

# ANNUAL REPORT

2022-23



**ICFRE - ARID FOREST RESEARCH INSTITUTE**

P.O. Krishi Upaj Mandi, New Pali Road, Jodhpur

Web : [afri.icfre.gov.in](http://afri.icfre.gov.in) email - [dir\\_afri@icfre.org](mailto:dir_afri@icfre.org)

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# **ICFRE-ARID FOREST RESEARCH INSTITUTE, JODHPUR**

## **Annual Report 2022-23**

### **Overview**

ICFRE -Arid Forest Research Institute, situated at Jodhpur in Rajasthan (India), is a premier institutes under the umbrella of Indian Council of Forestry Research & Education (ICFRE) working under the Ministry of Environment, Forest and Climate Change, Govt. of India. The objective of the Institute is to carry out scientific research in forestry in order to provide technologies to increase the vegetative cover and to conserve the biodiversity in the hot arid and semi-arid region of Rajasthan, Gujarat and Dadara & Nagar Haveli union territory. The Institute Campus covers 66 ha. of area on the New Pali Road, Jodhpur. This year, ICFRE-AFRI has efficiently executed both ICFRE Plan funded as well as externally funded projects (EAPs) with financial support from different funding agencies–National CAMPA, RFD-CAMPA, DBT, DSIR and others. During the financial year 2022-2023, significant progress was made in the two ongoing ICFRE plan funded projects and five externally funded projects that were ongoing.

Under the project entitled - “Development of suitable agroforestry models in IGNP command area of Western Rajasthan” on the theme “Forest Productivity”, good survival was recorded for *Prosopis cineraria* (99%) and *Tecomella undulata* (99%), *Cordia myxa* (95%) and grafted *Zizyphus mauritiana* (93%). Growth parameters demonstrated a significant better height and collar diameter of *Tecomella undulata* than *Prosopis cineraria* seedlings. Shisham planted in boundary plantation gave highest growth performance. Crop yield reduction did not differ between tree species. It was observed that economic return was higher in Agri-horti trial than agri-silvi trial for Kharif season.

Under the theme of “Genetic Improvement” activities pertaining to one ICFRE plan project and four externally funded projects were undertaken during the financial year. The plan project was intended to isolate and clone the vacuolar Na<sup>+</sup>/H<sup>+</sup> antiporter gene – *nhx1* from *Prosopis juliflora* and *Salvadora persica* and to carry out functional validation of the cloned genes. In this project, cDNA was prepared from the extracted RNA and primers specific for *nhx1* gene of *Prosopis juliflora* were identified. The DBT-funded project for characterization of *spcbl-10* (Calcineurin B-Like Protein-10) from *S. persica* was initiated this year. RNA extraction followed by cDNA preparation was achieved and already available degenerate primers were tested, while testing for newer primer sets is underway.

Under the Rajasthan SFD-CAMPA funded project on Seed Production Area development in Western Rajasthan, exhaustive surveys were carried out in various districts of Rajasthan for identifying natural stands of important species, *Prosopis cineraria*, *Tecomella undulata*, *Zizyphus mauritiana*, *Zizyphus nummularia*, *Salvadora persica* and *Salvadora oleoides*. In second Rajasthan SFD CAMPA-funded project on improvement of survival rate in Kair (*Capparis decidua*) under field planting conditions by architecting root biomass and in

situ moisture management, field surveys were conducted in 6 districts Rajasthan for seed collection. Germination experiments were undertaken with seven different types of containers, out of which larger and longer containers were found to be better for root and seedling growth. Under the theme of “Non-Wood Forest Products”, Candidate Plus Trees (CPTs) of *Boswellia serrata*, *Butea monosperma* and *Anogeissus pendula* were identified and marked. Under the theme “Forest Protection”, three trainings (funded by DSIR, New Delhi) were conducted for rural women of Rajasthan on use of biofertilizer for crop productivity enhancement. Under the theme “Forest Protection”, four trainings were organized for rural women of Rajasthan on “Use of Biofertilizer for Crop Productivity Enhancement” funded by DSIR, New Delhi.

This year another Detailed Project Report (DPR) was prepared and submitted to the funding agency, i.e., HRRL, on a consultancy project titled "Preparation of Detailed Project Report (DPR) for Greenbelt Development at HPCL Rajasthan Refinery Ltd.(HRRL), Pachpadra, Barmer, Rajasthan site and providing support during the plantation and maintenance period". The team conducted Pachpadra refinery site inspection tours, did soil profiling and soil analysis. Two consultants were also involved in the preparation of this DPR. Field tours were conducted and report was prepared for project entitled “Improvement of water quality in immediate catchment of proposed Navnera Reservoir on Kalisindh River through measures and rehabilitation of lost habitat of scheduled wildlife (reptiles) in remaining forest area near Abra Village, tehsil Digod, district Kota, Rajasthan” of Environment Management Division, Indian Council of Forestry Research and Education. Field tours were also conducted under project entitled "Preparation of Restoration Plan, NPV of Future Ecosystem Services, etc., for River Subarnarekha and its River Beds" of the Institute of Forest Biodiversity, Hyderabad and report was prepared.

Various trainings, workshops and webinars were organized on various themes and topics for the benefit of scientists, technical staff and project fellows. Project Completion Report (PCR) for various completed projects were submitted. A total of 2 booklets & pamphlets were published at ICFRE-AFRI, Jodhpur. Total 2 of workshops/ seminars/ conference, etc., were organized by scientific staff of the institute. Several scientists submitted abstracts and posters in conferences and their abstracts were published in the abstract books of the respective workshop/seminar/conference. A total of 15 and 11 papers were published in reputed national and international journals, respectively.

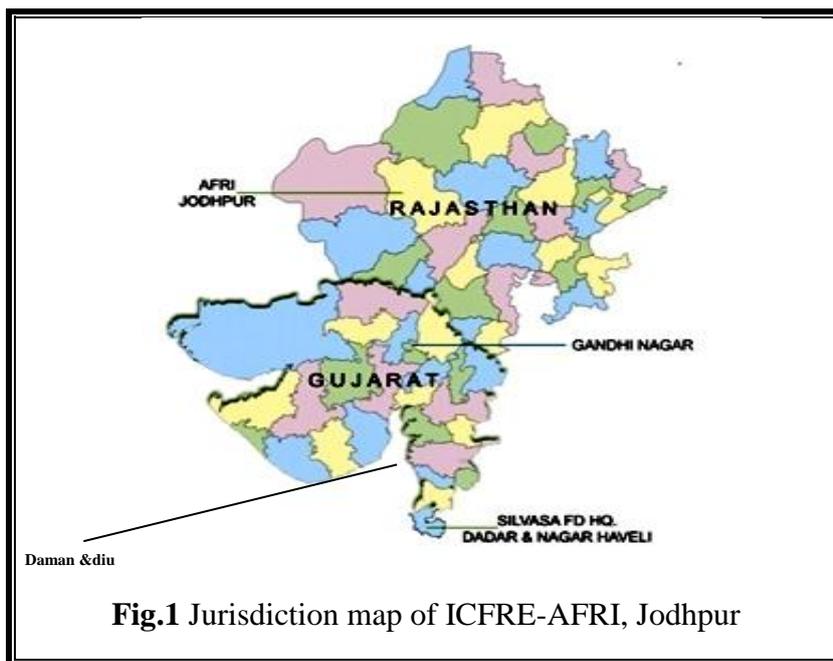
### **Summary of the projects**

<b>Projects</b>	<b>Completed Projects</b>	<b>Ongoing Projects</b>	<b>New Projects Initiated During 2022-23</b>
<b>Plan</b>	-	2	-
<b>Externally Aided</b>	-	4	1
<b>Total</b>	-	6	1

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## 1. INTRODUCTION

ICFRE-Arid Forest Research Institute, Jodhpur (Rajasthan) is one of the nine institutes of the Indian Council of Forestry Research & Education (ICFRE), an autonomous organization of the Ministry of Environment, Forests & Climate Change, Government of India. The goals of the institute are to carry out scientific research in forestry and allied fields to enhance the productivity and vegetative cover, to conserve the biodiversity and to develop the technologies for the stakeholders working in forestry sector in Rajasthan, Gujarat, Dadra & Nagar Haveli and Daman & Diu (**Fig. 1**). Major emphasis of research at the institute are on soil, water and nutrient management; technologies for afforestation of stress sites; management of plantations; growth and yield modeling; planting stock improvement and biotechnology; bio-fertilizers and bio-pesticides; Agroforestry & extension; phytochemistry & non-timber forest products; integrated pest and disease management; biodiversity and climate change; and forestry education and extension.



## MoUs signed

- MoU between ICFRE-AFRI and Gujarat SFD signed on 12.07.2022 at Aranya Bhawan, Gandhinagar, Gujarat in presence of the PCCF & HoFF, Sh. M. M. Sharma, IFS. The signatories of the MoU were Sh. Mahesh Singh, IFS, APPCF(RT) from GFD and Dr Tarun Kant, Scientist G & GC(R) from ICFRE-AFRI for mutual cooperation in the field of forestry research.

- MoU signed with HRRL officials on 27.07.2022 for preparation of DPR on greenbelt development at HRRL refinery, Pachpadra and monitoring the plantation and maintenance works.
- MoU signed between ICFRE-AFRI Jodhpur and Head, KVK, Gujarat on 12.09.2022 for quality teak production plantation.
- MoU signed between ICFRE- ICFRE-AFRI Jodhpur and Vice- Chancellor, Maharaja Ganga Singh University, Bikaner (Raj.) on 14.10.2022 for Sandalwood plantation under AICRP 03.
- MoU signed between ICFRE- ICFRE-AFRI Jodhpur and S.R. Choudhary, AARAV Farm, village Ambasan, Dist. Mehsana, Gujarat on 07.10.2022 for *Eucalyptus* plantation trial under AICRP 04.

### **Visit of dignitaries**

- Shri Jogeshwar Garg, MLA - Jalore (Rajasthan) visited ICFRE-AFRI on 11.05.2022.
- Sri Swami Maheshwarananda Puri ji of the Om Vishwa Deep Gurukul Ashram and Education and Research Centre, Jadan, Pali who is a renowned Yog Guru visited ICFRE-AFRI, Jodhpur on 3rd June 2022 during the ongoing events leading to World Environment Day 2022.
- Mr. Naohiro Matsui, from Japan International Cooperation Agency (JICA) visited ICFRE-AFRI on 27.01.2023.
- Padamshree Himtaram Bhaambu visited ICFRE-AFRI on 17.03.2023.
- Mr. Gyanendra Nepal, Chief Attorney, Bagmati Province, Nepal and his delegates visited ICFRE-AFRI on 29.03.2023.

### **New initiatives**

- Consultancy Project on "Scientific study on green belt development work for HRRL at Panchpadra, Barmer, Rajasthan".

### **RRCs organized**

- ICFRE-AFRI-TFRI Joint Regional Research Conference was organized & co-hosted by ICFRE-AFRI, Jodhpur in hybrid mode on 22.06.2022 on the theme "Status of forestry research with special reference to agroforestry of dry regions."

## **2. RESEARCH HIGHLIGHTS**

### **A. CAMPA Activities**

The Ministry of Environment, Forest & Climate Change (MoEF&CC) sanctioned CAMPA funded AICRPs & FGR Programme. ICFRE-AFRI, Jodhpur is a part of a total 22 AICRPs as well as in FGR programme and has been carrying out relevant research under the programmes. Among all, two AICRPs (AICRP-24 and AICRP-26) are being implemented by ICFRE-AFRI based NPCs. The progress made under CAMPA-AICRP&FGR components is submitted by concerned NPCs and project coordinators directly to the ICFRE.

### **B. Plan and External Projects**

#### **2.1 Ecosystem Conservation and Management**

##### 2.1.1 Overview

##### 2.1.1.1 Projects under the Theme

<b>Projects</b>	<b>Completed Projects</b>	<b>Ongoing Projects</b>	<b>New Projects Initiated During the Year</b>
Plan	-	-	-
Externally Aided	-	-	-

2.1.2 Climate Change: Nil

2.1.3 Ecology & Environment: Nil

2.1.4 Biodiversity: Nil

2.1.5 Forest Botany: Nil

2.1.6 Tribals and Traditional Knowledge System: Nil

#### **2.2 Forest Productivity**

##### 2.2.1 Overview

Under this theme, a project entitled “Development of suitable agroforestry models in IGNP command area of Western Rajasthan” is ongoing. It is aimed at assessing different agroforestry models, like agri-silvi and agri-horti systems, in the IGNP command area on different parameters, like finding suitable tree and crop species, and benefits and economic returns gained by farmers in different cropping seasons.

### 2.2.1.1 Projects under the Theme (in table as given at 2.1.1.1)

Projects	Completed Projects	Ongoing Projects	New Projects Initiated During the Year
Plan	-	-	-
Externally Aided	-	1	-

### 2.2.2 Silviculture: Nil

### 2.2.3 Social Forestry, Agro-forestry/ Farm Forestry: 01

#### 1. Development of suitable agroforestry models in IGNP command area of Western Rajasthan. (PI: Dr. Bilas Singh, CTO; Funding agency: ICFRE)

Block plantation of Agri-silvi (2 ha), Agri-horti (1.5 ha) and Boundary plantation (300 RM) trial were planted on farmer's field in IGNP command area, Bandha, Ramgarh, Jaisalmer in September 2021. Survival was recorded for *Prosopis cineraria* (99%) and *Tecomella undulata* (99%) in Agri-silvi model and for *Cordia myxa* (95%) and grafted *Zizyphus mauritiana* (93%) in Agri-horti trial. Height and collar diameter of *Tecomella undulata* (Rohida) were significantly greater than *Prosopis cineraria* (Khejri) seedlings in Agri-silvi trial. Growth parameter did not differ significant in Agri-horti trial. Fruiting started in grafted *Zizyphus mauritiana* in 37 plants (0.60 -2.50 kg/plant) and fruiting in grafted *Cordia myxa* also started in 12 plants. Growth performance of shisham seedlings was highest. Crop yield reduction did not differ between tree species. Economic return was highest (Rs. 3076/ha) in Agri-horti trial and it was lowest (Rs. 1000/ha) in agri-silvi trial for Kharif season.





**Fig.2** (A) Agri-silvi trial at RMM, Ramgarh, IGNP command area, Jaisalmer; (B) *Dalbergia sissoo* planted on Boundary at RMM, Ramgarh, IGNP command area, Jaisalmer; (C) Plantation of Agri-horti trial at RMM, Ramgarh, IGNP command area, Jaisalmer; (D) Fruiting in grafted *Zizyphus mauritiana* in Agri-horti model at RMM, Ramgarh, IGNP command area, Jaisalmer

2.2.4 Forest Soils & Land Reclamation: Nil

2.2.5 Watershed Management: Nil

## 2.3 Genetic Improvement

### 2.3.1 Overview

Under this theme, four projects are running. In the ICFRE plan project, the aim is to isolate and clone the vacuolar  $\text{Na}^+/\text{H}^+$  antiporter gene – *nhx1* from *Prosopis juliflora* and *Salvadora persica* and to carry out functional validation of the cloned genes via transgenic approach. The antiporter is responsible to maintain  $\text{Na}^+$  homeostasis (ion balance) in cytosol in the absence of which the plant cannot survive high salt concentration in soil solution. In the DBT-funded project, the isolation, cloning and characterization of the gene *Spcbl-10* from a halophytic tree species of the arid regions – *Salvadora persica* (Miswak) is being attempted for the first time. The gene *cbl-10* is widespread in plants and codes for a protein which acts as a calcium sensor and mediates salt tolerance. In one of the projects funded by the SFD-Rajasthan, Seed Production Areas (SPAs) will be developed for target species, i.e., *Prosopis cineraria*, *Tecomella undulata*, *Zizyphus mauritiana*, *Zizyphus nummularia*, *Salvadora persica* and *Salvadora oleoides*, that can be used to obtain genetically improved seeds for immediate planting and for future tree improvement programmes. In the other project, the main objective is to bring improvement in survival rate of *Capparis decidua* in field planting conditions by architecting root biomass and in situ moisture management

### 2.3.1.1 Projects under the Theme (in table as given at 2.1.1.1)

Projects	Completed Projects	Ongoing Projects	New Projects Initiated During the Year
Plan	-	1	-
Externally Aided	-	2	1

### 2.3.2 Conservation of Forest Genetic Resources

#### 2. Improvement of Survival Rate in Kair (*Capparis decidua*) Under Field Planting Conditions by Architecting Root Biomass and in situ Moisture Management. (PI: Dr. M.T Hegde, Sci-F; Funding agency: SFD Rajasthan).

Field survey was conducted for seeds collection *Capparis decidua* during April 2022 in 6 districts of Rajasthan viz., Jodhpur, Nagaur, Bikaner, Pali, Jalore and Sirohi. Seeds were collected from various locations and germination experiments were conducted with seven different types of containers. The root and shoot growth was analysed after 45 days of sowing. The roots grew 3-4 times faster than shoots 45 days after directly sowing into containers. Initial results indicated larger and longer containers are better for *Capparis* seedling growth. Seedlings are ready for planting and planting site has been prepared for planting during monsoon season.

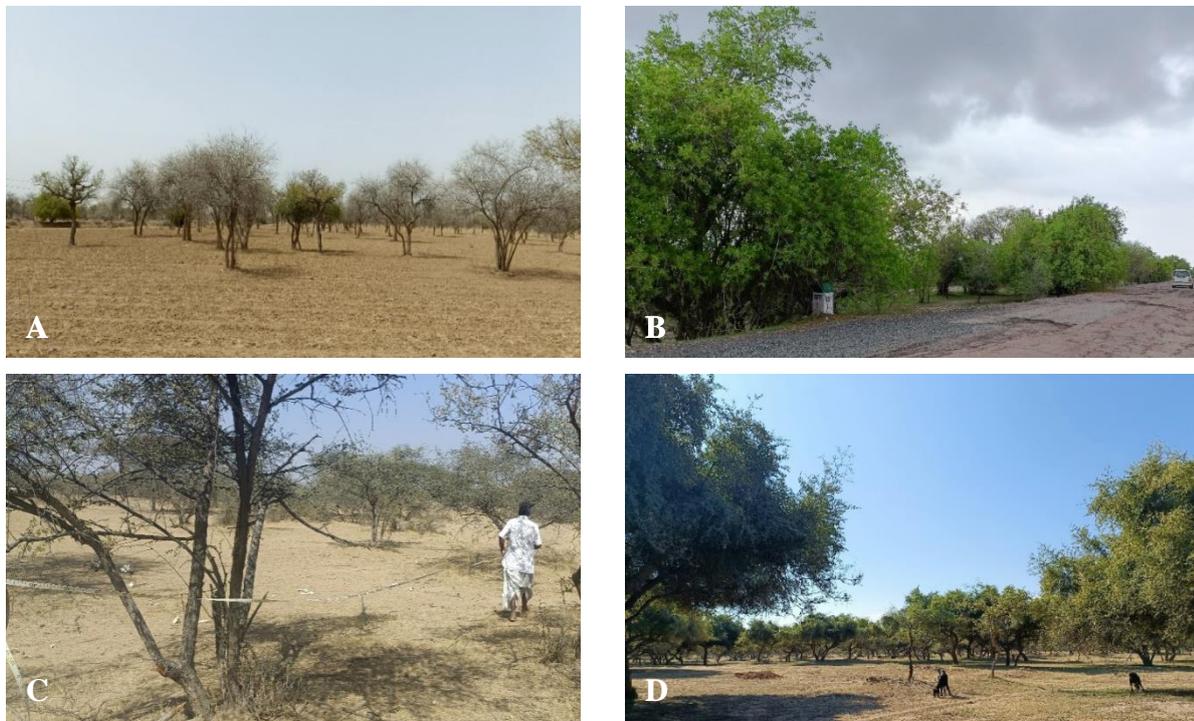


**Fig.3** (A) PCCF and HoFF Rajasthan and Director reviewing the progress; (B) PCCF and HoFF Rajasthan visited the experiment at model nursery of ICFRE-AFRI Jodhpur; (C) Seedlings of *Capparis* raised in various sized containers; (D) Preparation of extender for root trainers

### 2.3.3 Tree Improvement

#### 3. Development of Seed Production Areas of important tree species of Western Rajasthan. (PI: Dr. Desha Meena, Sci-D; Funding agency: SFD Rajasthan)

Exhaustive surveys were carried out in Jodhpur, Jalore, Pali, Sirohi, Nagaur, Jaisalmer, Barmer, Bikaner and Churu Districts of Rajasthan for the identification of natural stands of *Prosopis cineraria*, *Tecomella undulata*, *Zizyphus mauritiana*, *Zizyphus nummularia*, *Salvadora persica* and *Salvadora oleoides*. Identified the natural stands of *Tecomella undulata* (Paboosar, Nagaur, IGNP Bikaner and Mohangarh, Jaisalmer), *Salvadora persica* (Tal Chappar Churu.), *Salvadora oleoides* (Leel ki Beed, Churu and (Lakhetli) Bayatu, Barmer), *Prosopis cineraria* (Mohangarh, Jaisalmer and IGNP Bikaner), *Zizyphus nummularia* (Sindhari, Barmer, Degraimataoran, Dabla Jaisalmer and Jorbed, Bikaner). Quadrants of 50\*50 cm were laid down at each of the identified sites and recorded the morphological data (GPS location, Height, diameter, crown, no of branches, health, flowering and fruiting percentage) for each of the trees.



**Fig.4** (A) Identified population of *Tecomella undulata* at Paboosar; (B) Identified population of *Salvadora persica* at Tal Chappar, Churu; (C) Laying down of quadrant at Dandli, Sindari for *Zizyphus nummularia*; (D) Identified population of *Zizyphus nummularia* at Degrai Mata oran, Jaisalmer

#### 2.3.4 Vegetative Propagation: Nil

#### 2.3.5 Biotechnology

#### 4. Cloning and Characterization of Salt Tolerance Conferring Vacuolar Na<sup>+</sup>/H<sup>+</sup> Antiporter (*nhx1*) Genes from *Prosopis juliflora* (Sw.) Dc. & *Salvadora persica* L. (PI: Dr Tarun Kant, Sci-G; Funding agency: ICFRE)

RNA extraction from leaves of *Prosopis juliflora* and *Salvadora persica* have been achieved. Quantification of extracted RNA have been done, the yield of RNA ranged between 2 to 4 ug per 100 mg of fresh sample and the absorption ratio (A260/280) was 1.98 (close to ratio for pure RNA). cDNA have been prepared from RNA and stored for future objective. Actin primer were used as positive control and found to amplify the fragment of actin gene from *P. juliflora* and generated a band of 201 bp. Five specific gene primer optimization have been done using Primer Blast. The designed primers were found specific for NHX1 gene of *Prosopis juliflora*. These primers have been tested on cDNA of *P. juliflora* performing PCR. Out of five, four primer were found to amplify the fragment of *nhx1* gene, after agarose gel electrophoresis generated expected size specific band.

#### 5. Cloning and Characterization of a Na<sup>+</sup> And Ca<sup>2+</sup> Homeostasis Gene – *Spchl-10* (Calcineurin B-Like Protein-10) from Facultative Halophytic Tree – *Salvadora persica* L. (Miswak). (PI: Dr Tarun Kant, Sci-G; Funding agency: DBT Funded)

The project was initiated new. RNA extraction from various tissues of *Salvadora persica* was done. cDNA was synthesized from RNA and stored for future objectives. Actin primers were used as positive control and found to amplify the fragment of actin gene from *S. persica*. The gene sequences from model plant *Arabidopsis thaliana* and others were downloaded and analyzed. Primers already developed for the gene for other species (with known gene sequence) were procured and tested. New degenerate primers were also developed and tested. Amplicons of various sizes were generated and have been sent for sequencing. Non-specific gene amplification is currently obtained. More degenerate primers are being tested to get a good representative of *cbl-10* gene amplicon specifically from *S. persica* which are species and gene specific.

## 2.4 Forest Management

### 2.4.1 Overview

#### 2.4.1.1 Projects under the Theme (in table as given at 2.1.1.1)

Projects	Completed Projects	Ongoing Projects	New Projects Initiated During the Year
Plan	-	-	-
Externally Aided	-	-	-

#### 2.4.2 Sustainable Forest Management (SFM): Nil

2.4.3 Forest Economics: Nil

2.4.4 Forest Biometrics: Nil

2.4.5 Participatory Forest Management: Nil

2.4.6 Policy and Legal Issues: Nil

2.4.7 Information and Communication Technology (ICT): Nil

## **2.5 Wood Products**

2.5.1 Overview

2.5.1.1 Projects under the Theme (in table as given at 2.1.1.1)

<b>Projects</b>	<b>Completed Projects</b>	<b>Ongoing Projects</b>	<b>New Projects Initiated During the Year</b>
Plan	-	-	-
Externally Aided	-	-	-

2.5.2 Wood and other Lignocellulosic Composites : Nil

2.5.3 Wood Processing: Nil

2.5.4 Value Addition and Utilization: Nil

2.5.5 Wood Chemistry: Nil

2.5.6 Pulp and paper: Nil

## **2.6 Non-wood and Forest Products (NWFPs)**

2.6.1 Overview

Under this theme, one project funded by the SFD-Rajasthan is currently running which aims at identifying Candidate Plus Trees (CPTs) and identification of Seed Production Areas (SPAs) for some broad-leaved species in Rajasthan, e.g. *Boswellia serrata*, *Butea monosperma* and *Anogeissus pendula* that can be used to obtain genetically improved seeds for immediate planting and for future tree improvement programmes.

2.6.1.1 Projects under the Theme (in table as given at 2.1.1.1)

<b>Projects</b>	<b>Completed Projects</b>	<b>Ongoing Projects</b>	<b>New Projects Initiated During the Year</b>
Plan	-	-	-
Externally Aided	-	1	-

## 2.6.2 Resource Development of NWFPs

### 6. Survey and selection of Candidate Plus Trees and identification of Seed Production Areas and Broad Leaved Species in Rajasthan. (PI: Sangeeta Tripathi, CTO; Funding agency: SFD Rajasthan).

Identified & marked 13 CPTs of *Boswellia serrata*, 17 CPTs of *Butea monosperma* and 42 CPTs of *Anogeissus pendula* in Jaipur district of Rajasthan.

Recorded passport data of each CPT. GPS Mapping of all CPTs was carried out.

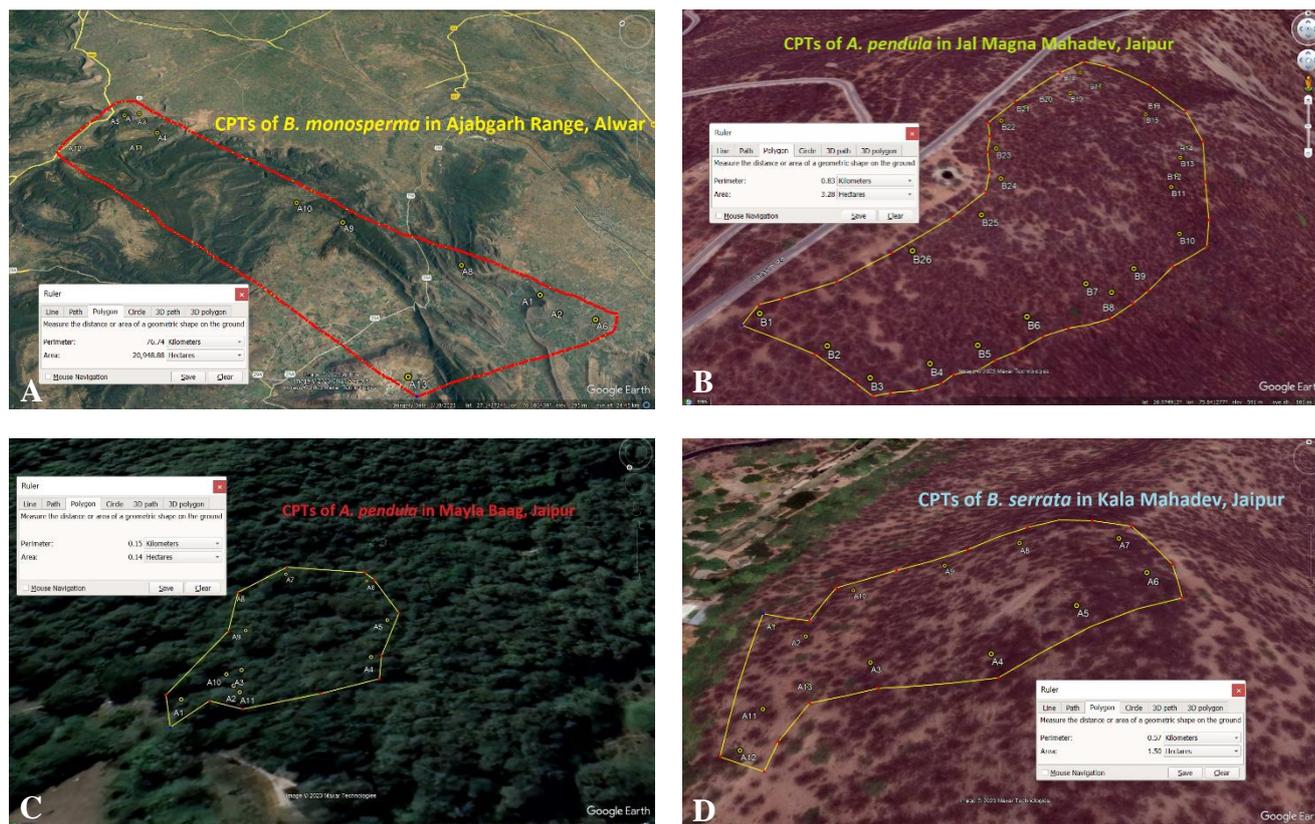


Fig. 5 (A-D) GPS locations of the marked CPTs.

## 2.6.3 Sustainable Harvesting and Management: Nil

## 2.6.4 Chemistry of NWFPs, Value Addition and Utilization: Nil

## 2.6.5 Biofuels and Bioenergy: Nil

## 2.7 Forest Protection

### 2.7.1 Overview

Under this theme, one project is ongoing with the objective of providing training to rural women of Rajasthan on the use of biofertilizer for enhancement of crop productivity, which will also eventually help in their upliftment.

#### 2.7.1.1 Projects under the Theme (in table as given at 2.1.1.1)

Projects	Completed Projects	Ongoing Projects	New Projects Initiated During the Year
Plan	-	-	-
Externally Aided	-	1	-

#### 2.7.2

Insects pests, diseases and control

#### 2.7.3 Mycorrhizae, rhizobia and other useful microbes

### 7. Training of Rajasthan Rural Women on Use of Biofertilizer for Crop Productivity Enhancement. (PI: Dr. Sangeeta Singh, Sci-F; Funding agency: DSIR, New Delhi)

Four trainings were conducted out of which 3 trainings were conducted at Nagaur district on 17<sup>th</sup> & 18<sup>th</sup> Nov, 2022 and 15<sup>th</sup> Mar, 2023 and one mega training was conducted at ICFRE-AFRI Jodhpur in which resource person on entrepreneurship was also present along with biofertilizer application and mass multiplication demonstration training to guide the women farmers for generation of income. Dr. Ajeet Varma and Dr. Swati Tripathi joined the meeting in online mode being part of this project at Amity University and replied to the queries raised by the participants. The trainees/ participants were provided packets of *Piriformospora indica* prepared by Amity University, Noida and *Trichoderma harzianum* prepared by ICFRE-AFRI, Jodhpur as test samples.



**Fig. 6 (A-B)** Trainings given to rural women of Rajasthan on use of biofertilizers.

2.7.4 Weeds and Invasive species: Nil

2.7.5 Forest Fire and Grazing: Nil

### 3. Education Vistas/Activities

#### 3.1 FRI University (Applicable for FRI, Dehradun only )

Ph.D. was awarded from FRI Deemed University to Dr. Atif Iqbal on the research work entitled “Studies on *Agrobacterium*-mediated transformation of *Azadirachta indica* (Neem) for induction of cold tolerance” under the supervision of Dr. Tarun Kant, Scientist G

**3.2 HRD Trainings Organized:** Topics must be indicated in annexure while providing numerical information in the table given below:

No. of Trainings	Duration ( in days)	No. of participants
<b>03</b>	<b>03</b>	<b>96</b>

**3.3 Visits Abroad:** Nil

**3.4 Participation in Seminars/Symposia/Workshops/Trainings**

1. As a resource person, Dr. Tarun Kant delivered an invited talk entitled “The Flourishing Forest-Based Handicraft Industry of Western India – Status, Challenges and Prospects on 26.09.2022 under One Week Compulsory Training Course on “Forest Based Handicrafts and International Trade” for IFS Officers organized by Amity University, Noida.
2. Dr Tarun Kant delivered a lecture entitled “Genetically Modified plants for a sustainable future and addressing the controversies” to the IFS Officers during the Compulsory Training programme organized at ICFRE-AFRI, Jodhpur from 12-16 Dec, 2022.
3. Organized a Farmer’s Workshop under Tree Grower’s Mela on 17 Mar, 2023
4. Dr. Maheshwar Hegde Sc. F attended International Symposium on Intersectoral Cooperation for Resilient Landscapes from 29-30 Mar, 2023 organized by International Union for Forest Research Organisation (IUFRO) at Fri Dehradun and presented a poster on Tree Transplantation Study with Some Important Tree Species of Desert Landscape of Rajasthan, India.
5. Dr. N. K. Bohra Attended International Workshop on 'Enhancing Ecosystem Services by Improving Forest Quality and SLEM Knowledge Dissemination on dated 22-24 Mar, 2023 at Dehradun.
6. N. K. Bohra and Maheshwar T. Hegde presented Sandalwood Based Agro forestry System- an Emerging trend in Gujarat, India. Paper presented in International Symposium on Intersectoral Cooperation for Resilient Landscapes on 29-30 Mar, 2023 by International Union for Forest Research Organisation (IUFRO).
7. Sh. S.N. Murthy, Scientist-B attended training on “instrumental drug discovery” at CSIR-CDRI, Lucknow from 6-10 Feb, 2023.
8. Smt. Sangeeta Tripathi, Naveen Vanveru attended trining on “instrumentation (GC-MS,HPLC etc)” at CSIR-CDRI, Lucknow from 20-24Feb,2023.

**4. Extension Panorama/Activities**

- **National Forest Library and Information Centre(NFLIC)** (Applicable for FRI, Dehradun only)
- **Environmental Information System (ENVIS)** (Applicable for FRI, Dehradun & IFGTB, Coimbatore only)

**4.1. Trainings Organized** : Topics must be indicated in text while providing information in the table given below:

S. No.	Topic	Duration and Period		Participants		Overall feedback of participants
		Days	Date	Category	Number	
<b>a. Training under VVK</b>						
1.	One VVK training at KVK, Rajkot (Guj) (Topic: Biodiversity in Gujarat)	03	1-3 <sup>th</sup> Nov, 2022	field functionaries and progressive farmers	46	The training was excellent for field of forestry, agroforestry and agricultural and useful to forest staff and farmers. Farmers also require information on floriculture.
2.	One VVK training at ICFRE-AFRI, Jodhpur (Raj) (Topic: Agroforestry, soil and water conservation dry region)	03	21-23 <sup>rd</sup> Dec, 2022	11 forest staffs and 14 farmers	25	
3.	One VVK training at ICFRE-AFRI, Jodhpur (Raj) (Topic: Agroforestry, soil and water conservation dry region)	03	21-23 <sup>rd</sup> Dec, 2022	Forest field functionaries & Farmers	25	The training was excellent and improved knowledge in field of forestry and agroforestry.
<b>b. Training under DV</b>						
	Nil					
<b>c. Training under GSDP</b>						
	Nil					
<b>d. Other Trainings (excluding HRD Training)</b>						
04.	Training of Rural Women on Use of Biofertilizer for Productivity Enhancement	4	17 <sup>th</sup> Oct, 2022 18 <sup>th</sup> Oct, 2022 15 <sup>th</sup> Mar, 2023 17 <sup>th</sup> Mar, 2023	Rural women farmers	90	Beneficial to the farmers

**4.2 Report on the activities performed under following:**

4.2.1 Van Vigyan Kendras (VVKs): 04

(a) Bichhwal (Bikaner ), Rajasthan, established

- (b) Chhipardi Beedi (Rajkot) Gujarat, **established**
- (c) Rudana Nursery, Khanwel (Silvasa) Dadra & Nagar Haveli and Daman, **established**
- (d) Kalka Mata Nursery(Udaipur), Rajasthan, **established**

#### **VVK at Bichhawal Nursery, Bikaner (Rajasthan)**

Meetings were conducted with Rajasthan Forest officials regarding VVK works. Under Rajasthan VVK Hi-Tech nurseries (at Bichhwal Bikaner with its satellite facility at Mohangarh) of SFD Rajasthan were maintained in 2022-23.

#### **(i) Maintenance of Hi-Tech Nursery Bichhwal, Bikaner-**

Maintenance works of Hi –Tech nursery Bichhwal, Bikaner have been executed and Agrosched net (50%) for net house (size 8×32 m), polysheet, G.I. profile with spring, nut etc. were fitted and made operational.



**Fig. 7** Cemented construction of water channel at IGNP area, Mohangarh, Jaisalmer (Raj)

#### **(ii) Maintenance of Hi-Tech Nursery at IGNP area, Mohangarh, Jaisalmer**

Cemented construction of water channel (8.4 Cum) and its plaster (196 Sqm) at High-Tech nursery, IGNP area, Mohangarh, Jaisalmer have been completed.

**(iii) VVK Training** - The three days training programme under Van Vigyan Kendra (VVK) Bikaner for farmers and field functionaries was organized at ICFRE-AFRI, Jodhpur during 21-23<sup>rd</sup> Dec, 2022. The topic of training was “Agroforestry, soil and water Conservation in dry land”. A total 25 participants (11 forest staffs and 14 farmers) from various villages/ranges of Jodhpur and Bikaner circle attended training. They learned techniques of organic and compost manure farming techniques and nursery management, raising quality plant stock and maintenance, conservation and economic benefits of agroforestry, cultivation of arid fruit tree and production, silvipastoral and grass production, and sustainable goal etc. Trainees also visited and learned about technologies demonstrated on forestry, agroforestry, soil water conservation at KVK, Jodhpur and Interpretation centre and hi-tech nursery at ICFRE-AFRI Jodhpur.



**Fig. 8 (A-D) VVK Training during 21-23<sup>rd</sup> Dec, 2023 at ICFRE-AFRI, Jodhpur**

## **(2) VVK at Chhipardi Beedi, Rajkot (Gujarat)**

A number of meetings were organized between ICFRE-AFRI official and additional PCCF (Research) and DCF (Research), Gujarat Forest Department, GFRI, Gandhinagar for research demonstration, maintenance of VVK nursery and training works for financial year 2022-23.

### **Maintenance of R & D Nursery, Chhipardi Biddi, Rajkot (Gujarat)**

Excavations of foundation, CPVC pipe, different diameter of LLDPE pipe, sprinkler and its accessories were purchased and completely fitted for irrigation purposes in 4 old Net House at R & D Nursery, Chhipardi Biddi, Rajkot and made operational.



**Fig. 9 Renovation of R & D Nursery Rajkot, Gujarat**

**VVK Training:** Three days VVK training was organized at KVK Rajkot (Gujarat) for field functionaries and progressive farmers on 1-3<sup>rd</sup> Nov, 2022. The total 46 participants (31 forest staffs and 15 farmers) attended the training. The topic of training was “Biodiversity in Gujarat”. Both classroom lecturers and field visit were included in this training programme. They learned about forest diversity in Gujarat, forest management through JFM, wildlife biodiversity in Gujarat, benefit of diversity biodiversity in agriculture, biodiversity in agroforestry in Gujarat, diversity cultivars in agriculture and its benefit and Sustainable Development Goals. During the field visit, the participants learned about progeny trial and clonal trial, spacing and species trials, silvipastoral systems at Dharmendra Beeddi, vermi-compost and high quality seedlings propagation techniques and nursery management at R & D nursery, Chippardi Biddi, Rajkot. They also visited and learned about improved groundnut cultivation at demonstration area of KVK, Rajkot and demonstration of weather station and get information on weather at Regional Rainfed Research Station, Rajkot.



**Fig. 10 (A-B)** VVK training at KVK Rajkot during 1-3<sup>rd</sup> Nov, 2022

### **Kalka Mata Nursery, Udaipur (Rajasthan)**

A meeting was conducted between ICFRE-AFRI and RFD to renovate Agroshed house, capacity building, development of demonstration centre at Kalka Mata Nursery, Udaipur.



**Fig. 11** Meeting between ICFRE-AFRI official with DFO, Udaipur (VVK nodal officer), Udaipur on 26<sup>th</sup> May, 2022

### **(i) Renovation of High-Tech nursery at VVK Udaipur**

Earth work, dry Stone Kharanja under floor and CC work was done as last year Poly house (size 19.6 m × 28 m × 0.10 m) structure made at Hi-Tech Nursery, Kalka Mata, Udaipur.

## (ii) Signage boards at VVK Udaipur

Signage boards were prepared and fixed at VVK, Kalka Mata nursery, Udaipur

## (iii) VVK training

The three days training was organized under VVK, Udaipur for farmers and field functionaries at ICFRE-AFRI, Jodhpur during 21-23<sup>rd</sup> Dec, 2022. The topic of training was “Agroforestry, soil and water Conservation in dry land”. A total 25 participants (14 forest staffs and 11 farmers) from various villages/ranges of Udaipur, and Pali Division participated in the training. Participants acquired knowledge about preparation of value added organic and compost manure techniques, raising quality plant stock and maintenance, nursery management, ecological and economic benefits of agroforestry, cultivation of arid fruit tree and production, silvipastoral and grass production, and sustainable goal etc. Participants also visited and learned about technologies demonstrated on forestry, agroforestry, soil water conservation at KVK, Jodhpur and Interpretation centre and hi-tech nursery at ICFRE-AFRI Jodhpur.



**Fig. 12 (A-B)** VVK Udaipur training at ICFRE-AFRI, Jodhpur during 21-23<sup>rd</sup> Dec, 2022

## VVK/KVK Networking:

- Link of e-copy of "ICFRE-AFRI Darpan" (Quarterly magazine - January to December, 2021) published by ICFRE-AFRI was sent to Krishi Vigyan Kendras of Rajasthan and Gujarat Region via e-mail in the month of May, 2022.
- A team of 40 trainees of Diploma in Agriculture Extension Services for Input Dealers (DAESI) from KVK, CAZRI, Jodhpur visited ICFRE-AFRI dated on 17.06.2022.
- Link of e-copy of "ICFRE-AFRI Darpan" (Quarterly Magazine – year 20, Vol.-1) published by ICFRE-AFRI was sent to Krishi Vigyan Kendras of Rajasthan and Gujarat Region via e-mail in the month of Aug, 2022.
- KVK, Vyara, (Navsari Agriculture University, Navsari, Gujarat) signed MoU with ICFRE-AFRI on 12.09.2022 for the Clonal trial of teak under agroforestry in the AICRP-09 entitled “Quality teak production: Capitalizing on clone”. To compare performance of collected all over teak clone with Valsadi teak (Gujarat).
- An e-copy of the pamphlet "High yielding Clones of Shisham (*Dalbergia sissoo* Roxb. ex. DC) suitable for plantation in hot-semi-arid and sub humid regions of Gujarat and uplands of Rajasthan" published by ICFRE-AFRI was sent through e-mail to Krishi Vigyan Kendras of Rajasthan and Gujarat Region in the month of Sept, 2022.
- A meeting was organized at KVK, Rajkot between KVK and ICFRE-AFRI on 13.10.2022 regarding VVK, Rajkot training.

- Dr. Bilas Singh and Sh. A. S. Chouhan, ICFRE-AFRI, Jodhpur visited KVK, Jamnagar (Gujarat) to explore possibility of VVK, Rajkot training on 11.10.2022.
- In collaboration with KVK, Rajkot (Gujarat) 3 days training programme was organized under VVK, Rajkot dated from 1-3<sup>rd</sup> Nov, 2022.
- In collaboration with KVK, CAZRI, Jodhpur 3 days training programme was organized under VVK, Udaipur and VVK, Bikaner jointly at ICFRE-AFRI, Jodhpur dated from 21-23<sup>rd</sup> Dec, 2022.
- Link of e-copy of "ICFRE-AFRI Darpan" (Quarterly magazine - April to July, 2022) published by ICFRE-AFRI was sent to Krishi Vigyan Kendras of Rajasthan and Gujarat Region via e-mail in the month of Jan, 2023.
- E-copy of the leaflet, published by ICFRE-AFRI on "Ayurvedic Medicine for Boons: Ashwagandha (*Withaniasomnifera*Dunal.)" was sent to Krishi Vigyan Kendras of Rajasthan and Gujarat Region via mail in the month of Jan, 2023.
- Along with 05 farmers, Dr. R.R.Meghwani, S.M.S. KVK, Jodhpur attended "Tree Grower Mela-2023" under VVK-KVK linkage programme dated on 17.03.2023.



**Fig. 13** Signing of MOU with KVK, Vyara on 12<sup>th</sup> Sept, 2022

#### 4.2.2 Demo Village (DV)

##### **Maintenance of Demo Village and demo plantation:**

DV site was protected and maintained. Signage boards were made and fixed at Demo Village, Mohangarh, Jaisalmer. Demonstration plot of Guggal (43 clones) was planted (1 ha) and maintained. Earth work for irrigation Channel was constructed.



**Fig. 14** Guggal clones plantation at Demo village, 1445 RD, IGNP area, Mohangarh, Jaisalmer

### Research plantation plots:

Research plot of Eucalyptus of 200 clones (1000 plants) was planted in 1.02 ha area under AICRP-04 and for *Dalbergia sissoo* was planted (864) in 1.08 ha area under AICRP-21 at DV site under CAMPA.

#### 4.2.3 Tree Growers Mela (TGM)

TGM was organized at ICFRE-AFRI, Jodhpur on 17<sup>th</sup> Mar, 2023. Chief guest of inaugural programme was Prof. G. R. Jakhar, Ex VC, Shri Ganga Singh University, Bikaner. He advocated to promote agroforestry for support of ecological and livelihood in dry region of Rajasthan. A short film on “Contribution of ICFRE-AFRI in Biodiversity conservation” under Documentary head in Extension - CAMPA fund and leaflet of Rohida tree (*Tecomella undulata*) was released by the Guests in inaugural session. An interaction session was organized between farmers and experts of forestry and agriculture. A workshop was also organized on raising high quality seedling and nursery management, sustainable development of agroforestry, use of biochar, improved varieties of millets, its value addition and marketing. More than 400 farmers, environmentalist and tree growers participated in the event. In this fair, 20 stalls were exhibited on different government departments on developed techniques/financial institutions/ entrepreneurs viz. value added forest produce, medicinal plants and products, bio-fertilizer and organic compost etc. Brochure of ICFRE-AFRI and Pamphlets/leaflets of different techniques and medicinal plants are also distributed among farmers. One seedling per farmer was distributed to interested farmers.



**Fig. 15 (A-D)** Inaugural function of TGM at ICFRE-AFRI, Jodhpur on 17<sup>th</sup> Mar, 2023



**Fig. 16** (A-B) Plantation ceremony; (C-D) Farmers visiting stall in TGM at ICFRE-AFRI, Jodhpur on 17<sup>th</sup> Mar, 2023

### Prakriti

Prakriti programme is to provide platform for school children to learn practical skills towards sustainable use of resources. It also aims to promote awareness about forests and environment and stimulate interest among students of Kendriya Vidyalaya and Jawahar Navodaya Vidyalaya in maintaining the balance. Under this programme, ICFRE-AFRI conducted various activities. Brief details of activities are:

S.No.	Name of institution/school	Date	Participants of students
1.	Kendriya Vidyalaya, BSF, Ramgarh, Dist.- Jaisalmer (Rajasthan)	29.04.2022	55
2.	Jawahar Navodaya Vidyalaya, Narmada (Gujarat)	06.05.2022	35
3.	Kendriya Vidyalaya, Nagaur (Rajasthan)	28.06.2022	80
4.	Kendriya Vidyalaya no.1 (Airforce), Jodhpur (Rajasthan)	19.07.2022	72
5.	Madhuban Public School, Jodhpur (Rajasthan)	19.07.2022	36
6.	IIT Kendriya Vidyalaya, Karvad, Jodhpur(Rajasthan)	12.08.2022	48
7.	Jawahar Navodaya Vidyalaya, Mohangarh, Jaisalmer (Rajasthan)	30.09.2022	543
8.	Army Public School, Ajmer road, Jodhpur (Rajasthan)	02.12.2022	76
9.	Shree IG Vidhya Mandir Sr. Sec. School, Bilada, Jodhpur(Rajasthan)	19.01.2023	80

10.	S. R. Adarsh Vidhya Mandir Sr. Sec. School, Jhalamand, Jodhpur (Rajasthan)	28.02.2023	150
11.	Madhuban Public Sr. Sec. School, Basni, Jodhpur (Rajasthan)	29.03.2023	70
		TOTAL	1245
Total 1245 students benefitted under Prakriti Programme in 2022-2023			

### Weekly activity under Azadi Ka Amrit Mahotsav (2022-23)

- World Earth Day was celebrated on 22.04.2022 at ICFRE-Arid Forest Research Institute, Jodhpur ICFRE-AFRI with the theme, 'Invest in Our Planet' under the 'Azadi ka Amrit Mahotsav'. Chief Guest of the event Shri. D. D. Ojha expressed his views on the origin of earth and the role of our culture & traditions in its conservation. Guest of honour, Shri Prasann Puri Goswami expressed his views about the role of conservation & plantation of trees to make earth greener & healthier.
- On 28.04.2022 “Hindi Translation and Typing Workshop” was organized by Information & Technology Cell, ICFRE-AFRI, Jodhpur under 'Azadi ka Amrit Mahotsav'. Assistant Director (Rajbhasha), Shri Kailash Chand Gupta described the goals set by the Department of Official Language, Government of India for the official uses of Hindi.
- on 06.05.2022 a programme under 'Azadi ka Amrit Mahotsav' as a countdown of Internationalyoga day on 21st June is celebrated in ICFRE--Arid Forest Research Institute. Chief guest and Chief speaker of the programme was Prof. Vimla Sheoran of Jai Narayan Vyas University, Jodhpur.
- On 22.05.2022, International Biodiversity Day 2022 on the theme, “Building a Shared Future for All Life” was celebrated under the Azadi Ka Amrit Mahotsav at ICFRE-AFRI, Jodhpur. Shri Uma Ram Choudhary, Retired IFS Officer was the chief guest of the event presided by Group Coordinator (Research) Dr. Tarun Kant, Scientist F.
- On 03.06.2022 on the occasion of world environment day 2022 under 'Azadi ka Amrit Mahotsav' a human chain was formed by scientists, officers, employees and research scholars. With the formation of human chain, the institute’s commitment to environment protection was shown by ICFRE- ICFRE-Arid Forest Research Institute, Jodhpur on the basis of the theme “only one earth”. A campus cleaning programme also done on environment day.
- On 21.06.2022, Yoga session organized on the occasion of InternationalYogaDay at ICFRE-AFRI as part of 'Azadi ka Amrit Mahotsav'. Chief Guest of the event was Yoga expert Prof. Vimla Sheoran, Head, Zoology, JNVU, Jodhpur |
- On 19.07.2022 under 'Azadi ka Amrit Mahotsav', a “Nature Walk” program was organized at ICFRE-AFRI. In this program the Teachers and Students of two different schools- Kendriya Vidyalaya No.1 Air Force, (72 students of 7<sup>th</sup>-8<sup>th</sup>) and Madhuban Public Sr. Secondary School, Jodhpur (36 students of class 9<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup>) visited ICFRE-AFRI campus with faculty members Sh. Kalyan Singh, Sh. Nitesh Paliya, Smt. Mamta Meena, Smt. Suman Sharma of Kendriya Vidyalaya and Dr. Shubha Dadhich and Smt. Saroj of Madhuban Public Sr. Secondary School, Jodhpur.
- On 28.07.2022 the 73<sup>rd</sup> Van Mahotsav was organized under the 'Azadi ka Amrit Mahotsav' ICFRE-Arid Forest Research Institute Jodhpur. The program was started by planting high yielding Shisham clones developed by ICFRE-AFRI and Thar Shobha Khejri in the ICFRE-AFRI premises. The chief guest in the program, Professor Dr. Surja Ram Jakhar, Head of the Department of Geosciences, JNVU, Jodhpur, emphasized on the need for environmental protection by creating green belt through plantation in the threatened water areas. Special guest

Mr. Suman Kumar Meena, Executive Engineer, Central Ground Water Board, Jodhpur highlighted the importance of interdependence of forest and water conservation. Director, ICFRE-AFRI, Mr. Mana Ram Baloch, IFS while detailing the works done by ICFRE-AFRI for forest and environment protection, urged to pay equal attention to plantation as well as conservation of planted trees.

- On 12.08.2022 under "Prakrati" program, Dr. Bilas Singh, CTO, ICFRE-AFRI interacted with students of 9<sup>th</sup> & 10<sup>th</sup> class and teachers of IIT Kendriya Vidyalaya, Karvad, Jodhpur and delivered a lecture entitled "Role of Forest in Soil and Water Conservation" as part of Azadi ka Amrit Mahotsav. ICFRE-AFRI documentary film was screened at the school that enabled the students and teachers to know about ICFRE-AFRI's interventions in forestry.
- On 15.08.2022, 76<sup>th</sup> Independence Day was celebrated at ICFRE-AFRI, Jodhpur under the Azadi Ka Amrit Mahotsav. Event started with the flag hoisting by Director ICFRE-AFRI, Shri M. R. Baloch (IFS), followed by National anthem. Director ICFRE-AFRI in his address described the background & the components of Azadi ka Amrit Mahotsav as well as the work done by ICFRE-AFRI since its inception in 1987 & the resolves for the years ahead.
- On 18-19<sup>th</sup> Oct, 2022 as per the Directives of Department of Sports, Ministry of Youth Affairs & Sports, Govt. of India, Fit India Freedom Run 3.0 event was celebrated under the Azadi Ka Amrit Mahotsav at ICFRE-AFRI Jodhpur on the theme, "Azadi ke 75 saal, fitness rahe bemisaal" as an endeavour to promote fitness and creating awareness amongst the staff & residents of ICFRE-AFRI. In the two days event, 2 km run was organized on 18.10.22 which was attended by 84 participants (Men) & on 19.10.22 attended by 30 participants (Women).
- On 14.11.2022 Under the Azadi Ka Amrit Mahotsav, a talk was organized on Rajasthani Dingal Bhasha (poetic style) at ICFRE-AFRI Jodhpur. On this occasion Mr. Sawai Singh Rajpurohit of ICFRE-AFRI defined Dingle literature on the basis of poems. He gave a lecture describing the struggle of Maharana Pratap in Dingle language.
- On 27.12.2022 a lecture was given by Dr. Bilas Singh, Chief Technical Officer, ICFRE-AFRI, on the subject of "Work done by ICFRE-AFRI in relation to forest produce for tribals" at ICFRE-AFRI, Jodhpur under Azadi Ka Amrit Mahotsav and giving information about tribal population distribution in Gujarat and various schemes useful for them and about the development of capacity building and value addition of the above mentioned VFEC/SHG groups through research projects done by ICFRE-AFRI. Tarun Kant Group Coordinator Research explained about the importance and need of documentation of indigenous traditional knowledge (ITK).
- On 20.01.2023 under Azadi ka Amrit Mahotsav and a lecture on "Diseases in daily life and their protections" delivered by Chief Guest Dr. D.S. Mertiya of ICFRE-AFRI Dispensary. During this program he provided detailed information about communicable and non-communicable diseases in human caused by the current lifestyle. To get rid of these diseases, the Dr. Mertiya told Yoga, Pranayama to be useful. He also answered various queries of the audience.
- On 27.01.2023 Lecture on women empowerment under Azadi Ka Amrit Mahotsav was given by Ms. Mukta Parikh, SHO, Pratap nagar, Jodhpur at ICFRE-AFRI. Ms. Mukta Parikh explained about various ways to empower the women in today's time.
- On 24.03.2023 under the Azadi ka Amrit Mahotsav a lecture program was organized by ICFRE-AFRI, Jodhpur under the topic ATAMNIRBHAR Bharat. Under this program, women entrepreneur Mrs. Ruchika Leela provided detailed information about the preparation and marketing of snacks (biscuits, crispy poha etc.) made from millet. This year is being celebrated as International Millets Year, so the importance of coarse grains was shown through this program.

#### 4.3 Technologies transferred- A brief write up with suitable photographs on Efforts made on extension /commercialization of the following:

##### 4.3.1 Clones/Varieties released (species wise)

Two Vegetative multiplication Gardens (VMGs) of the newly released clones of *Dalbergia sissoo* viz., ICFRE-AFRI-DS-1, ICFRE-AFRI-DS-2 and ICFRE-AFRI-DS-4 have been established (0.1 ha each) at ICFRE-AFRI main Campus and ICFRE-AFRI Model Nursery during July, 2022 and October, 2022, respectively.



**Fig. 17 (A-D) Shisham clones planted at ICFRE-AFRI, Jodhpur**

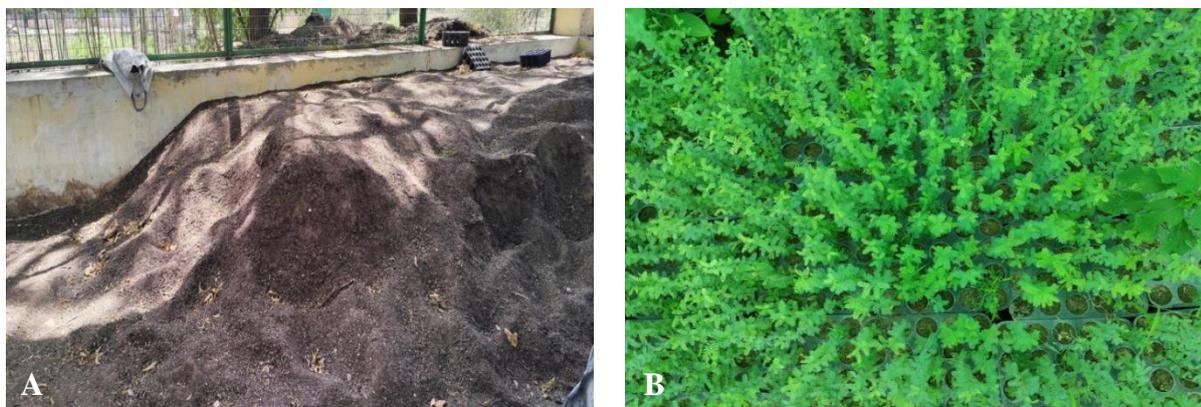
##### 4.3.2 Packages of practices developed (species wise)

##### 4.3.3 Products developed

##### 4.3.4 QPM produced and supplied to stakeholders (species wise)

Forty thousand saplings like *Azadirachta indica*, *Prosopis cineraria*, *Tecomella undulata*, *Acacia Senegal*, *Salvadora persica*, *Salvadora oleioides*, *Cordia myxa*, *Cordia gharaf*, *Pongamia pinnata*, *Holoptelea integrifolia*, *Zizyphus* spp., *Moringa oleiflora*, *Senegalia catechu*, *Ailanthus excelsa*, *Commiphora wightii*, *Santalum album*, *Syzygium cumini*, *Vachellia nilotica*, *Dalbergia sissoo*, *Terminalia arjuna*, *Anogeissus pendula* were produced in ICFRE-AFRI nursery and supplied to various stakeholders and further ICFRE-AFRI provided nursery techniques to them. 8,000 kg of Compost is prepared in ICFRE-AFRI main campus, value-

added, packed in different size packets and supplied to stakeholders. Total Rs.16,00,000/- income generated from ICFRE-AFRI nursery by selling various saplings, compost and value-added compost.



**Fig. 18** (A) Compost preparation and its value addition at Nursery; (B) Seedlings Growing in Nursery

#### 4.3.5 Patented technologies

4.3.6 License/Material Transfer Agreement signed- Please provide details in the given format as annexure -11 (MTA details)

4.4 Intellectual Property - Patents Granted/Applied (during the year), any other information regarding IP

4.4.1 Patents granted/ applied for: 01

A Fed-Batch solid culture Bio-reactor for growing cell biomass of medicinal plant Guggal has been developed at ICFRE-AFRI. Patent application has been submitted Patent application No. 202311020537.

4.4.2 Others

4.5 Research Publications: Please provide information in the table given below (Numbers only):

Books	Booklets/ Brochure/ Bulletins/ Phamphlets	Article in Seminars/ Conferences/ Workshops etc.		Popular Article	Research Papers in Journals		Chapters in Books/ Proceedings
		Articles	Abstracts		Foreign	Indian	
<b>03</b>	<b>02</b>	<b>08</b>	<b>08</b>	<b>24</b>	<b>11</b>	<b>15</b>	<b>14</b>

4.6 Seminars/Symposia/Workshops Organized

No. of Seminars/Symposia/Workshops/ meetings organized	No. of days	No. of participants
<b>02</b>	<b>06</b>	<b>157</b>

#### 4.6.1 Awareness /Demonstration programmes organized

No. of Awareness/ Demonstration programmes organized	No. of days	No. of participants
<b>39</b>	<b>39</b>	<b>1443</b>

#### 4.6 Consultancies

1. One DPR has been prepared and submitted to the funding agency, i.e., HRRL, on a consultancy project titled "Scientific Study on Green Belt Development Work for HRRL at Pachpadra, Rajasthan".
2. Dr. Sachin Sharma, Scientist-B and Sh. Sumantra Basu, Scientist-B, conducted field tours and prepared report as a team member in project titled "Improvement of water quality in immediate catchment of proposed Navnera Reservoir on Kalisindh River through measures and rehabilitation of lost habitat of scheduled wildlife (reptiles) in remaining forest area near Abra Village, tehsil Digod, district Kota, Rajasthan" of Environment Management Division, Indian Council of Forestry Research and Education.
3. Sumantra Basu, Scientist-B, conducted field tours and prepared a report as a team member in a project titled "Preparation of Restoration Plan, NPV of Future Ecosystem Services, etc., for River Subarnarekha and its River Beds" of the Institute of Forest Biodiversity, Hyderabad.

#### 4.7 Technical Services

##### 4.7.1 Identification and testing services

##### 4.7.2 Advisories given to SFDs and other stakeholders

##### 4.7.3 Other technical services not covered elsewhere in the report

#### 4.8 Activities of Rajbhasha

भावाअशिप -शुष्क वन अनुसंधान संस्थान, जोधपुर में हिन्दी सप्ताह (14 से 20 सितंबर, 2022) का आयोजन हुआ। दिनांक 14.09.2022 को 'हिन्दी दिवस' के दिन हिन्दी सप्ताह -2022 का समारंभ हुआ। इस अवसर पर संस्थान के समूह समन्वयक )शोध (एवं वैज्ञानिक- जी डॉ .तरुण कान्त ने सभी को राजभाषा प्रतिज्ञा दिलवाई एवं संस्थान निदेशक श्री माना राम बालोच द्वारा हिंदी दिवस के सम्बन्ध में जारी अपील को पढ़ा। तत्पश्चात संस्थान के कनिष्ठ अनुवादक , श्री अजय वशिष्ठ ने माननीय गृह मंत्री, भारत सरकार के हिंदी दिवस पर दिए गए उनके सन्देश को पढ़ा तथा हिन्दी सप्ताह के दौरान आयोजित होने वाली प्रतियोगिताओं की जानकारी दी।

दिनांक 20.09.2022 को हिंदी सप्ताह का समापन समारोह आयोजित हुआ। जिसमें बतौर मुख्य अतिथि श्री ओम प्रकाश भाटिया, कथाकार , विशिष्ट अतिथि श्री सत्यदेव संवितेन्द्र , कवि एवं डॉ .कीर्ति माहेश्वरी , सहा .आचार्य , हिंदी विभाग , जय नारायण व्यास विश्वविद्यालय , जोधपुर रहे । संस्थान निदेशक श्री एम .आर . बालोच , भा.व.से .ने अतिथियों का स्वागत किया एवं दीप प्रज्वलन के बाद स्वरचित कविता पाठ प्रतियोगिता आयोजित हुई कार्यक्रम में पधारे अतिथियों ने हिंदी सप्ताह के दौरान आयोजित हुई प्रतियोगिताओं के विजेताओं को प्रमाण -पत्र प्रदान कर उनका उत्साहवर्धन किया। इस अवसर पर संस्थान निदेशक , समूह समन्वयक)शोध (एवं अतिथियों ने अपने-अपने विचार व्यक्त किये । संस्थान के सहा .निदेशक)राजभाषा (श्री कैलाश चन्द गुप्ता ने वर्ष 2021-2022 का हिंदी का प्रगति प्रतिवेदन पढ़ा तथा कार्यक्रम का संचालन एवं आभार ज्ञापन कनिष्ठ अनुवादक , श्री अजय वशिष्ठ ने किया ।

इसके अतिरिक्त इस संस्थान में नियमित रूप से प्रत्येक तिमाही में विभागीय राजभाषा कार्यान्वयन समिति की बैठक का आयोजन हुआ तथा कार्मिकों में हिन्दी में कार्य करने को बढ़ावा मिले इस हेतु समय-समय पर हिन्दी कार्यशालाएं भी आयोजित हुईं।



**Fig. 19** हिंदी सप्ताह का समापन समारोह 2023.

#### 4.9 Awards and Honours

ICFRE-Arid Forest Research Institute, Jodhpur has been awarded the "33<sup>rd</sup> Vriksha Bandhu Award" today on the occasion of World Environment Day. The award was received by the Director ICFRE-AFRI, Sh. M.R. Baloch, IFS in a function held today and organized by Adhyatmik Kshetra Paryavaran Sansthan, Jodhpur. The award is a recognition of the works being done by ICFRE-AFRI for the last 35 years that has positively impacted the environment. The Director was accompanied with the contingent of ICFRE-AFRI Scientists and Officers on the occasion.

#### 4.10 Special Activities (Such as Van Mahotsava, Forestry Day and Other occasions)

1. World Earth Day on 22.04.2022
2. International Biodiversity Day on 22.05.2022
3. Environment Day on 05.06.2022
4. World day to combat desertification on 17.06.2022
5. Yoga Diwas Day on 21.06.2022
6. Van Mahotsava Celebration on 28.07.2022
7. International Day of Forests on 21.03.2022

## आफरी में डा. अम्बेडकर 131वीं जयन्ती पर कार्यक्रम

14 अप्रैल २०२२ को बाबा साहेब डॉ. भीमराव अम्बेडकर जयंती शुष्क वन अनुसन्धान संस्थान, जोधपुर द्वारा हर्षोल्लास से मनाई गई |

अम्बेडकर जयंती कार्यक्रम का शुभारंभ बाबा साहेब को पुष्प अर्पण एवं दीप प्रज्वलन से हुआ | समस्त आफरी परिवार एवं मुख्य अतिथि द्वारा पुष्पांजली अर्पित की गई | श्रीमती अनीता द्वारा स्वागत संबोधन दिया गया | इस अवसर पर डॉ. कांता कटारिया, प्रोफेसर, राजनीति विज्ञान, जेएनवीयू, जोधपुर मुख्य अतिथि रही | इन्होंने बाबा साहेब की जीवनी पर अपने विचार व्यक्त करते हुए कहा कि, बाबा साहेब एक महान व्यक्ति थे, वे न केवल संविधान निर्माता थे बल्कि एक राष्ट्र निर्माता थे |

कार्यक्रम के अध्यक्ष श्री एम आर बालोच निदेशक आफरी ने अम्बेडकर साहब, महावीर स्वामी एवं महात्मा ज्योति बा फुले पर अपने विचार व्यक्त किये और कहा कि सर्वधर्म समान हैं, हमें सामाजिक कुरूपतियों एवं अन्धविश्वास को भुलाकर अहिंसा व महिला शिक्षा को महत्व देना चाहिए |

संस्थान के डॉ.तरुण कान्त, समूह समन्वयक शोध ने डॉ. अम्बेडकर साहब के बारे में बोलते हुए कहा कि, वे एक ऐसे व्यक्तित्व थे जिन से हमको सदैव प्रेरणा मिलती है | उन्होंने उनके द्वारा लिखित संविधान को एक धार्मिक साहित्य बताया और कहा की हमे इसका अनुसरण करना चाहिए |

अम्बेडकर जयंती के अवसर पर डॉ. एम टी हेगडे, श्री के आर चौधरी, श्री सवाई सिंह राजपुरोहित, श्री सोहन लाल गर्ग ने बाबा साहेब एवं महात्मा ज्योति बा फुले पर अपने विचार व्यक्त किये |

इस कार्यक्रम में संस्थान के समस्त अधिकारियों/कर्मचारियों/शोधार्थियों एवं आफरी परिवार के बच्चे उपस्थित रहे |कार्यक्रम का संचालन श्रीमती अनीता, प्रभागाध्यक्ष, सुविधा एवं सेवाएँ ने किया |



**Fig. 20 (A-D) डॉ. भीमराव अम्बेडकर जयंती का आयोजन.**

4.11 Extension Activities performed under CAMPA Extension (this information is different from the information provided in the Chapter as above)

## **5. Administration and Information Technology**

### **Introduction**

#### **5.1 Information Technology**

The existing IT infrastructure was maintained properly. The leased line provided by the National Knowledge Network (NKN) was maintained, and 24×7 internet connectivity was provided to the users. Several video conferencing sessions were organized during the year. The Hindi and English websites of the institute were regularly updated throughout the year. The reports of important events held at the institute were uploaded to the institute's website as well as the ICFRE website. The PIMS and payroll modules of the IFRIS were successfully run throughout the year. Twelve new computers & ten laser printers were procured under different budget heads. Furthermore, a new video conferencing system was procured and installed under the UNDP one-time grant. The CCTV surveillance system is being maintained, and other routine tasks related to information technology were performed during the year.

**5.2 Administration:** A brief note on general administration activities along with information on the following:

**5.2.1 Sevottam:** Activities relating to the Citizens/Clients Charter as detailed below has to be included in the Annual Report.

##### **5.2.1.1 Action taken to formulate the Charter for the Department and its subordinate formation**

The charter has been prepared based on the seven steps mentioned in Sevottam. Considering ICFRE's mandated mission "To generate, preserve, disseminate advance knowledge, technologies and solutions for addressing issues related to forests and promote linkages arising out of interactions between people, forests and environment on a sustained basis through research, education and extension", ICFRE-AFRI is pursuing forestry research for conservation of biodiversity and enhancement of bio-productivity in Rajasthan, Gujarat and Dadra & Nagar Haveli with special emphasis on arid and semi-arid regions. Keeping the National Forestry Research Plan (NFRP) in view, ICFRE-AFRI has identified its thrust areas based on the inputs and active participation of different stakeholders. The institute is implementing its research endeavors after duly recognizing the user's needs.

Main research focus of the institute **includes:**

1. Soil, water and nutrient management
2. Development of technologies for afforestation of stress sites
3. Seed handling, nursery, plantation techniques and management
4. Planting stock improvement and biotechnology
5. Biofertilizers and biopesticides
6. Phytochemistry, non-wood forest products
7. Biodiversity conservation and climate change
8. Agroforestry and JFM
9. Forestry education & extension

Different procedures have been formulated for identifying the research problems of dry areas; formulating the projects based on the problems; and dissemination of the research results and technologies to the end users. In order to identify the research problems, institute-level interaction workshops are organized involving various stakeholders, like officials of state forests departments of

Rajasthan and Gujarat, scientist of other sister organization like CAZRI and University, progressive farmers and NGOs. Research problems highlighted during discussions are taken under project formulations by the scientists after the thorough review of scientific literature.

The projects are then sent to the external experts for evaluation and their suggestions. After incorporating the suggestions/modifications, the projects are presented before the Research Advisory Group (RAG) meeting. After including suggestion of RAG members, if any, revised projects are prepared and progress of the ongoing projects are presented in the Research Policy Committee (RPC) meeting for approval. After the approval of projects, the funds are allotted and the projects are executed by the scientists.

The technologies developed through the projects are extended/ demonstrated to the end users with the help of demonstration trials, extension trainings, Van Vigyan Kendras, Demo village, printed material, radio talk, workshops, conferences and the publications uploaded to the website of the institute.

#### 5.2.1.2 Action taken to implement the Charter;

To fulfill the charter, research projects were prepared addressing the research mandate of the institute and submitted for funding to various donor agencies for implementing the Charter. Seven new projects (one project to be funded by ICFRE, one to be modified, and five recommended for external funding) were approved for initiation in the next financial year by RPC held in February, 2023. Several extension trainings were held during the year for dissemination of the research results of the various projects executed in the institute. The research results of the projects, the technologies developed by the institute and the events held at the institute were continuously updated on the website of the institute. In addition to these, environmental awareness programs were organized by the institute in the form of World Environment Day, Biodiversity Day and World Day for Combating Desertification and Van Mahotsava. The details of these have been mentioned above in this report.

#### 5.2.1.3 Details of Training Programmes, Workshops, etc. held for proper implementation of Charter; **(this is not the same as provided in chapter no. 4.3 and 4.4. Trainings organized for implementation of charter only is to be given )**

As mentioned in Annexure 7.

#### 5.2.1.4 Details of publicity efforts made and awareness campaigns organized on Charter for the Citizen/Clients;**( awareness campaigns organized for charter only)**

Various events were organized, manuscript published and talks delivered by ICFRE-AFRI officials during different events, conferences, workshops helped in publicity efforts made and awareness campaigns organized on Charter for the Citizen/Clients. The details are given in Annexure 9.

#### 5.2.1.5 Details of internal and external evaluation of implementation of Charter in the Organization and assessment of the level of satisfaction among Citizen/Clients.

All the new projects and progress made in the ongoing research projects were presented to the internal and external experts of the RPC, who gave their comments on the quality of the new projects and the progress made in the ongoing projects. The experts prioritized the new projects and expressed their satisfaction on the progress of the ongoing projects.

### 5.3 Welfare measures for the SC / ST/ backward / minority communities

S. No.	Name of officer & Post	Liaison Officer
1.	Sh. Deepak Kumar, Scientist B	Liaison Officer for SC
2.	Sh. S.L. Meena, ACTO	Liaison Officer for ST
3.	Ms. Kusum Lata Parihar, STO	Liaison Officer for OBC

### 5.4 Welfare measures for women

Members of women cell meet once in a quarter and discuss rules and guideline concerning women employee at workplace. International Women’s day was celebrated at ICFRE-AFRI on 8<sup>th</sup> March 2023. Under this program, Rangoli Competition, Poster Competition and Easy Writing Competition on subject “Women Empowerment” were organized during 02.03.2023-06.03.2023. On last day of program, Smt. Bhawna Sharma, HoD Extension Division, delivered Welcome Address. A short movie compiled by Smt. Meeta Singh Tomar, Technician, was also shown in this event. Dr. Tarun Kant, GCR, and Sh. K.C. Gupta, Assistant Director, Rajbhasha, also expressed their views on Women Empowerment. Winners of all competitions are awarded with Certificates. Program was conducted by Sh. Deepak Kumar, Scientist B.



**Fig. 21** Celebrations held on Women’s Day at ICFRE-AFRI, Jodhpur

## 5.4. HR News

### स्थानान्तरण/कार्य-मुक्त/सेवानिवृत्त

1. श्री किंगशुक मोदक, वैज्ञानिक-बी स्थानान्तरण वर्षा वन अनुसंधान संस्थान, जोहरट (आसाम) दिनांक 31.03.2022
2. श्रीमती सीमा कुमार, वैज्ञानिक-ई अधिवर्षिता आयु पर दिनांक 30.09.2022 को सेवा निवृत्त हुए।
3. श्रीमती सरोज सिसोदिया, पुस्तकालयाध्यक्षा अधिवर्षिता आयु पर दिनांक 31.12.2022 को सेवा निवृत्त हुए।
4. श्री मुकेश कुमार यादव, तकनीकी सहायक - नियुक्ति दिनांक 05.07.2022
5. श्री परमेश्वर, एम.टी.एस.- नियुक्ति दिनांक 07.07.2022
6. श्री बलदेव राम, एम.टी.एस.- नियुक्ति दिनांक 11.07.2022
7. श्री परमवीर सिंह सोलंकी, अवर श्रेणी लिपिक- नियुक्ति दिनांक 11.07.2022
8. श्री अक्षय गोयल, एम.टी.एस.- नियुक्ति दिनांक 25.07.2022
9. श्री करण कुमार, एम.टी.एस.- नियुक्ति दिनांक 27.07.2022
10. श्री नवीन वणवेरु, तकनीकी सहायक-नियुक्ति दिनांक 28.07.2022
11. श्री गौरव जांगिड़, वन रक्षक-नियुक्ति दिनांक 01.08.2022
12. श्री बलवान इन्दौरा, एम.टी.एस.- नियुक्ति दिनांक 01.08.2022
13. श्री प्रवीण, एम.टी.एस.- नियुक्ति दिनांक 08.08.2022
14. श्री विक्रम वणवेरु, एम.टी.एस.- नियुक्ति दिनांक 08.08.2022
15. श्री राहुल अग्रवाल, अवर श्रेणी लिपिक-नियुक्ति दिनांक 18.08.2022
16. श्री रीतेश कुमार, एम.टी.एस.-नियुक्ति दिनांक 22.08.2022
17. श्री संजीत कुमार, तकनीसीयन (इलेक्ट्रीकल)-नियुक्ति दिनांक 30.08.2022
18. श्री शिवम वर्मा, तकनीसीयन (प्लम्बर)-14.09.2022
19. श्री ओम प्रकाश, तकनीकी सहायक - नियुक्ति दिनांक 19.10.2022

### पदोन्नति

1. श्रीमती सरोज सिसोदिया, पुस्तकालय सूचना सहायक को दिनांक 13.04.2022 से पुस्तकालयाध्यक्षा पद पर पदोन्नत किया गया।
2. डॉ. तरुण कान्त, वैज्ञानिक-एफ को पदोन्नति दिनांक 01.07.2022 से वैज्ञानिक-जी पद पर पदोन्नत किया गया।

### त्याग-पत्र

1. बुम्बारी सुप्रिया तीगगा, अवर श्रेणी लिपिक त्याग-पत्र दिनांक 03.09.2022
2. श्री गौरव जांगिड़, वन रक्षक त्याग-पत्र दिनांक 03.02.2023

**Annexure 1-11 (total 12 Nos.)****1. Format for information on RTI –Annexure -1**

RTI Applications/ Requests	No. of applications received as transfer from other P/As u/s 6(3)	Received during the month (including cases transferred to other Public Authority)	Number of cases transferred to other Public Authorities u/s6(3)	Decisions where requests/ Appeals rejected	Decisions where requests/ Appeals accepted
1 <sup>st</sup> Quarter	05	33	1	0	23
2 <sup>nd</sup> Quarter	06	23	1	0	29
3 <sup>rd</sup> Quarter	02	15	0	0	13
4 <sup>th</sup> Quarter	04	13	0	0	15
<b>Total</b>	<b>17</b>	<b>84</b>	<b>2</b>	<b>0</b>	<b>80</b>
<b>RTI First Appeals</b>					
1 <sup>st</sup> Quarter	0	03	0	0	03
2 <sup>nd</sup> Quarter	0	0	0	0	00
3 <sup>rd</sup> Quarter	0	03	0	0	03
4 <sup>th</sup> Quarter	0	02	0	0	01
<b>Total</b>	<b>0</b>	<b>08</b>	<b>0</b>	<b>0</b>	<b>07</b>

**2. Format for information on Vigilance Cases -Annexure-2**

Information on the vigilance cases						
S.No	Vigilance cases carried forward from previous years	Vigilance cases initiated in the year	Vigilance cases disposed	Vigilance cases pending	Nature of such cases	Remarks, if any
NIL						

**3. Format for information on Audit Objections- Annexure-3**

Information on the Audit objections						
S.No	Audit objections carried forward from previous years	Audit objections initiated in the year	Audit objections disposed	Audit objections pending	Nature of Audit objections	Remarks, if any
1.	30	22	6	46	Internal audit	

**4. Email and postal addresses- Annexure-4****Director****ICFRE-Arid Forest Research Institute**

P.O. Krishi Upaz Mandi, New Pali Road, Jodhpur, 342005,

Email: [dir\\_ICFRE-AFRI@icfre.org](mailto:dir_ICFRE-AFRI@icfre.org), [groupco\\_ICFRE-AFRI@icfre.org](mailto:groupco_ICFRE-AFRI@icfre.org)

Phone: 0291-2742549,2729104, FAX: 0291-2722764

## 5. List of abbreviations- Annexure-5

AF&ED	Agroforestry and Extension Division
ICFRE-	ICFRE-Arid Forest Research Institute
AFRI	
AM	Arbuscular Mycorrhiza
ARS	Agriculture Research Station
AICP	All India Co-ordinated Project
CAZRI	Central Arid Zone Research Institute
CETP	Common Effluent Treatment Plant
CIT	Chartered Institute of Technology
CSOs	Clonal Seed Orchards
CTAB	Cetyl Tri-methyl Ammonium Bromide
DEMO	Demonstration
DFO(WL)	Divisional Forest Officer (Wild Life)
DRDO	Defence Research Development Organization
DST	Department of Science & Technology
DNH	Dadra & Nagar Haveli
DNA	Deoxy Ribonucleic acid
DVs	Demo Village
EC	Electrical Conductivity
ENVIS	Environmental Information System
ET	Evapo-Transpiration
FED	Forest Ecology Division
FGTB	Forest Genetics and Tree Breeding
FPD	Forest Protection Division
FSI	Forest Survey of India
FRI	Forest Research Institute
FYM	Farmyard Manure
GM	Genetically Modified
GEF	Global Environmental Facilities
GIS	Geographic Information System
GoI	Government of India
GPS	Global Positioning System
HoD	Head of Division
HFRI	Himalayan Forest Research Institute
ICFRE	Indian Council of Forestry Research & Education
ICBN	International Conference on Biotechnology & Nanotechnology
IBA	Indole Butyric Acid
ICAR	Indian Council of Agriculture Research
ICRAF	International Council for Research on Agroforestry
IES	Indian Engineers Service
IFFCO	Indian Farmers Fertilizer Cooperative Limited
IFRIS	Indian Forestry Research Information System
IFS	Indian Forest Service
IT	Information Technology
ISSR-PCR	Inter Simple Sequence Repeat-Polymerase Chain Reaction
KVK	Krishi Vigyan Kendra
LCM	Leaf Compost Manure
Mg	Mega Gram (10 <sup>6</sup> g)

mM	Milli Mole
MoU	Memorandum of Understanding
MoEF&CC	Ministry of Environment, Forest & Climate Change
NAA	Naphthalene Acetic Acid
NFRP	National Forestry Research Plan
NKN	National Knowledge Network
NSFDDE	National Scheduled Castes Finance and Development Corporation
NTFP	Non-Timber Forest Product
NWFP	Non-Wood Forest Product
OBC	Other Backward Class
PIMS	Personnel Information Management System
PSB	Phosphorus Solubilizing Bacteria
PAR	Photosynthetic Active Radiation
RAG	Research Advisory Group
RFD	Rajasthan Forest Department
RIMS	Research Management Information System
RPC	Research Priority Committee
RSFD	Rajasthan State Forest Department
RSR	Root to Shoot Ratio
RTI	Right To Information
SAAER	The Society for Agriculture and Arid Ecology Research
SC	Scheduled Caste
SFD	State Forest Department
SFS	State Forest Service
SLEM	Sustainable Land and Ecosystem Management
SPAs	Seed Production Areas
SPSS	Statistical Package for Social Science
SSP	Single Super Phosphate
SSOs	Seedling Seed Orchards
ST	Scheduled Tribe
SWC	Soil Water Content
TREE	Training, Research, Extension & Education
TDS	Total Dissolved Solids
TERI	The Energy and Resources Institute
UT	Union Territory
UNCCD	<i>United Nations Convention to Combat Desertification</i>
UV	Ultra Violet
VAM	Vesicular Arbuscular Mycorrhiza
VMG	Vegetative Multiplication Garden
VVK	Van Vigyan Kendra
VFPMC	Village Forest Protection & Management Committee
ZSI	Zoological Survey of India

### 6. Format for details of trainings organized - annexure-6 (HRD Trainings)

SN.	Topic	Duration and period		Participants		Overall feedback of participants
		Days	Date	Category	Numbers	
1.	Biodiversity in Gujarat (VVK Rajkot Training)	3	1-3 <sup>rd</sup> Nov, 2022	Forest field functionaries	31	The training was excellent for field of forestry, agroforestry and agricultural and useful to forest staff and farmers. Farmers also require information on floriculture.
				Farmers	15	
2.	Agroforestry, soil and water Conservation in dry land (VVK Bikaner Training)	3	21-23 <sup>rd</sup> Dec, 2022	Forest field functionaries	11	The training was excellent and improved knowledge in field of forestry and agroforestry.
				Farmers	14	
3.	Agroforestry, soil and water Conservation in dry land (VVK Udaipur Training)	3	21-23 <sup>rd</sup> Dec, 2022	Forest field functionaries	14	The training was very good to improve knowledge of forestry and agroforestry. Training period should be more.
				Farmers	11	

### 7. Format for details of trainings organized - annexure-6(A) (Extn. Trainings)

S. No.	Topic	Duration and Period		Participants		Overall feedback of participants
		Days	Date	Category	Number	
a. Training under VVK						
1.	One VVK training at KVK, Rajkot (Guj) (Topic: Biodiversity in Gujarat)	03	1-3 <sup>rd</sup> Nov, 2022	field functionaries and progressive farmers	46	The training was excellent for field of forestry, agroforestry and agricultural and useful to forest staff and farmers. Farmers also require information on floriculture.
2.	One VVK training at ICFRE-AFRI, Jodhpur (Raj)	03	21-23 <sup>rd</sup> Dec, 2022	11 forest staffs and 14 farmers	25	

	(Topic: Agroforestry, soil and water conservation dry region)					
3.	One VVK training at ICFRE-AFRI, Jodhpur (Raj) (Topic: Agroforestry, soil and water conservation dry region)	03	21-23 <sup>rd</sup> Dec 2022	Forest field functionaries & Farmers	25	The training was excellent and improved knowledge in field of forestry and agroforestry.
<b>b. Training under DV</b>						
	Nil					
<b>c. Training under GSDP</b>						
	Nil					
<b>d. Other Trainings (excluding HRD Training)</b>						
04.	Training of Rajasthan Rural Women on Use of Biofertilizer for Crop Productivity Enhancement	4	17 <sup>th</sup> Oct, 2022 18 <sup>th</sup> Oct, 2022 15 <sup>th</sup> Mar, 2023 17 <sup>th</sup> Mar, 2023	Rural women farmers	90	Beneficial to the farmers
05.	One Week Compulsory Training for IFS officers	5	12-16 <sup>th</sup> Dec, 2022	IFS officers	25	Good

Category = Students, farmers, ladies, officers from SFDs, Members of JFMCs etc.

### **8. Format for details of participation in workshops etc. Annexure-7**

<b>Workshops/seminars/symposia/meetings etc. participated in</b>						
<b>S.No.</b>	<b>Topic</b>	<b>Duration and period</b>		<b>Participants from the institute</b>		
		<b>Days</b>	<b>Date</b>	<b>Category</b>	<b>Numbers</b>	
1.	Democracy: Role and Responsibilities of Investigative Agencies	01	01.04.2022	Scientist	1	
2.	Traditional Knowledge and Ethnobotany	01	20.04.2022	Scientist	1	
3.	National Institute for Research and Application of Natural Resources to Transform, Adapt, and Build Resilience (NIRANTAR)	1	09.06.2022	Scientist	1	
4.	Review of drought preparedness and mitigation measures.	1	30.08.2022	Scientists	2	
5.	New Analytical Methods in Soil Research	5	12.09.22 – 16.09.22	Scientist	1	

6.	Advanced Techniques in Soil, Plant and Water Analysis for Technical Staff of ICFRE, Dehradun.	5	19.09.22 – 23.09.22	Technical officer	1
7.	Computer and Internet Applications	5	19.09.22 – 23.09.22	Technical staff	1
8.	Brainstorm on issues related to R&D in water sector	1	12.10.2022	Scientist	1
9.	Measurement of Forest Carbon Exchange through Eddy Covariance-based Carbon Flux Towers	3	31.10.22 – 02.11.22	Scientists, Technical staff	3
10.	Sap flow data retrieval and validation	5	28.11.22 – 02.12.22	Scientist	1
11.	VVK Training	3	21.12.22 – 23.12.22	Technical staff	1
	Role of Grasses in Climate Change Adaptation and Mitigation	1	30.12.2022	Scientist	1
12.	Finalization of training modules for capacity building of stakeholders on issues related to the Centre of Excellence on Sustainable Land Management.	1	11.01.2023	Scientists	2
13.	Hands on Training on Application of GIS & Remote Sensing in Forestry	5	16.01.23 – 20.01.23	Scientists, Technical officer	3
14.	Instrumental drug discovery	5	06.02.23 – 10.02.23	Scientists	1
15.	Measurement of Forest Carbon stocks through Eddy covariance	2	09.02.23 – 10.02.23	Scientists	2
16.	Instrumentation (GC-MS and HPLC, Spectrophotometers etc.)	5	20.02.23 – 24.02.23	Technical staff	1
17.	Climate Change, Carbon Sequestration and Mitigation	5	13.03.23 – 17.03.23	Technical officer	1
18.	Enhancing Ecosystem Services by Improving Forest Quality and SLEM Knowledge Dissemination at Dehradun.	3	22.03.23 – 24.03.23	Scientist	1
19.	International Symposium on Intersectoral Cooperation for Resilient Landscapes	2	29.03.23 – 30.03.23	Scientist	2

Category =Scientists, TOs, Forest Officers, etc .

### 9. Format for details of Workshops/symposia etc. organized- Annexure-8

Workshops/seminars/symposia/meetings etc. organized						
S.No.	Topic	Duration and period		Participants		Overall feedback of Participants
		Days	Date	Category	Numbers	
1.	Scientific study on green belt development work for HRRL at Pachpadra, Rajasthan.	1	03.03.23	Officers from SFDs, HRRL employees, ICFRE-AFRI employees, agricultural university employees.	7	Good
2.	Tree Growers Mela	1	17.03.2023	Progressive farmers	150	Good

Category = Students, farmers, ladies, officers from SFDs, Members of JFMCs etc.

### 10. Format for details of Awareness. Demonstration programmes organized- Annexure -9

Awareness. Demonstration programmes organized						
S.No.	Topic	Duration and period		Participants		Overall feedback of Participants
		Days	Date	Category	Numbers	
1.	Developed technologies on Forestry  A team of FRO's along with their Office In-charge Sh. Anurag Anand, FRO, OFRC, Angul	1	14.04.2022	Forest range officers	58	
2.	Mr. N.S. Parihar, Facilitation KVK, CAZRI, Jodhpur	1	17.06.2022	Govt. official	01	
3.	K.V. No.1, AFS, Jodhpur	1	19.07.2022	Students	76	
4.	Madhuban Public Sr. Sec. School, Madhuban, Basani, Jodhpur.	1	19.07.2022	Students	38	
5.	Mr. Siddhart Kiyer, IES, New Delhi	1	04.08.2022	Govt. official	03	

6.	A team of FRO's along with their Office In-charge Sh. C.A. Rahman, CASFOS, Burnihat, Assam	1	10.08.2022	Forest range officers	28	
7.	A group of IFS(P) Officer trainees (2021-23) visited ICFRE-AFRI with Faculty I.C Dr. M. Sudhakar,	1	18.08.2022	IFS officers	34	
8.	A team of FRO's along with their Office In-charge Sh. V. Karthik, ACF (OT), CASFOS, Coimbatore	1	18.08.2022	Forest range officers	44	
9.	A team of forester trainees along with their instructor Sh. Baljit Singh from Forest Training Institute, Pinjore (Hariyana)	1	30.08.2022	Forester trainees	50	
10.	Sh. Gorakh Kalmnge, Associate Professor, IGNFA, Dehradun	1	30.08.2022	College faculty	01	
11.	A team of FRO's trainees along with their instructor sh. V. Rammohan, Dy. Director, TSFA from Telangana state forest Academy, Hyderabad	1	31.08.2022	Forest range officers	36	
12.	A group of Agriculture students of class 11 <sup>th</sup> with faculty member Kavita Sharma and Mr. Somariya from RSM International School, Sarswati Nagar, Jodhpur	1	01.09.2022	Students and faculty	17	
13.	A group of Science students of class 12 <sup>th</sup> with faculty member	1	16.09.2022	Students and faculty	26	

	Sh. Jaskanwar Jain from M. S. Kawar International School, Pali.					
14.	Sh. Satyadev Sanvitendra	1	20.09.2022	Professional	01	
15.	Dr. Om Prakash Bhatiya	1	20.09.2022	Professional	01	
16.	A group of 50 Forest Guard with Sh. T. Dutt and Sh. Ankush Sharma from Forest Training Institute, Chail, Himachal Pradesh.	1	22.09.2022	Forest officials	52	
17.	29 students from College of Technology and Agriculture Engineering, Agriculture University, Mandore, Jodhpur visited ICFRE-AFRI with Dr. Ashish Pawar, Asst. Professor.	1	27.09.2022	Students and faculty	30	
18.	A group of 27 Forest Guard Trainees from FTI, Jodhpur visited ICFRE-AFRI with I.C Sh. Karan Singh Rajpurohit.	1	11.10.2022	Forest guard trainees	28	
19.	A Group of 47 RFOs Trainees from Tamilnadu State Forest Academy, Coimbatore visited ICFRE-AFRI on with Sh. G.K Deelipan, Faculty.	1	26.10.2022	Range forest officers	48	
20.	121 students of Saraswati Bal Vidhya Mandir higher secondary school with Mr. Mahendra Singh and other faculty visited ICFRE-AFRI.	1	14.11.2022	Students and faculty	130	
21.	A Group of 47	1	14.11.2022	Range	49	

	RFOs Trainees from Chandrapur State Forest Academy of Administration, Development & Management, Chandrapur, and Maharashtra visited ICFRE-AFRI with Sh. S.S. Dahiwale, Faculty.			forest officers		
22.	A group of 42 RFO Trainee (Batch 2021-2023) visited ICFRE-AFRI with leader Dr. C.K. Kavidayal, from Uttarakhand Forestry Academy, Haldwani.	1	18.11.2022	Range forest officers	43	
23.	76 students of Army public school, jodhpur with Sh. Amarnath Sinha and 5 faculty visited ICFRE-AFRI.	1	02.12.2022	Students and faculty	82	
24.	Dr. Sharat Chauhan, Indian Administration Service officer, Principal Secretary to the Govt. of Arunachal Pradesh, Department of Environment, Forest and Climate Change visited ICFRE-AFRI.	1	14.12.2022	Govt. officials	01	
25.	48 Regular Forest Guards Trainees (68 <sup>th</sup> batch) with Sh. Ashwani Khadsholi, HPFS, Dy Director, Forest Training Institute, Chail, Solan (Himachal Pradesh) visited ICFRE-AFRI, Jodhpur.	1	16.12.2022	Range guard trainees	49	
26.	50 (SFD + farmers)	1	22.12.2022	VVK	50	

	VVK Trainees under VVK Udaipur and VVK Bikaner visited ICFRE-AFRI.			trainees		
27.	A group of 41 RFO Trainee visited ICFRE-AFRI with sh. T.R. Sharma, jt. Director from Himachal Pradesh forest academy, Sundarnagar.	1	05.01.2023	Range forest officers	42	
28.	A Group of 52 Students from Lahoo Memorial College of Science & Technology, Department of Pharmacy, Jodhpur visited ICFRE-AFRI with Faculty Dr. Nikhil Batra.	1	09.01.2023	Students and faculty	55	
29.	23 farmers from Vidisha (MP) visited ICFRE-AFRI under ATMA programme with programme coordinator sh. Suresh Kumar.	1	09.01.2023	Farmers	24	
30.	A Group of 35 Assistant Professor.SMSs from Agriculture University, Jodhpur visited ICFRE-AFRI with Faculty Dr. N. L. Dangi.	1	10.01.2023	College faculty	36	
31.	40 students of Shree IG Vidhya Mandir Sr. Sec. School, Bilara, Jodhpur with Sh. Pukhraj Seervi and 3 faculty visited ICFRE-AFRI.	1	18.01.2023	Students and faculty	43	
32.	40 students of Shree IG Vidhya Mandir Sr. Sec. School, Bilara, Jodhpur with Sh. Om Prakash	1	19.01.2023	Students and faculty	45	

	Seervi and 4 faculty visited ICFRE-AFRI.					
33.	32 Forester Trainees of basic course from Forest Training Institute, Jodhpur visited with Sh. K.S. Rajpurohit, RFO, FTI, Jodhpur.	1	19.01.2023	Forester trainees	33	
34.	30 Assistant professor. SMS of Agriculture university, jodhpur visited ICFRE-AFRI with one faculty.	1	07.02.2023	College faculty	31	
35.	42 RFO Trainees (8 <sup>th</sup> batch) with Sh. Shrikant Khamaduli, ACF & Sh. Giridhar Agrawal from Karnataka Forest Academy, Dharward, Karnataka visited ICFRE-AFRI, Jodhpur.	1	10.02.2023	Range forest officers	44	
36.	41 students of Adarsh Mahavidhalaya, Jodhpur with Dr. Hansa Joshi and 3 other faculty visited ICFRE-AFRI.	1	16.02.2023	Students and faculty	45	
37.	Dr. C. Kunhikanan, Director, IFGTB, Coimbatore.	1	02.03.2023	Scientist	01	
38.	34 RFO Trainees (7 <sup>th</sup> batch) with Sh. Parameshwarappa H., Range Forest Officer from Karnataka Forest Academy, Dharward, Karnataka visited ICFRE-AFRI, Jodhpur.	1	03.03.2023	Range forest officers	36	
39.	Visit of 31 participants of Nepal	1	29.03.2023	Foreign delegation	32	

	Delegation as a part of NLUJ-ITEC collaboration for special training for Attorneys from office of Attorney General, Nepal.					
Total					1443	

Category = Students, farmers, ladies, officers from SFDs, Members of JFMCs etc.

### **11. Format for details on License. Material Transfer agreements annexure -10**

Sl. No.	Name of Technology. package of practices	Name of species	Name of the party	Revenue details including revenue generated and mode of payment, if any
	<b>NIL</b>			

### **12. List of publications - annexure -11 (publications)**

#### **Books**

1. Mahanta D.K., Komal J., Bhoi T.K. and Samal I. (2023). An Objective Guide to Entomology sericulture and nematology. Publisher Jain Brothers ISBN-9789390576173
2. Mahanta D.K., Komal J., Samal I. and Bhoi T.K. (2022). A Complete Guide on Entomology. Publisher: Astral publication, ISBN: 978-93-5461-686-0
3. Mahanta D.K., Komal J., Bhoi T.K. and Samal I. (2022). A Complete Guide on Beneficial Insects. Publisher: Astral publication ISBN: 978-93-5461-681-5.

#### **Booklets.Brochures.Bulletins. Pamphlets etc.**

1. A Quarterly Hindi Magazine - ICFRE-AFRI Darapn, April to June 2022 (Year 20<sup>th</sup> Volume 1, 500 Copies Published )
2. A Quarterly Hindi Magazine - ICFRE-AFRI Darapn, July to September 2022 (Year 20<sup>th</sup> Volume 2, 500 Copies Published )

#### **Article in Seminars.Conferences.Workshops etc**

#### **Arcticles**

- Tanmaya Kumar Bhoi, Vipula Vyas, Varsha Giri and Sangeeta Singh. Soil arthropods potential nutrient recycler in soil in Desert area published in 3<sup>rd</sup> International Web-conference on Natural Resource management for global food security and sustainable development goals organised by the Academy of Natural Resource Conservation and Management (ANRCM) Lucknow, Uttar Pradesh 02-03 December, 2022.
- Vipula Vyas, Varsha Giri, Tanmaya Kumar Bhoi and Sangeeta Singh. Characterization of Native Rhizobia associated with *Dalbergia sissoo*: A potential root legume tree for Thar Desert published in 3<sup>rd</sup> International Web-conference on Natural Resource management for global food

security and sustainable development goals organised by the Academy of Natural Resource Conservation and Management (ANRCM) Lucknow, Uttar Pradesh, 2-3<sup>rd</sup> December, 2022.

- Tanmaya Kumar Bhoi, Pooja Sharma, Anjali Joshi, Ipsita Samal. Monitoring and detection of pesticide contaminants in freshwater through Sensor based Technology published in 7<sup>th</sup> India water week 2022, 1-5<sup>th</sup> November, India Expo Centre, Greater Noida
- Anjali Joshi, Aditi Tailor, Pooja Sharma and Tanmaya Kumar Bhoi. “Effect of climate change on crop production and its mitigation with regards to development of climate resilient varieties with special reference to rainfed agriculture” published in 7<sup>th</sup> India water week 2022, 1-5<sup>th</sup> November, India Expo Centre, Greater Noida.
- Pooja Sharma, Anjali Joshi, Aditi Tailor, Tanmaya Kumar Bhoi and Randhir K. Choudhary. The interdependence of water and forest ecosystem in the scenario of changing climate published in 7<sup>th</sup> India water week 2022, 01-05 November, India Expo Centre, Greater Noida
- Aastha Sharma and Desha Meena. Molecular analysis of flower color variants of *Tecomella undulata* using start codon targeted marker. 28-30 April, 2022 International symposium on Advances in plant biotechnology and nutritional security and 43rd annual meeting of plant tissue culture association India, at ICAR, NIPB, New Delhi, India.
- Desha Meena and Aastha Sharma. “Identification of Seed Production Areas- An Important Step in Tree Improvement Programme”, 108<sup>th</sup> Indian Science Congress (ISC 2023) 3-7<sup>th</sup> January, 2023 at R.T.M. Nagpur University, Nagpur, Maharashtra.
- Desha Meena and Aastha Sharma. “Phenological studies of *Tecomella undulata* with reference to different flower colour morphotypes”, 108<sup>th</sup> Indian Science Congress (ISC 2023) 3-7<sup>th</sup> January, 2023 at R.T.M. Nagpur University, Nagpur, Maharashtra.

## Abstracts

- Kratika and Tarun Kant (2023). *In vitro* Slow Growth Cultures for Medium Term Conservation of Arid and Semi-arid Region RET Species Abstract published and presented as poster (BNC-08) at International Symposium on ‘Intersectoral Cooperation for Resilient Landscapes’ held on 29th and 30th March organized by Indian Council of Forestry Research and Education (ICFRE) in collaboration with International Union of Forest Research Organization (IUFRO) at ICFRE-Forest Research Institute, Dehradun, India.
- Pooja Kattiparambil and Tarun Kant (2023). Cross-Transferability of SSR Markers for Inferring Genetic Diversity in *Prosopis cineraria* (L.) Druce (Khejri), Abstract published and presented as poster (BNC-14) at International Symposium on ‘Intersectoral Cooperation for Resilient Landscapes’ held on 29th and 30th March organized by Indian Council of Forestry Research and Education (ICFRE) in collaboration with International Union of Forest Research Organization (IUFRO) at ICFRE-Forest Research Institute, Dehradun, India.
- Shiwani Bhatnagar, Raj Kumar Suman, Bundesh Kumar, Mamta Sankhla and Ameen Ullah Khan (2022). *Trioza obsoleta* induced leaf galls of *Diospyros melanoxylon* Roxb. (Tendu). In: Souvenir cum Abstracts. Proceedings Book of 4<sup>th</sup> International Conference on “Global Efforts on Agriculture, Forestry, Environment and Food Security (Theme: Climate Change and Its Impact) (GAFEF-2022)”. Volume 2 September 17-19<sup>th</sup>, 2022, p. 216.
- Shiwani Bhatnagar, Ameen Ullah Khan, Lokendra Singh Rathore and Neha Sharma (2022). A study of insect visitors on Kumat: A desert tree of Thar. In: Souvenir cum lead.abstract proceedings book National Conference on Food & Nutritional Security and Sustainable Agriculture (NFSA-2022), Organized by Society for Agriculture Innovation and Development, Ranchi, India, pg. 225.

- Shiwani Bhatnagar, Sangeeta Singh, Neha Sharma (2022). Powdery mildew disease on *Ailanthus excelsa* in Rajasthan. In Souvenir Cum Abstracts.Proceedings: National Symposium on Recent trends in Phytopathology to address emerging challenges for achieving food security, organised by ICAR Vivekanandh Parvatiya Krishi Anusandhan Sansthan, Almora, p.15
- Shiwani Bhatnagar, Neha Sharma and Kavita Bhatnagar (2022). DNA barcoding: an important tool for identification of insect borers of timber species. In: Souvenir Cum Abstracts. Proceedings Book of 4<sup>th</sup> International Conference on “Global Efforts on Agriculture, Forestry, Environment and Food Security (Theme: Climate Change and Its Impact) (GAFEF-2022)”. Volume 2 September 17-19, 2022, p. 259
- Shiwani Bhatnagar, Neha Sharma, Raj Kumar Suman and Ameen Ullah Khan (2022). *Trachylepidia fructicasseilla* Ragonot infestation in pods and seeds of *Cassia fistula* L. In: Souvenir cum lead.abstract proceedings book National Conference on Food & Nutritional Security and Sustainable Agriculture (NFSA-2022), Organized by Society for Agriculture Innovation and Development, Ranchi, India, p. 138.
- Aditi Tailor, Pooja Sharma and Anjali Joshi (2022). Abstract entitled “Salinization of water resources in Indian context: A long-standing problem of great concern”. in 7<sup>th</sup> India water week 2022, 1-5<sup>th</sup> November, India Expo Centre, Greater Noida

### Popular articles

- Giri V., Bohra N.K., Vyas V., Bhoi T.K. and Yadav A. (2023) Significance and conservation of grassland ecosystem in arid and semi-arid regions of Rajasthan and Gujarat. *Biotica Res Today*, 5(1): 43-44.
- Giri V., Vyas V., Bhoi T.K. and Bohra N.K. (2022) Kapok tree – A potential non-timber forest product plant. *Biotica Res Today*, 4(12): 863-864.
- Vyas V., Giri V., Bhoi T.K. and Singh S. (2023) PGPR (Plant Growth Promoting Rhizobacteria) – A safer alternative to chemical fertilizers. *Van sangyan*, 10(1): 1-5.
- Vyas V., Bhoi T.K. and Samal I. (2022) Wetlands degradation and conservation measures. *Van sangyan*, 9(9): 27-28.
- Samal I., Bhoi T.K. and Mahanta D.K. (2022) Insect hotel: A mode of conservation of beneficial insect. *Van sangyan*, 9(4) (April Issue).
- Samal I. and Bhoi T.K. (2022) Possible solutions of plastic through insect. *Van sangyan*, 9(7). (July Issue)
- Samal I. and Bhoi T.K. (2022) Insects: an invertebrate inspiration for artists. *Biotica Res Today*, 4(6):v456-457.
- Bohra N. K. (2022), Magical Herb of Ayurveda-*Tinospora cordifolia*. *Pratiyogita Darpan*, pp. 88-89.
- Bohra N. K. (2022), *Withania coagulans* (Stock) Dunal-A Multipurpose Medicinal Plant. *Pratiyogita Darpan*, 2022, pp. 98 (August Issue).
- Bohra N. K. (2022), *Tecomella undulata* (Rohida)- An Endangered Tree. Botanical article *Pratiyogita Darpan* . September . 2022 . pp 105.
- बायोडीजल पादप जैव ईणन राजस्थानी खेती जनवरी 2022 पृष्ठ संख्या 45–49
- “औषधीय महत्व के पौधे” राजस्थानी खेती जनवरी 2022 पृष्ठ संख्या 32–3
- जैव विविणता दिवस और जैव विविणता . जलते दीप

- औषणीय महत्व के पौणो (प्रतियोगिता दर्पण/जून/2022 पृष्ठ संख्या 102–103)
- राजस्थान में अकाल एवं जल प्रबन्धन (प्रतियोगिता दर्पण/अगस्त/2022 पृष्ठ संख्या 97–98)
- फूलों की व्यावसायिक खेती (सामान्य ज्ञान दर्पण /सितम्बर/2022 पृष्ठ संख्या 55)
- गुडमार— चीनी विनाशक पादप (सामान्य ज्ञान दर्पण /अक्टूबर/2022 पृष्ठ संख्या 60–61)
- मरु क्षेत्र में घासों से हरियाली एवं आर्थिक उन्नति।(सामान्य ज्ञान दर्पण /नवम्बर/2022 पृष्ठ संख्या 52–53)
- उड़न राख भी उपयोगी है। (सामान्य ज्ञान दर्पण /मई/2022 पृष्ठ संख्या 46)
- अमीन उल्लाह खान एवं शिवानी भटनागर, वैज्ञानिक 'डी' बहुउपयोगी-नींबू पर कीट प्रकोप एवं प्रबंधन, (आफरी दर्पण के अंक जुलाई से दिसंबर 2023 में प्रकाशन हेतु भेजा गया)।
- शिवानी भटनागर, अमीन उल्लाह खान, राज कुमार नेहा शर्मा एवं ममता सांखला 2022. सीतामाता वन अभ्यारण में सागौन के वृक्षों पर स्केलेटोना इजर-यूटेक्टोना माचेरालिस (*Eutectona machaeralis*) का गंभीर संक्रमण। आफरी दर्पण, शुष्क वन अनुसन्धान संस्थान, जोधपुर, राजस्थान। 20-1: 2.
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