend corrective measures for improving future afforestation programmes.	maintenance practices, and community participation. GPS-based geo-tagging and photographic documentation of plantation sites and assets were completed for transparency and future monitoring. The evaluation generated important recommendations for improving plantation techniques, species selection, water harvesting measures, and long-term sustainability of afforestation programmes in arid and semi-arid regions of Rajasthan. The study also contributed to strengthening ecological restoration efforts, enhancing green cover, supporting carbon sequestration, and improving the effectiveness of future plantation and degraded land rehabilitation programmes.
9.	Monitoring and Evaluation of Advance Work Executed under Various Schemes in Rajasthan (2024–25)	Nodal Officers Dr.Sachin Sharma ,Scientist-C	May,2025-February,2026	Rajasthan Forest Department	Completed	To conduct third-party monitoring and evaluation of advance work undertaken under various afforestation schemes in Rajasthan prior to plantation establishment. To assess the quality, adequacy and compliance of pre-plantation activities such as pitting, fencing, soil and moisture conservation (SMC) works, site preparation and infrastructure development. To evaluate readiness of	ICFRE–AFRI, Jodhpur carried out extensive monitoring and evaluation of advance plantation works across Jodhpur and Bikaner Forest Circles covering 61 plantation sites spread over approximately 1818.12 hectares under different schemes and plantation models including CAMPA, State Plan, NABARD and externally aided projects. The evaluation included assessment of pitting quality, fencing, soil and moisture conservation structures, geo-tagging of assets, boundary delineation, enumeration of pits

						plantation sites and identify operational gaps affecting plantation success. To provide scientific recommendations for improving plantation planning, implementation and monitoring in arid and semi-arid regions of Rajasthan.	and verification of plantation infrastructure. The study revealed that most plantation sites showed satisfactory implementation of advance works, though variations in quality and compliance were observed among divisions. AFRI documented surplus and shortfall patterns in fencing dimensions, pit numbers and SMC structures compared to Measurement Book (MB) records. Detailed assessment of fencing types including barbed wire, welded mesh, stone wall and ditch fencing indicated that many sites maintained good structural condition and effectiveness, while some sites required repair and strengthening measures. Pit evaluation showed variable compliance with prescribed dimensions and standards across plantation divisions. AFRI also evaluated linear and volumetric SMC works such as V-ditches, contour trenches, furrows, nadis and check dams constructed for water harvesting and moisture conservation in arid ecosystems. The study highlighted operational challenges such as pit refilling due to wind-blown sand, partial filling of structures by debris, topographical limitations and maintenance
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						gaps affecting site preparedness. Joint verification exercises confirmed high levels of agreement between field observations and departmental records for most parameters. Based on the evaluation, AFRI provided recommendations regarding species selection, survival enhancement, infrastructure planning, quality control, ecological alignment, technological integration and capacity building for improving future afforestation
10	Green Belt Development for HRRL, Pachpadra, Barmer (Rajasthan)	Dr.Sachin Sharma,Scientist -C	6 months	HPCL Rajasthan Refinery Limited (HRRL), Pachpadra, Barmer, Rajasthan	Completed	Preparation of a Detailed Project Report (DPR) for Green Belt Development at HRRL refinery complex, township and roadside plantation areas. Survey of green belt areas, collection and analysis of soil samples, and assessment of soil quality parameters including pH, EC, nutrients and soil fertility. Recommendation of suitable plantation models, soil reclamation techniques, plant species, irrigation and maintenance practices for saline and arid conditions. AFRI, Jodhpur conducted extensive reconnaissance surveys and baseline studies at the HRRL refinery complex, township and roadside plantation areas of Pachpadra. The study identified major ecological constraints including highly saline and saline-alkaline soils, shallow saline aquifers, waterlogging, harsh arid climate, low rainfall, high evapotranspiration, nutrient deficiency and poor soil organic carbon. Soil salinity in several areas was found to be extremely high with EC values ranging up to 17–19 dSm⁻¹ in shallow groundwater conditions. The AFRI team documented existing vegetation and

					Development of technical guidelines and budget estimates for plantation and long-term maintenance of green belt plantations in Pachpadra region.	categorized plant species into halophytes, facultative halophytes and glycophytes suitable for saline habitats. Important naturally occurring species observed in the study area included <i>Suaeda fruticosa</i>, <i>Salsola baryosma</i>, <i>Tamarix aphylla</i>, <i>Prosopis juliflora</i>, <i>Salvadora persica</i>, <i>Vachellia tortilis</i> and <i>Prosopis cineraria</i>. The report highlighted that very few successful plantation efforts had previously been undertaken in the Pachpadra salt basin region due to extreme environmental stress conditions. AFRI reviewed earlier research conducted in saline ecosystems of Rajasthan and Gujarat and recommended salt-tolerant tree and shrub species suitable for green belt development under highly saline conditions. Species such as <i>Prosopis juliflora</i>, <i>Salvadora persica</i>, <i>Tamarix articulata</i>, <i>Vachellia nilotica</i>, <i>Vachellia tortilis</i>, <i>Casuarina equisetifolia</i> and <i>Azadirachta indica</i> were identified as suitable for plantation depending upon salinity level and site conditions. The study further emphasized the importance of drainage management, soil reclamation, nutrient supplementation and removal of invasive species like <i>Prosopis juliflora</i> for successful
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							plantation establishment. The DPR prepared by AFRI provided scientific recommendations for green belt planning over refinery premises, township areas and approximately 90 km roadside plantations. The project established a technical framework for ecological restoration, pollution mitigation, microclimate improvement and sustainable green belt development in the arid saline landscape of western Rajasthan.
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