

वार्षिक अनुसंधान प्रतिवेदन

ANNUAL RESEARCH REPORT

2015-2016



राज्य वन अनुसंधान संस्थान, जबलपुर (म.प्र.)
STATE FOREST RESEARCH INSTITUTE, JABALPUR (M.P.)



*Dr. Gauri Shankar Shejwar
Hon'ble Forest Minister, Govt. of M.P.
at SFRI during National Seminar*



*Trainee forest guards being appraised
about raising of lac insects in the
institute*



**Installation of camera trap in National Park for
monitoring of prey & predators**



Provenance trials of Litsea in SFRI Campus

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FROM THE DIRECTOR'S DESK

Environmental degradation due to widespread destruction of forests remains a cause of concern as ever. Forest loss plays a central role in global warming and climate change, biodiversity loss, soil degradation and continuous fresh water supplies.



To alleviate environmental degradation, good information, serious thinking, informed dialogue, experimentation and learning from the past short-comings is required. Good research, well disseminated and widely discussed, helps in mitigation and providing solutions to the problematic issues. People that work with forest and forestry must address to these challenges.

State Forest Research Institute for the past 53 years of its glorious journey has been making steady growth in search of excellence and striving to focus its efforts on adaptive and applied research programmes for progress of forestry sector in the state. The institute is fully committed to address the new challenges and problems which require new interventions and new system of managing forests.

In the year 2015-16 the institute was accredited by Quality Council of India (QCI), New Delhi, under National Accreditation Board of Education and Training (NABET) in the medium irrigation projects and mining sector. The institute was also certified as an ISO 9001:2008 organization for quality management practices. The institute expanded its research base by creating Wildlife and Agro-Forestry cells to provide research inputs for wildlife management and promoting agro-forestry practices in the state.

Assignments like Environmental Impact Assessment, preparation of Environmental Management Plan, monitoring of wildlife, providing high quality certified treated seeds, forest resource accounting have added to prestige and credibility of the institute, as a frontline organization in forestry research.

Efforts are being made to transfer technologies evolved through research from lab to land, keeping in view the applied and adaptive research mandate of the institute. The awareness and exposure trainings for newly recruited forest rangers, forest guards, school and college students are being organized to promote extension of research programmes.

The institute achieved its objectives envisaged in its Annual Action Plan for the year 2015-16 by undertaking 34 research projects. During the year 2015-16, 11 projects were completed, 32 research projects were continued, 02 new projects were initiated and 14 regular activities were carried out. During this year, 27 papers were published in various journals and 29 papers were presented in various seminars and workshops, and, edited books by the scientists and research personnel of the institute were published. The institute also published 19 technical bulletins and brochures based on the findings of completed research projects with a view to make research available to stakeholders .

The institute organized the "6th Kamta Prasad Sagreiya Memorial lecture by Dr. V. Sawarkar, eminent scientist on "Landscape Approach to Conservation of Biological Diversity", on 21st March, 2016 to commemorate World Forestry Day. This event was actively attended by senior forestry professionals, scientist, academicians, researchers and ended with fruitful deliberations.

The institute organized two national seminars on "Recent advances in research and development in medicinal and aromatic plants-a country scenario" on 27th-28th November, 2015 and on "Invasive weed management in the forest and grassland of wildlife protected areas" 13th-14th February, 2016.

The institute published the Annual Research Report 2014-15, Quarterly journals 'Vaniki Sandesh' and 'Journal of Tropical Forestry', marketing information newsletter 'Vandhan' and 13 technical bulletins and 6 brochures for dissemination of technologies developed through research.

The continued encouragement and guidance provided by the learned members of the Board of Governors and the Research Advisory Committee of the institute is gratefully acknowledged. This has inspired us to achieve the goals and objectives of the institute.

Our sincere thanks and appreciation to the M.P. Forest Department and other esteemed national and state funding agencies for having reposed faith and confidence in us, which enabled us to accomplish our research objectives.

I am delighted to be associated with this premier institute and grateful to all my colleagues and peers for their sustained efforts to propel SFRI as one of the leading institution of forestry research. It is a pleasure and honour for me to present the Annual Research Report of the institute for the year 2015-16.

I sincerely hope that this Annual Research Report will help the readers to catch up with an update on the progress of the institute during the last one year. We look forward to your valuable guidance, advice, and suggestions that can help us to improve our quality and standards in achieving further progress in our future research activities.

***Dr. Dharmendra Verma, IFS
Director***



Chapter - 1

THE INSTITUTE

1.1 INTRODUCTION:

The institute came into existence on 27th June, 1963, for the scientific development of forestry sector in the state following the impetus generated by the recommendations of tenth silvicultural conference held at Dehradun in 1961. It was granted autonomy on 29th October, 1994 and was registered on 2nd August, 1995 as a society under M.P. Societies Registration Act 1973. Over the years the institute has developed as an educational, training, research and consultancy organization at the state and national level. The institute is carrying out adaptive and applied research programmes. It is dedicated to research and tropical forestry, environment and biodiversity conservation. The vision of SFRI is to function as nodal centre of research in forestry and to provide scientific support to the state and its peoples on matters related to forestry, with particular emphasis on conservation, sustainable utilization and scientific management of natural resources. The institute conducts multidisciplinary research, provides technical advice to practical problems. It also disseminates research findings through training, education, seminars, workshops, public fairs and consultancy services, technical bulletins, series of pamphlets, brochures and two quarterly journals named 'Vaniki Sandesh' and 'Van-Dhan Vyapar'. 'Vaniki Sandesh' contains papers and articles of practical importance and also on research findings of the projects of the institute which can be applied and adopted in the field. Journal of Tropical Forestry is also published from the institute campus by Society for Tropical Forestry Scientists comprising senior forest officers and scientists from the state and all over the country. The journal carries technical research papers, articles and research recommendations of forestry projects undertaken by various organizations.

The institute is located at N 23^o07'.380' latitude and E 079^o55'.923 longitude at Jabalpur in a lush green campus spread over a sprawling area of about 102 ha. The region of Jabalpur has close proximity to two major forest types, namely sal and teak forests of Madhya Pradesh and four protected areas (PA's) namely Kanha, Bandhavgarh, Pench and Satpuda. This unique location rendered it suitable for the creation of this institute here. It houses a rich infrastructure of various research and experimental plots, research nursery, ornamental nursery, clonal nursery, medicinal and aromatic plants nursery, rose garden, seasonal garden, gene-bank, glass-house, mist-chambers, shade-net houses, botanical garden, bambusetum, tissue culture, soil and seed testing laboratories along with administrative block, conference halls, lecture room, museum, herbarium, auditorium, library and documentation centre, guest house, officers' rest house, etc. The institute also has various types of residential accommodation for its employees inside the campus.

1.2 MISSION AND GOALS:

Mission:

The institute's mission is to focus its efforts on adaptive and applied research programmes for the conservation and development of forests and forestry sector in the state of Madhya Pradesh.

It endeavours to focus its activities as per the requirement of the forest development community and is engaged in need based research. The institute tries to acquire knowledge about sectoral problems in forest management and means to overcome them and disseminate the same simultaneously to the stakeholders.

Goals:

On-going research aims at:

1. Conservation of forests and forest resources - soil, water and floral and faunal diversity.
2. Enhancement of productivity of natural forests and plantations.
3. Efficient and sustainable utilization of forest resources and forest products – timber and NTFPs and expansion of tree cover.
4. Sustainable management of forests involving forest -dependent communities and people's participation



5. Mass production of high fruit yielding forest tree species through biotechnological approaches.
6. Preparation of inventory and biodiversity assessment in Madhya Pradesh.
7. Monitoring and evaluation of wildlife and their habitats.
8. Documentation of existing agro-forestry systems for different agro-climatic conditions.

1.3 THRUST AREAS:

1. Collection of quality seeds, its certification and disposal.
2. Production of quality planting material using biotechnological tools.
3. Development of micro and macro-propagation techniques.
4. Vegetational surveys to assess bio-diversity status and to identify rare and threatened species.
5. Germplasm collection, evaluation and conservation.
6. Cultivation, sustainable harvesting, processing, storage, certification and market information service for medicinal plants.
7. Collection of growth data and preparation of volume and yield tables.
8. Ecological studies and environmental impact assessment and preparation of environmental management plans.
9. Strengthening of *ex-situ* gene bank of medicinal and aromatic plants.
10. Development of botanical garden for conservation, of rare, endangered, threatened and endemic plants of MP for mass multiplication.
11. Vegetation and edaphic studies in different preservation plots, established in various forest types of MP.
12. Conservation of rare endangered and threatened (RET) species in natural condition.
13. Study on ecology & conservation of wildlife including herbivores, carnivores & avifauna of the state.
14. Protection, maintenance and successional study in terms of growth, biomass and carbon sequestration in preservation plots laid in different forest types of Madhya Pradesh.
15. Modernization and digitalization of existing forest herbarium of State Forest Research Institute, Jabalpur (M.P.).
16. Development, implementation of sustainable harvesting technologies and determination of sustainable harvesting limits of commercially important NTFPs in tribal dominated tropical forests.
17. Impact assessment of agro-forestry technologies on natural resource management and livelihoods.
18. Establishment of an advanced laboratory for molecular characterization and chemoprofiling.
19. Sustainable harvesting and primary processing of gums and gum oleo resin.
20. Screening and management of diseases of some selected important medicinal & aromatic plants.
21. Preparation of form factor table for important miscellaneous timber species of M.P.
22. Effect of various pretreatment on seed germination of fresh and stored seed of *Tectona grandis* (Teak)
23. Training on techniques of protection of sal forests affected by sal borer attack.
24. Training and extension programmes for transfer of research technologies.

1.4 MAJOR RESEARCH CONTRIBUTIONS:

The institute undertakes need-based forestry research programmes of the state and plays a dynamic role to address various forestry management problems. Some of the research contributions are enumerated below:

1. Development of high tech nursery and preparation of quality planting material of RET species for their restoration in natural forest and rural/urban areas through plantation.



2. Development of raised mother bed technology and mass multiplication of clonal plants of eucalyptus in SFRI, Jabalpur.
3. Computerization and digitization of records of sample plots situated in Madhya Pradesh.
4. Preparation of wildlife conservation plan for Jaggannathpur OCM of South Eastern Coal Field Ltd. (SECL) Bhatgaon Area, Dist. Sarguja (C.G.)
5. Development of integrated biotechnological package by genetic diversity assessment using molecular characterization, chemo-profiling, standardization of micro-propagation and cryopreservation protocol of four RET species (*Berberis aristata*, *Swertia angustifolia*, *Embelia tsjeriam-cottam*, *Saraca asoca*).
6. Quantitative determination of bioactive compounds of highly threatened medicinal plant species (*Butea superba*, *Epigeous corallocarpus*, *alectra chitrakutensis*) through chemoprofiling and standardization of propagation techniques using biotechnological interventions for their conservation.
7. Standardization of seed and nursery techniques for production of quality planting stock of important indigenous species (*Terminalia chebula*, *Terminalia bellirica*, *Adina Cordifolia*, *Sapindus trifoliatus*, *Adunsonia digitata*).
8. The scheduled tribes and other traditional forest Dwellers (Recognition of Forest Right Act, 2006) Implementation and its impact in Madhya Pradesh.
9. Social Impact Assessment (SIA), Environment Impact Assessment (EIA), Bio-diversity (BO) study and identification of High Conservation Value Forest (HCVF) of Barghat & Lamta project division plantation of MPRVVN Ltd.
10. Estimation of wood demand and supply in M.P.
11. Impact of tourism on environmental, ecological and socio-economics dynamics in around the tiger reserves of Madhya Pradesh.
12. Study on agricultural crop damage by wildlife animals and its management in Hoshangabad circle of Madhya Pradesh.
13. Role of Management Interventions in Wildlife Habitat Improvement on Abandoned Sites of Satpura Tiger Reserve, Madhya Pradesh
14. Study of comparison of soil cultural produces in existing bamboo (*D. stictus*) plantation project.
15. Study to ascertain causes of mortality in teak trees in different regions of M.P.
16. Preparation of volume and yield tables of several species.
17. Revision of form factors of teak and sal in different forest divisions of M.P.
18. Identification and collection of germplasm from plus trees.
19. Inventory of forest flora and plant resources with emphasis on rare and threatened species in various National Parks with special reference to wildlife management.
11. Cryogenic preservation of germplasm of endangered medicinal plant species.
12. Study of socio-economic aspects of forestry, emphasizing economics of non-timber forest products, medicinal and aromatic plants and studies on dependency of tribals on forests for fuel and fodder.
13. Environmental impact assessment and preparation of environmental management plan of irrigation and power generating projects.
14. Standardization of protocols for micro propagation of endangered medicinal plant species of central India and their cryogenic preservation for future multiplication.
15. Development of integrated insect pest and disease control system for major economically important tree species.
16. Assessment of sal regeneration in borer affected sal forests of Madhya Pradesh.
17. Germplasm evaluation of important medicinal plants through chemo-profiling technique.
18. Wildlife conservation plan for the areas being diverted for developmental projects.
19. Protection, maintenance and successional study of growth biomass and carbon sequestration in different forest types of MP.



20. Development of packages of seed techniques for important forest tree species.
21. Development of nursery techniques and models for plantation of rare endangered and threatened (RET) species in natural condition.
22. *Ex-situ* conservation of medicinally important wild tuberous /rhizomatic plants and studies on their phenology and growth performance.
23. Studies on photosynthetic efficiency, biomass production and carbon sequestration of bamboo in plantation forests.
24. Development of technology for conservation and sustainable management of wild medicinal plants and NTFPs through community participation in Shahdol forest circle of Madhya Pradesh.
25. Standardization of Seed and Nursery Techniques for Production of Quality Planting Stock of Important Indigenous Species.

1.5 ADMINISTRATION:

The administration of the State Forest Research Institute Society is governed by a Board of Governors, which is constituted by the following members:

1.	Honorable Minister of Forests, Forest Department, Govt. of M.P., Bhopal	Chairman
2.	PCCF & HoFF, Madhya Pradesh, Bhopal	Vice Chairman
3.	Addl. Chief Secretary, Dept. of Forests, Govt. of M.P. , Bhopal	Member
4.	Principal Secretary, Dept. of Finance, Govt. of M.P. , Bhopal	Member
5.	PCCF (Wild Life) M.P., Bhopal	Member
6.	Managing Director, M.P. Forest Development Corporation, Bhopal	Member
7.	Managing Director, M.P. Minor Forest Produce (Trade and Development) Federation, Bhopal	Member
8.	Director General, Indian Council of Forestry Research & Education Dehradun, Bhopal	Member
9.	Director, Wildlife Institute of India, Dehradun	Member
10.	PCCF, (Working Plan), MP, Bhopal	Member
11.	PCCF/APCCF (R/E & Lok Vaniki) M.P. , Bhopal	Member
12.	Director General, MP Council of Science & Technology, Bhopal	Member
13.	Shri A. P. Diwedi, PCCF (M.P.), Retd	Member (Nominated by Govt. of MP)
14.	Prof. N. N. Pathak, Head Department of Forestry JNKVV, Jabalpur	Member (Nominated by Govt. of MP)
15.	Director, State Forest Research Institute, Jabalpur	Member Secretary & Treasurer



1.6 RESEARCH ADVISORY COMMITTEE:

The Research Advisory Committee of the institute comprising eminent forest officers and stakeholders examines and approves the project proposals of the institute, evaluates their progress and results and also monitors the quality of research. The committee comprises of the following members:

1.	Principal Chief Conservator of Forests & HoFF, M.P.	Chairman
2.	P.C.C.F. (Wildlife), M.P.	Member
3.	P.C.C.F (Working Plan), M.P.	Member
4.	A.P.C.C.F.(Development), M.P.	Member
5.	A.P.C.C.F. (M.P. Forestry Project), M.P.	Member
6.	P.C.C.F. (Production), M.P.	Member
7.	PCCF/APCCF (Research and Extension), M.P.	Member
8.	Director General, MPCOST, Bhopal	Member
9.	Managing Director, M.P.R.V.V.N, Bhopal	Member
10.	Managing Director, M.P.M.F.P. Federation, Bhopal	Member
11.	Director, T.F.R.I, Jabalpur	Member
12.	Director, I.I.F.M., Bhopal	Member
13.	Director (Research), JNKVV, Jabalpur	Member
14.	Head, Bioscience Division, R.D.V.V, Jabalpur	Member
15.	CCF (Central Circle), Jabalpur	Member
16.	DFO (Territorial), Jabalpur	Member
17.	Director, Horticulture, Govt. of M.P.	Member
18.	Dean, Veterinary and Animal Husbandry, JNKVV, Jabalpur	Member
19.	Representative of an NGO	Member
20.	APCCF/CCF, NCL, Singrauli	Member
21.	Representative of traders of forest based products	Member
22.	Representative of forest based industries	Member
23.	Farmers' representative	Member
24.	Director, S.F.R.I., Jabalpur.	Member Secretary

1.7 ORGANIZATION:

S.No	Forestry Professionals	Sanctioned	Working
1	Director (PCCF/APCCF/CCF)	1	1
2	Addl. Director (CCF/CF)	1	1
3	Deputy Director (CF/Dy.CF)	4	2



4	Assistant Director (ACF)	3	3
5	Forest Ranger	1	1
6	Dy. Ranger	1	2
7	Forester	8	8
8	Forest Guard	10	9
	Total	29	27
	Scientist		
1	Forest Ecology Scientist (Scientist-F)	1	1
2	Forest Genetics Specialist (Scientist-E)	1	1
3	Seed Specialist (Scientist-E)	1	1
4	Tree Improvement Specialist	1	0
5	Forest Botanist (Scientist-E)	1	1
6	Biodiversity Scientist	1	0
7	Marketing Specialist (Scientist-E)	1	1
	Total	7	5
	Technical		
1	Statistical Assistant (Sr. Research Officer)	1	1
2	Technical Assistant (Social–economics), (Sr. Research Officer)	3	1
	Technical Assistant (Contingency)		2
3	Technical Assistant (Forestry Research), (Sr. Research Officer)	9	6
	Technical Assistant		2
4	Technical Assistant (Consultancy/Extension), (Sr. Research Officer)	1	1
5	Technical Assistant (Library), (Sr. Research Officer)	1	1
6	Technical Assistant (Documentation) (Sr. Research Officer)	1	1
7	Technical Assistant(Computer) (Sr. Research Officer)	1	1
8	Lab. Technician, (Sr. Research Officer)	7	1
	Lab. Technician		1
9	Lab Incharge, (Sr. Research Officer)	3	1
10	Ledger Assistant (Research Officer)	3	1
	Ledger Assistant		1
11	Herbarium Assistant (Contingency)	1	1



12	Lab Assistant	3	1
13	Field Assistant	3	3
	Total	37	25
	Non-Technical		
1	Head Clerk	1	0
2	Accountant	1	0
3	Assistant grade – II	1	1
4	Assistant grade – III	4	3
5	Driver	6	5
6	Daftari	4	2
7	Peon/ Orderlies	7	5
8	Chowkidar	2	1
9	Mali	3	1
10	Dak Runner	2	1
11	Khalasi	1	0
12	Sweeper	2	1
	Total	34	20

1.8 WORKING BRANCHES OF THE INSTITUTE:

Forestry research in the institute is categorized in 12 broad areas. They are as follows :

1. Biodiversity and Medicinal Plants
2. Forest Botany
3. Forest Ecology and Environment (EIA Cell)
4. Forest Genetics, Plant Propagation and Biotechnology
5. Forest Mensuration and Statistics
6. Silviculture
7. Seed
8. Social Economics and Marketing
9. Tree Improvement
10. Wildlife
11. Agro-Forestry
12. Extension, Consultancy and Training
13. Library and Documentation
14. Computers and Information Technology



Chapter – 2
IMPORTANT RESEARCH PROGRAMMES

The mandate of the institute is to provide scientific technical support to the M.P. forest department and various forestry related institutions, as well as other stakeholders and forestry sector as a whole, in the state. In order to achieve this objective, the institute has undertaken various research programmes, monitoring and evaluation and extension activities. The important amongst them can be broadly classified as under:

A. Ecology and Biodiversity Conservation:

1. Development of nursery techniques and models for plantation of rare endangered and threatened (RET) species in natural condition.
2. Impact assessment on wild life habitat and assessment of biological diversity.
3. Enrichment of herbarium and development of electronic data base.
4. Environmental impact assessment of development projects and preparation of environmental management plans.
5. Ecological studies in natural regeneration of sal and grasslands of national parks with special reference to wildlife management.
6. Documentation of traditional knowledge of local tribal & communities of Malwa eco region of M.P.
7. Development of high tech nursery and preparation of quality planting material of RET species for their restoration in natural forest and rural/urban areas through plantation.
8. *Ex-situ* conservation of medicinally important wild tuberous / rhizomatic plants and studies on their phenology and growth performance.
9. Development of technology for conservation and sustainable management of wild medicinal plants and NTFPs through community participation in Shahdol Forest Circle of Madhya Pradesh.
10. Environment Impact Assessment and Environmental Management of cluster of sand mines in Madhya Pradesh.
11. Up-gradation of laboratory under EIA/EMP cell for water, air and noise pollution analysis in environmental impact assessment projects.
12. Studies on photosynthetic efficiency, biomass production and carbon sequestration of bamboo in plantation forests.

B. Silviculture and Forest Management:

1. Development of raised mother bed technology and mass multiplication of clonal plants of eucalyptus in SFRI, Jabalpur.
2. Preparation of wildlife conservation plan for Jaggannathpur OCM of South Eastern Coal Field Ltd. (SECL) Bhatgaon Area, Dist. Sarguja (C.G.)
3. Ecological studies on Grasslands of Bandhavgarh Tiger Reserve with special reference to wildlife management.
4. Impact assessment on flora fauna wildlife and its habitat in the area being diverted for extension of manganese ore underground mining of M/s J.K. Minerals Dist. Balaghat in Madhya Pradesh.
5. Network Project on Conservation of Lac insect Genetic Resources.
6. Assessment of sal regeneration in borer affected sal forests of Madhya Pradesh.
7. Evaluation of works of forest development authority and infrastructural developmental works in forest villages of Madhya Pradesh Forest Department.
8. Enhancement of flowering in Mahua using various treatments with hormones and fertilizers.
9. Development of nursery and planting techniques of economically important indigenous species.



10. Development of integrated insect pest and disease control system for major economically important tree species.
11. Resource assessment of NTFPs in People's Protected Areas (PPA's).
12. Study on felling cycles of *Dendrocalamus strictus*.
13. Analysis of soil samples.
14. Estimation of carrying capacity of grazing in different forest types and canopy density in M.P.
15. Identification and documentation of plus trees of important tree species.
16. Digitization of old records of M.P. Forest Department and forestry research.
17. Studies on screening and management of diseases of some selected important medicinal & aromatic plants.
18. DNA based monitoring of presence of tiger and their movements in the Kanha Pench corridor of Madhya Pradesh.
19. Survey of existing Barahsingha & Blackbuck habitat evaluation for habitat viability assessment for Kanha Tiger Reserve and Satpura Tiger Reserve.
20. Monitoring and evaluation of wildlife and their habitats for sustainable management and development in the protected areas of MP.
21. Impact of tourism on environmental, ecological and socio-economics dynamics in around the tiger reserves of Madhya Pradesh.
22. Study on agricultural crop damage by wildlife animals and its management in Hoshangabad circle of Madhya Pradesh.
23. Protection maintenance and growth study of dominant tree species for estimation of biomass and carbon sequestration in preservation plots laid in different forest types of MP.
24. Documentation of traditional knowledge of local tribal and communities of Malwa eco-region of Madhya Pradesh - Neemuch and Ratlam districts.
25. Integrated management of diseases of economically important tree species Dhawada, Bija and Achar occurring in forests of M.P.
26. Causes and remedial measures of sal mortality (*Shorea robusta*) in forest areas of M.P.
27. Study of comparison of soil cultural produces in existing bamboo (*D. strictus*) plantation project

C. Seed Technology:

1. Studies on quality seed production and germination behaviour of teak seeds in relation to age and size.
2. Collection, processing, testing, certification and supply of quality seeds of various forest species.
3. Development of seed technology and nursery techniques for some economically important indigenous species.
4. Seed certification.
5. Development of packages of seed techniques for important forest tree species.
6. Documentation of developed Seed Technology, Nursery and Planting Techniques of Important Forestry tree Species Particularly of Economic, MFP and Medicinal Value.
7. Standardization of seed and nursery techniques for production of quality planting stock of important indigenous species (*Terminalia chebula*, *Terminalia bellirica*, *Adina Cordifolia*, *Sapindus trifoliatus*, *Adunsonia digitata*).



D. Forest Mensuration and Biometrics:

1. Revision of form factors table for important miscellaneous timber tree species of Madhya Pradesh.
2. Maintenance of sample plots, tree increment plots and linear tree increment plots and their periodic growth measurements.
3. Preparation of volume and yield tables.
4. Computation of form factors for timber and fuel wood production.
5. Establishment of new sample plots in coppice crop and plantation areas.
6. Revision of form factors of teak and sal in different regions of Madhya Pradesh.
7. Preparation of growth tables for coppice origin plants of important miscellaneous species in Madhya Pradesh.

E. Genetics, Plant Propagation and Tree Improvement:

1. Development of integrated biotechnological package by genetic diversity assessment using molecular characterization, chemoprofiling, standardization of micropropagation and cryopreservation protocol of four RET species.
2. Quantitative determination of bio-active compounds of highly threatened medicinal plant species through chemoprofiling and standardization of propagation techniques using biotechnological interventions for their conservation
3. Selection of superior races of Khamer (*Gmelina arborea*) through clonal propagation.
4. Production of superior quality plants of different species for distribution to forest department, forest dependent communities and other people of Madhya Pradesh.
5. Germplasm evaluation of important medicinal plants through chemo-profiling technique and production of quality planting stock through improved biotechnological tools.
6. Determination of the optimum harvesting time on the basis of alkaloid contents of identified medicinal plants.
7. Cryogenic preservation of germplasm of medicinal plants for future breeding purposes.
8. Genetic diversity assessment of *Boswellia serrata* and standardization of micro clonal propagation protocols through biotechnological interventions for the production of elite planting material.
9. Standardization and multiplication of clonal propagation protocol for commercially important forestry species *Anogeissus pendula*.
10. Clonal multiplication of *Dendrocalamus asper* (Thailand bamboo) through micropropagation technique.

F. Non-Wood Forest Products (including medicinal plants):

Ex-situ conservation

1. *Ex-situ* conservation of medicinally important wild tuberous /rhizomatic plants and studies on their phenology and growth performance.
2. *Ex-situ* conservation of important rare and endangered medicinal plant species, through establishment of gene-bank and their mass propagation.

Sustainable harvesting

1. Sustainable harvesting practices, propagation, tree improvement, wildlife uses, marketing and consumption status of Non-Timber Forest produce and medicinal plants.
2. Determination of sustainable harvesting limits of commercially important wild medicinal plant species in natural forests with active participation of user forest dependent communities.
3. Sustainable harvesting and primary processing of gums and gum oleo resin in Madhya Pradesh.
4. Sustainable livelihood based management plan for Kuno-Palpur wildlife sanctuary of Madhya Pradesh.



Processing, Storage and Marketing

1. Development of marketing information service of medicinal plants.
2. Standardization of primary processing and drying techniques of NWFPs.
3. Development of seed storage techniques.
4. Strengthening of MIS cell and establishment of five regional market data collection and analysis centers in Madhya Pradesh.

Certification

1. Chemoprofiling of *Commiphora wightii*, *Andrographis paniculata* and *Bacopa monneri* *Aloe vera*, *Gymnema sylvestre*, *Gloriosa superba*, *Stevia rebaudiana*, *Encostema littorale* (Chhota chirayta).
2. Seed certification

G. Ethno-botanical studies:

1. Documentation of ethno-botanical information on natural gum and resin yielding plants of Madhya Pradesh.
2. Documentation of traditional knowledge of local tribal and communities of Malwa eco-region of Madhya Pradesh - Neemuch and Ratlam districts.
3. Documentation of traditional tribal knowledge on utilization and sustainable management of forest resources in tribal belt of Mandla and Dindori districts.

H. Socio-economic studies and impact assessment:

1. म.प्र. में प्रमुख गोंदों के संग्रहण के आंकड़ों का संकलन एवं प्राथमिक संग्राहकों पर सामाजिक आर्थिक प्रभाव।
2. Valuation of forest resources and its accounting.
3. Collection of data regarding important gums of Madhya Pradesh and its impact on the socio-economic condition of its collectors.

I. Transfer of technology:

1. Training on technical know how of gum tapping from *Butea monosperma* in Umaria and Tikamgarh districts to local people and frontline staff of forest department.
2. Training on protection of forest from sal borer in Madhya Pradesh.
3. Extension of "Results of various research projects conducted at SFRI", through workshops to the field staff and beneficiaries.
4. Training on biotechnology, plant propagation and tissue culture.
5. Training-cum-demonstration program in cultivation, processing and marketing of medicinal and aromatic plants.
6. Trainings for the staff of forest department in the maintenance of seed orchards and seed production areas.
7. Training on sustainable harvesting, processing, grading and storage of Salai gum Oleo resin and Dhaora gum in Sheopur district.
8. Participation in exhibitions and fairs.



Chapter – 3
RESEARCH ACTIVITIES
Abstract of Research Activities

2015-2016

S. N.	Name of the Research Branch	No. of completed projects		No. of on-going projects		No. of newly initiated projects		No. of regular activities
		External Projects	Internal Projects	External Projects	Internal Projects	External Projects	Internal Projects	
1	Biodiversity and Medicinal Plants	-	-	6	-	-	1	1
2	Forest Botany	-	-	3	-	-	-	1
3	Forest Ecology and Environment	2	-	6	1	-	-	-
4	Forest Genetics, Plant Propagation and Biotechnology	1	-	3	-	1	-	1
5	Forest Mensuration & Statistics	1	-	-	-	-	-	1
6	Seed Technology	3	-	1	1	-	-	1
7	Silviculture	-	-	1	1	-	-	1
8	Social Economics and Marketing	2	-	2	-	-	-	-
9	Tree Improvement	1	-	1	-	-	-	8
10	Wildlife	1	-	5	-	-	-	-
11	Agro-Forestry	-	-	1	-	-	-	-
	TOTAL	11	-	29	3	1	1	14



3.1 BIO-DIVERSITY BRANCH

Mandate

1. Biodiversity assessment in forest areas of Madhya Pradesh.
2. Identification of rare and threatened plant species and their *in-situ* and *ex-situ* conservation.
3. Survey of medicinal plants.
4. Mass multiplication and development of agro-techniques of commercially important medicinal plants.

Staff

Dr. Uday Homkar	:	Sr. Research Officer
Dr. S. K. Masih	:	Sr. Research Officer
Mr. Arvind Haldkar	:	Forester

Project Staff

Mr. Kundan Sharma	:	Research Fellow
Mr. Imrat Sen	:	Research Fellow
Miss. Tanvi Telang	:	Research Fellow

Completed projects

Internally funded: Nil

Externally funded: Nil

Ongoing Projects

Internally funded: Nil

Externally funded: Six

1. Development of nursery techniques and models for plantation of rare, endangered and threatened (RET) species in natural conditions.
2. Up-gradation and Renovation of Forestry museum at State Forest Research Institute, Jabalpur.
3. *Ex-situ* conservation of medicinally important wild tuberous /rhizomatic plants and studies on their phenology and growth.
4. Development of cultivation techniques of Van jeera (*Centrantherum anthelminiticum* (L) Kantze).
5. Documentation of ethno-botanical information on natural Gum and resin yielding plants of Madhya Pradesh.
6. Documentation of traditional knowledge of local tribal and communities of Malwa eco region of Madhya Pradesh - Neemach and Ratlam districts.

Newly initiated projects during the year

Internally funded: One

1. ग्लेरीसिडिया सेपियम की कटिंग द्वारा रोपण तकनीक का विकास।

Externally funded: Nil

Regular Activities

Ongoing: One

1. औषधीय पौधों के जीन बैंक एवं रोपणी का प्रबंधन एवं विकास।

Projects completed during the year

Internally funded: Nil

Externally funded: Nil

Ongoing projects

Internally funded: Nil



Externally funded: Six

1. Title - Development of nursery techniques and models for plantation of rare, endangered and threatened (RET) species in natural conditions.

I.D. No. : BD/P/E/10-11/08
Period : 5 Years (November, 2010 – October, 2015)
Sponsoring agency : MPMFD, (Research/Extension & Lok Vaniki) M.P. Bhopal.
P.I. : Dr. Uday Homkar
Project fellow : Miss Tanvi Telang
: Shri Imrat Sen

Objectives:

- To develop nursery techniques for important RET species namely *Bauhinia vahlii* (Mahul), *Barbaris aristata* (Daru Haldi), *Oroxylum indicum* (Sheonak), *Dillania pentagyna* (Kalla), *Semecarpus anacardium* (Bhilwa), *Randia dumetorum* (Menhar), *Radermachera xylocarpa* (Garudphal), *Dioscoria daemona* (Baichandi), *Gloriosa superba* (Kalihari), *Leea macrophylla* (Hathpan).
- To find out suitable time and method of collection of seed/planting material for preparation of plants of R.E.T. species.
- To develop models for plantation of R.E.T. species in natural condition.
- To create awareness among the field staff by disseminating the developed technology regarding these selected species.

Activities carried out during the year:

- *Bauhinia vahlii* (Mahul) and *Dioscorea daemona* (Baichandi) were tried to multiply through seeds by giving presowing treatments.
- Plantation of *Randia dumetorum* (Mainhar), *Berberis aristata* (Daruhaldi), *Bauhinia vahlii* (Mahul) and *Entada scandens* (Devsiyari) is raised at Amarkantak under the project.
- Other than these targeted species under project, *Entada scandens* (Devsiyari), *Bombax ceiba* (Yellow Semal) and *Stereospermum chelonoides* (Padhar) were also tried to multiply through various methods.
- Experiments of suitable media identification for *Bauhinia vahlii* (Mahul), *Dioscorea daemona* (Baichandi), *Bombax ceiba* (Semal) and *Stereospermum chelonoides* (Padhar) was laid.
- A repeated experiment was laid to find out the rooting response in cuttings of *Berberis aristata* (Daruhaldi).

Following experiments were laid during the year

(A) Experiment 1: Standardization of mass multiplication technique of targeted species viz. *Bauhinia vahlii* (Mahul), *Dioscorea daemona* (Baichandi), *Entada scandens* (Devsiyari), *Stereospermum chelonoides* (Padhar) and *Bombax ceiba* (Semal) through seeds.

Methodology:

- Experiments were laid in seed germination tray, inside the green net house.
- Seeds were treated with different agents like cold water, hot water, acid etc. as shown in following table.



Layout of experiment

Treatments	Replicates
H ₂ SO ₄ 10%	3
H ₂ SO ₄ 20%	3
H ₂ SO ₄ 30%	3
H ₂ SO ₄ 40%	3
GA3 100ppm	3
GA3 200 ppm	3
GA3 300 ppm	3
GA3 400ppm	3
GA3 500ppm	3
Cold water 12hrs.	3
Cold water 24hrs	3
Hot water 12hrs	3
Hot water 24hrs	3
Control	3

Interim Findings

- An average value of seed germination in controlled condition was recorded to be 77.3 % in *Bauhinia vahlii*, 99% in *Dioscorea daemona*, 13.3% in *Entada scandens*, 84.6% in *Bombax ceiba* respectively.
- Observation envisaged that the maximum seed germination in *Bauhinia vahlii* (100%) in different concentrations of GA3 solution i.e. GA3 200 ppm, GA3 300 ppm, GA3 400 ppm and GA3 500 ppm against the control and other treatments.
- In case of *Dioscorea daemona*, the maximum germination was obtained in the control (99%) as compared to other pre treatments applied.
- In case of *Entada scandens*, the pre sowing treatment of hot water for 24 hours was found to be the most suitable for maximum seed germination against the control and other pre treatments. The maximum germination was recorded to be 56.6 %.
- In case of *Bombax ceiba*, the pre-treatment of cold water for 24 hours was found to be the most suitable for seed germination against the control. The maximum seed germination by treating seeds with the above pre-treatment was recorded to be 100 %.

(B) Experiment 2: To find out suitable media for seed germination of *Bauhinia vahlii* (Mahul), *Dioscorea daemona* (Baichandi), *Entada scandens* (Devsiyari), *Bombax ceiba* (Semal) and *Stereospermum chelonoides* (Padhar).

Methodology:

- Experiments were laid in seed germination tray, inside the green net house.
- Different types of media used for the experiment as given in the experiment

Media (Treatment)	Composition	Replicates
Soil (Kapu soil)	1	3
Sand	1	3
FYM	1	3
Soil: Sand: FYM	1:1:1	3



Interim findings:

It was observed that the maximum seed germination percent was found in pure sand media in case of *Dioscorea daemonia* and *Bombax ceiba* with maximum seed germination of 67% and 98% respectively. In case of *Bauhinia vahlii* and *Stereospermum chelonoides* the maximum seed germination percent was found in FYM media i.e. 33.3% and 20% respectively.

It is evident from the observation from the experiments, that the seed germination media of sand is suitable for maximum seed germination in *Dioscorea daemonia* and *Bombax ceiba*. However, in case of *Bauhinia vahlii* and *Stereospermum chelonoides*, the seed germination media of FYM is suitable for maximum seed germination.

(C) Experiment 3: To find the rooting response in stem cuttings of *Berberis aristata* (Daruhalidi)

Observations: It was observed that the cuttings treated with IBA 250 ppm gives good rooting response as compared to control and other treatments.

(D) Development of plantation model of RET species :

- Plantation of four species viz. Mainhar, Mahul, Devsiyari and Daruhaldi is raised at Amarkantak.
- Spacing of 1X1 m, 2X2m and 3X3 m were taken for the plantation.

Plants available in medicinal plant nursery:

Plants prepared during the experimentation were planted in poly bag. Following plants of RET species are available in nursery.

Sp. Code	Species	Local Name
1	<i>Oroxylum indicum</i>	Sheonak
2	<i>Dillania indica</i>	Kalla
	<i>Dillania pentaphylla</i>	Karkat
3	<i>Grevia asiatica</i>	Falasa
4	<i>Stereospermum suaveolens</i>	Garudphal
6	<i>Berberis aristrata</i>	Daru Haldi

(On demand, plants can be prepared in large number)

Current status of the project: Ongoing

2. Title: Up-gradation and Renovation of Forestry museum at SFRI, Jabalpur.

I.D. No. : BD/P/E/11-12/18
Sponsoring Agency : 13th Finance Commission (M.P.F.D. Development Wing)
PI : Dr Uday Homkar

Objectives:

- To up-grade and renovate the existing museum of SFRI.

Progress:

- As per direction of BOG, work is retendered.
- Civil works and electrical works completed.
- English and Hindi write-ups finalised.

Current status of the project: Ongoing



3. Title : *Ex-situ conservation of medicinally important wild tuberous/rhizomatic plants and studies on their phenology and growth performance.*

I.D. No. : BD/P/E/13-14/05
Period : April 2013 – March. 2016. (Extended up to March 2017)
Sponsoring agency : MPMFD, (Research/Extension & Lok Vaniki) Bhopal, (M.P.)
P.I. : Dr. Uday Homkar
Project fellow : Shri Kundan Sharma

Objectives:

- To identify the medicinally important wild tuberous/rhizomatic plants of Madhya Pradesh.
- Collection and *Ex-situ* conservation of these tuberous/rhizomatic plants in gene bank medicinal of SFRI.
- To study the phenology and growth performance of these plants.
- To study the harvesting technique as well as maturity period of harvesting.
- To develop a demo-herbal garden of these tuberous plants and for *Ex-situ* propagation.

Activities carried out:

- 82 tuberous/rhizomatic plants have already been collected and planted in demonstration plots under the project.
- Phenological study of these species is in progress.

Current status of the project: On going

4. Title: *Development of cultivation techniques of Van jeera (Centrantherum anthelminiticum (L) Kantze).*

I.D. No. : BD/P/E/13-14/16
Period : January 2014 – December 2015 (extended upto Dec. 2016)
Sponsoring agency : MPMFD, (Research/Extension & Lok Vaniki) M.P. Bhopal
P.I. : Dr. Uday Homkar

Objectives:

- Development of cultivation techniques of Van jeera (*Centrantherum anthelminiticum (L) Kantze*)

Progress:

Due to climatological problem growth of the plants were not satisfactory, so all experiments will be repeated this year.

Current Status of the project: On going

5. Title: *Documentation of ethno-botanical information on natural gum and resin yielding plants of Madhya Pradesh.*

I.D. No. : BD/P/E/2013-14/17
Period : April 2014 - March. 2016
Sponsoring agency : MPMFD, (Research/Extension & Lok Vaniki) MP Bhopal
P.I. : Dr. S. K. Masih
Project staff : Mrs. Ruby Rai Duggal
: Ms. Sangeeta Paroha



Objectives:

- Collection of secondary information from various information centers.
- To make an inventory of gums and resins yielding plants of Madhya Pradesh.
- To prepare a data base of ethno-botanical information of gums and resins yielding plants of Madhya Pradesh.

Activities carried out during the year:

- More than 525 research papers, reports, documents, books, etc. from different documentation centers and libraries such as SFRI, TFRI, JNKVV, RDVV, Jabalpur (M.P.) were reviewed for document the ethnobotanical information of these gum and resin yielding plant species of Madhya Pradesh.
- Total 425 plant species of gum and resin yielding plant were scrutinized from India. A total of 129 plant species of gum and resin yielding plants were scrutinized from Madhya Pradesh.
- The complete data sheet with the information such as botanical name, family name, local/vernacular/trade name, distribution, morphological characteristics, ethnobotanical knowledge, habit wise status and part wise utilization of these gums yielding plant species of Madhya Pradesh is under preparation.

Important findings / interim findings, if any

- Preparation of final report under progress

Current status of the project - On-going

6. Title: Documentation of traditional knowledge of local tribal and communities of Malwa eco region of Madhya Pradesh - Neemach and Ratlam districts.

I.D. No.	: BD/P/E/13-14/19
Period	: April 2014-March 2016
Sponsoring agency	: MPCOST, Bhopal
P.I.	: Dr. S. K. Masih
Project staff	: Ms. Smita Rajput

Objectives:

- To carryout ethnobotanical survey of local tribe, villagers, communities in Neemach and Ratlam districts of Malwa eco region.
- To enlist and identify plants species of different habitats, families, groups having traditional knowledge with reference to medicine, food and multipurpose plant categories.
- Survey of existing local primary weekly markets to catalogue plants, plants parts and their products available during different season.

Activities carried out during the year.

- Collection of secondary data has been done through review of published and unpublished literature like reports, papers, documents, books, etc. from different documentation centers and libraries such as SFRI, TFRI, JNKVV, RDVV, Jabalpur (M.P.).
- The primary survey work for the collection of traditional knowledge of local tribal and communities have been carried out in 30 villages of Neemach and Ratlam districts of Madhya Pradesh.
- In each village resource person, knowledgeable medicine personal and local villagers have been interviewed personal and in focused group discussion through PRA exercise.
- On the basis of above field exercises the traditional knowledge of more than 204 plant species were recorded with botanical name, family name, vernacular and local names, part(s) used and folk / traditional uses.



- Simultaneously local existing primary markets of the study sites were also visited during field survey. An inventory of available medicinal plant species, NTFPs and their parts and products, etc. sold for their household income in these markets was made.

Current status of the project - On-going

Newly initiated projects during the year

Internally funded: One

1. **Title:** - *Xyj hfl fM; k l fi ; e dh dfVx }kjk jks .k rduhd dk fodkl A*

ID. No.	:	BD/P/I/15-16/05
Period	:	15 months (Sept., 2015 – Dec., 2016)
Sponsoring agency	:	Internal
P.I.	:	Dr. Uday Homkar

młs ; %

- ग्लेरीसिडिया सेपियम के रोपण हेतु विभिन्न आकार की कटिंग का चयन करने हेतु विभिन्न मोटाई की कटिंग का चयन किया गया। इन कटिंग को विभिन्न समुह में बाटा गया जैसे. 5–10, 11–15, 16–20, 21–25 एवं 26 से 30 से.मी.। इन समुह के एक भाग को IBA के 500ppm के घोल से 10 मिनट के लिये का उपचारित किया गया।
- अक्टुबर माह मे 30 से.मी. लंबे, 30 से.मी. चौडे एवं 60 से.मी. गहरें गड्ढे कर उसमे कटिंग लगायी गयी।

Ákj fHkd ij h.kke% 26 से 30 से.मी. आकार की कटिंग में से तीन स्थापित हो गयी है।

fjekd% इस वर्ष जून माह मे कटिंग पुनः लगायी जावेगी।

Current status of the project - On-going

Regular Activities

Ongoing: One

1. **Title:** - *VkSk/kh; i kSkka ds thau cfd , oa jks .kh dk i ca/ku , oa fodkl A*

ID. No.	:	BD/RA/I/01
Period	:	One year
Sponsoring agency	:	SFRI
P.I.	:	Dr. Uday Homkar

młs ; %

- जीन बैंक एवं औषधीय पौध रोपणी/उत्पादन क्षेत्र का प्रबंधन एवं विकास।
- औषधीय प्रजातियों की मातृ पौध तैयार करना।
- औषधीय प्रजातियों का संरक्षण एवं जीन बैंक का सुदृढीकरण एवं विस्तार।
- सर्पगंधा, कालमेघ, काली हल्दी, तीखुर एवं केवकंद का मातृ पौध क्षेत्र तैयार करना।
- आर.ई.टी. (R.E.T) प्रजातियों का संरक्षण एवं विस्तार।

ixfr%

- जीन बैंक में संरक्षित औषधीय पौधों की प्रजातियों : 425
- औषधीय प्रजातियों का संरक्षण एवं जीन बैंक क्षेत्र का सुदृढीकरण एवं विस्तार किया गया।
- मसाला वाटिका, नक्षत्र वाटिका, नवग्रह वाटिका, सर्पगंधा, काली हल्दी, तीखुर एवं केवकंद का मातृ पौध क्षेत्र तैयार किये गये।



3.2 FOREST BOTANY BRANCH

Mandate :

1. Maintenance and development of botanical garden.
2. Maintenance and development of forest herbarium.
3. Documentation and inventorization of plant diversity in natural forests of Madhya Pradesh.
4. Phenological studies of forest species
5. Carbon sequestration and climate change.

Staff

Dr. O.P. Chaubey	:	Scientist 'E' and Branch Head
Dr. Awadhesh Sharma	:	Sr. Research Officer
Shri Jatashanker	:	Technical Assistant

Project Staff:

Mohd Asif Mansoori	:	Project Assistant cum Data Entry Operator
Smt. Pragya Diwedi	:	Project Assistant
Suresh Prasad Charmkar	:	Junior Research Fellow

Completed projects during the year

Internally funded : Nil

Externally funded : Nil

Ongoing projects during the year:

Internal Funded : Nil

Externally Funded : Three

1. Protection, maintenance and successional study in terms of growth, biomass and carbon sequestration in preservation plots laid in different forest types of Madhya Pradesh.
2. Sustainable livelihood based management plan for Kuno-Palpur wildlife sanctuary of Madhya Pradesh.
3. Studies on photosynthetic efficiency, biomass production and carbon sequestration of bamboo in plantation forests.

Newly initiated project during the year

Internally funded : Nil

External funded : Nil

Regular Activities

Internally funded : One

1. Development and maintenance of botanic garden of SFRI.

Externally funded : Nil

Ongoing project during the year

Externally funded : Three



1. Title: Protection, maintenance and successional study in terms of growth, biomass and carbon sequestration in preservation plots laid in different forest types of Madhya Pradesh.

Project ID : BOT/P/E/11-12/07
Project period : 5 years (April 2011 – March 2016)
Sponsoring Agency : M.P. Forest department (Land Management)
Principal Investigator : Dr. O.P. Chaubey
Co-PI : Dr. A.K. Sharma

Objectives:

- Demarcation, barbed wire fencing and erection of boards in 39 preservation plots.
- Collection of growth data of naturally occurring miscellaneous dominant tree species in different preservation plots established in different forest types of Madhya Pradesh.
- Estimation of biomass accumulation and rate of carbon sequestration of dominant tree species and soil in different forest types/ preservation plots.

Activities carried out during this year:

- Barbed wire fencing completed in all the preservation plots excepted in Alirajpur and Hoshangabad forest division.
- Boards erected in all the 36 preservation plots except Bandhavgarh Tiger reserve and Bori WLS.
- Survey, demarcation and numbering of trees in all preservation plots were completed.
- Monitoring/recording of growth data and data base computerization.
- Secondary data collection of growth data, regeneration survey, biomass study, collection of soil/litter samples have been completed for 13 preservation plots viz; Narsinghpur (Gadarwara), Dewas (Udainagar), South Seoni (Kurai), Noradehi Wildlife Sanctuary (Mohli), Datia (Goraghat), South Sagar (Garhakota), North Sagar (Khurai), North Sagar (Khurai), Shivpuri (Pohri), Guna (Guna), Guna (Raghavgarh), Guna (North Guna), Datia (Seonda) forest divisions and data base computerized.

Important findings / interim findings, if any

Infrastructure for protection and monitoring of various preservation plots under different forest types/subtypes developed.

Methodological development was made using non harvest techniques for carbon sequestration of different tree species in various forest types/sub types of Madhya Pradesh in the current scenario of climate change.

Current status of the project: On going

2. Title : Sustainable livelihood based management plan for Kuno-Palpur wildlife sanctuary of Madhya Pradesh.

Project ID : BOT/P/E/13-14/15
Project period : 3 Year
Sponsoring Agency : APCCF (Research, Extension & Lok Vaniki), M.P., Bhopal
Principal investigator : Dr. O.P. Chaubey
Project Associate : Suresh Prasad Charmkar



Objectives:

- To work out the degree of reliance of the resident human population on the protected area (PA) resources, and people – PA interaction.
- To develop the package of sustainable and scientific utilization of important resources and preparation of management plan/working manual for the same.

Activities carried out during this year:

- For quantitative assessment of biological resource and its utilization pattern, the maps of PA areas for different impact zones starting from the central point of the sanctuary considering the radial distances viz., 0-1 km, 1-3 km, 3-5 km, 5-7 km and 7-10 km were collected.
- Primary survey work completed, maps, WII report and A. Khudsar report collected along with compartment details of core and buffer zones.
- Seasonal survey for trees, shrubs, herbs and ground flora for floristic study, herbarium and soils sample collected from 2 ranges in core zone namely east Palpur range and west Palpur range, and 3 ranges in buffer zones namely East Moravan, West Moravan and South Seroni.
- Data base on faunal diversity collected.
- Prepared proforma for ecological, socioeconomic and wild life survey (Secondary data).
- Floristic survey, data entry and analysis work of buffer zone.
- Information search completed.

Important findings / interim findings, if any:

Developed quantitative assessment techniques of biological resource and its utilization pattern. The databases would be of vital importance for habitat management of wildlife of protected areas selected for study.

Current status of the project: Ongoing

3. Title : Studies on photosynthetic efficiency, biomass production and carbon sequestration of bamboo in plantation forests

Project ID	:	BOT/P/E/14-15/07
Project period	:	3 years (April 2015 – March 2018)
Sponsoring Agency	:	APCCF (Research, Extension & Lok Vaniki), M.P., Bhopal
Principal investigator	:	Dr. O.P. Chaubey
Project Associates	:	Mohd Asif Mansoori Smt. Pragya Diwedi

Objectives:

- Estimation of photosynthetic efficiency in different aged bamboo plantations.
- Estimation of green and dry biomass of bamboo (above and below ground parts) in age series of plantations.
- Estimation of carbon and carbon pool in age series of plantations.

Activities carried out during this year: Nil

- Sampling, measurement, estimation of soil organic carbon, litter and microbial biomass of 14 Age group bamboo plantation sites of M.P. was completed viz; 1 year old (2014) of North Seoni Range, 3 year old (2012) of South Seoni range, 5 year old (2009) of North Seoni range, 6 years old (2008) of north Seoni range, 10 years old (2004) of North Seoni range, 14 years old (2001) of North Seoni range in Seoni Forest Division; 2 years old (2014) of Varaseoni range, 6 years old (2010) of Hatta range, 4 years old (2012) of Kirnapur range, 9 years old (2007) of Katangi range in South Balaghat division; 2 years old (2014) of West Bihar range, 6



years old (2010) of Tirgaon range, 7 years old (2009) of North Lamta range, 9 years old (2007) of Birsa Damoh range in North Balaghat division.

- Soil samples have been collected from bamboo plantations of different age from Kundam range, Jabalpur forest division for microbial and physico-chemical properties.
- Information regarding different aged bamboo plantations to be collected through official correspondence.

Important findings / interim findings, if any:

Site selection for different aged bamboo plantations was undertaken covering different forest divisions of Madhya Pradesh. The determination of photosynthetic efficiency and rate of carbon sequestration of bamboos would be useful to prove their efficiency for enhancing the species for environmental amelioration, socio-economic and livelihood benefits of various stakeholders, and finally to improve the ecological balance and to enhance the national economy.

Current status of the project: Ongoing

Regular activity: One

1. Title : Development and maintenance of botanic garden of State Forest Research Institute, Jabalpur (M.P.)

Project ID	:	BOT/P/I/11-12/06
Project period	:	5 years (April 2011 to March 2016)
Sponsoring Agency	:	Internal project
Principal investigator	:	Dr. O.P. Chaubey
Co-PI	:	Dr. A.K. Sharma

Objectives:

- Maintenance and protection of Infrastructure.
- Enrichment and development of the Garden.

Activities carried out during this year:

- Protection and maintenance of infrastructure and existing plants of the garden completed.
- Development and enrichment of the garden with new plant species from forest of M.P., completed.
- Soil working, weeding and watering of existing and newly added plants conserved in the garden completed.
- Beautification of the garden through planting of ornamental plants completed.

Important findings / interim findings, if any

1. Botanic garden more informative after conservation and development measures.
2. Awareness regarding conservation of indigenous and threatened plants generated among the field foresters, academicians, researchers, stakeholders and students.

Current status of the project: On going

Other significant achievements during the years

- 1 Imparted training and demonstration of Herbarium preparation and its management, and biodiversity conservation in botanical garden to rural people, trainee foresters, rangers and under graduate students of colleges and universities.
- 2 Identification of 375 plant specimens for Ph.D. students of RD University, Shri Gurunanak Mahila Mahavidyalaya, Jabalpur, Government Model Science College (Autonomous), Jabalpur, and medicinal practitioners.
- 3 Prepared and printed technical bulletin titled "खनन क्षेत्र में वनीकरण एवं पारिस्थितिकीय पुर्नस्थापना हेतु तकनीकी मार्गदर्शिका". by O.P. Chaubey and G. Krishnamurthy (2015).



3.3 FOREST ECOLOGY AND ENVIRONMENT

Mandate

1. Ecological studies in natural forests of M.P
2. Environmental Impact Assessment
3. Sustainable Forest Management

Staff

Dr. R.K. Pandey	:	Senior Scientist and Head
Dr. Jyoti Singh	:	Sr. Research Officer
Shri Rakesh Jain	:	Sr. Research Officer
Mr. Vijay Haldkar	:	Forester
Mrs.Madhuri Shrivastava	:	Technical Assistant

Project Staff

Mr. Shailendra Nema	:	Senior Research Fellow
Mr. Vikas Jain	:	Junior Research Fellow
Mr. Shiv Kumar Kaurav	:	Research Associate
Mr. Kundan Sharma	:	Junior Research Fellow
Mr. Krishna Kumar Patel	:	Junior Research Fellow
Mrs. Anupama Goswami	:	Junior Research Fellow
Mrs. Snehlata Mishra	:	Data Entry Operator
Mr. Vivek Awasthi	:	Data Entry Operator
Mr. Akshay Jain	:	Data Entry Operator

Completed Projects during the year

Internally funded: Nil

Externally funded: Two

1. Forest Resource assessment survey in four newly identified peoples protected forest areas (PPAs) i.e. Jabalpur, Satna, East Chhindwara, and Anuppur forest divisions of M.P.
2. Impact Assessment of road upgradation of National Highway No. 26 (B) on forest and wildlife habitat in the affected forest area (48.849 ha) of West Chhindwara Forest Division. (Amarwara to Narsinghpur).

On-going projects

Internally funded: One

1. Analysis activities of environmental impact assessment lab in SFRI Jabalpur

Externally funded: Six

1. Ecological Studies on Grasslands of Bandhawgarh Tiger Reserve with special reference to wildlife management.
2. Development of technology for conservation and sustainable management of wild medicinal plants and NTFPs through community participation in Shahdol forest circle of Madhya Pradesh.
3. Integrated management of diseases of economically important tree species Dhawada, Bija and Achar occurring in forests of M.P.
4. Causes and remedial measures of sal mortality (*Shorea robusta*) in forest areas of M.P.
5. मध्यप्रदेश स्टेट माइनिंग कारपोरेशन लि0 द्वारा विभिन्न जिलों में रेत खनन क्लस्टर्स के अन्तर्गत प्रस्तावित रेत खदानों का पर्यावरण प्रभाव मूल्यांकन एवं पर्यावरणीय प्रभाव प्रबंधन।



6. Preparation of Wildlife Conservation Plan for Jagannathpur OCM of SECL, Bhatgaon Area, Chhattisgarh.

New initiated during the year: Nil

Regular activities : Nil

Completed Projects during the year

Externally funded: Two

1. Title : Forest Resource assessment survey in four newly identified people's protected forest areas (PPAs) i.e. Jabalpur, Satna, East Chhindwara, and Anuppur forest divisions of Madhya Pradesh.

Project ID	:	ECO/P/E/10-11/06
Project period	:	Five years (2010-16)
Sponsoring Agency	:	M.P. State MFP, Federation (Trade & Dev.), Bhopal.
Principal investigator	:	Dr. R. K. Pandey
Associates	:	Dr Anjana Rajput
	:	Mrs Madhuri Shrivastava
	:	Mr. Vijay Haldkar
	:	Mr. Shailendra Nema

Objectives:

- Forest resource assessment survey both qualitative and quantitative with reference to medicinal, aromatic plants and other utilizable NTFPs in various habitat types of newly identified 4 PPAs situated in Jabalpur, Anuppur, Satna and Chhindwara forest divisions respectively.
- To assess the status and potential of NTFPs and medicinal plants in each PPA.
- To organize training/workshop at field level to develop skill and capabilities of user communities for sustainable management of forest resources.

Activities carried out during the year:

- As per the guidelines for resource assessment survey provided by MPMFP Federation, Co-Op Ltd, Bhopal, the 11th resource assessment survey was undertaken in the four PPAs. Selected sites were explored extensively and inventory of forest resources was made. List of medicinal, aromatic plants and other important NTFPs were prepared.
- Field workshops/trainings have also been imparted to the VFC/FPC members during the survey period.
- Collected data were analyzed, final report has been submitted to the funding agency MPMFP Federation, Bhopal.

Important Findings:

- Qualitative and quantitative assessment of forest resources in the selected PPAs particularly for commercially important medicinal, aromatic plants and other important NTFPs were undertaken with active community participation for *in-situ* sustainable management.
- Field workshops/trainings have also been imparted to the VFC/FPC members for non destructive harvesting techniques and management of NTFPs and medicinally important resources.
- Community oriented sustainable management and development of NTFPs in *In-situ* conditions.

Current status of the project: Completed



2. Title : Impact Assessment of road upgradation of National Highway No. 26 (B) on forest and wildlife habitat in the affected forest area (48.849 ha) of West Chhindwara Forest Division (Amarwara to Narsinghpur).

Project ID	: ECO/P/E/13-14/01
Project period	: One year (from April 2013- March 2014) Extended upto March, 2015
Sponsoring Agency	: Project Director, Indian National Highway Authority Unit (NHAI), Distt. Chhindwara
Principal Investigator	: Dr. R.K.Pandey
Associates	: Dr. Anjana Rajput : Mr. Rakesh Jain : Mr. Vijay Haldkar : Mr. Shailendra Nema : Mr. Vikas Jain

Objectives:

Assessment of impact due to proposed up-gradation and widening of road on:

- Forest ecology and structure
- Wild life habitat fragmentation, avifauna habitat and wildlife corridor values.
- To suggest mitigation measures.

Activities carried out during the year:

- Analysis of data collected on floral and faunal components of the study area, evaluation of wildlife habitat.
- Final report has been prepared and submitted to funding agency.

Important Findings

Extensive study on biological components was made along the 15 km width either sides of the proposed road. Collection of primary data on flora, fauna, major wildlife and its habitat by covering physical and biological parameters of the region was undertaken in all three seasons round the year.

- Forest vegetation was found to be rich in diversity. The average tree densities in various sub impact zones, ranging from 219.08 trees/ha to 449.19 trees/ha. were recorded. Maximum tree density observed in 1-3 km sub impact zone i.e. 449.19 trees/ha. In the shrub layer, established saplings and shrub species in different sub impact zones were found almost similar in density, ranging from 1022.76/ha to 1173.70/ha in all sub impact zones. The project site was represented to a potential habitat for regenerating tree species, perennial shrubs and climbers, that provides congenial habitats for sustained wildlife.
- Observation on the RET species of floral components envisaged that there are 21 RET species encountered in the study area. Two rare species i.e. *Aristolochia indica* and *Flacourtia indica*, 12 vulnerable category plant species, one species was reporting to near threatened category.
- The major wildlife species of schedule first category was observed in to Sloth bear (*Melursus ursinus*), Leopard (*Panthera pardus*), Python (*Python molurus*), Chinkara/Indian gazella (*Gazella gazella*) in the study area as per Wildlife (Protection) Act 1972.
- 21 forest compartments were found to be directly affected along the road and each compartment was fragmented into 44 small isolated patches. 0.4615 sq. km was estimated to be diverted and fragmented in the contiguous forest along the road due to up gradation of new NH road, passing through in different localities.

Current status of the project: Completed



Ongoing projects

Internally funded : One

1 Title : Analysis activities of environmental impact assessment lab in SFRI Jabalpur.

ID No. : Eco/P/I /15-16 /07
Project period : May. 2015 – April 2018
Sponsoring Agency : Internal
Principal Investigator : Dr. R.K. Pandey
Co Investigator : Mrs. Madhuri Shrivastava
Associate : Mr. Shiv Kumar Kaurav

Objective:

- Indoor and outdoor analysis of water, air and noise quality, in multidisciplinary projects.

Activities carried out during the year:

- Water samples of different location from Jabalpur city were collected quarterly.
- Water samples were collected from the tap water supplied from PHE water treatment plant, Jabalpur.
- Sample of Boring water was also collected from the same location.
- The samples collected were analyzed for pH, Electrical conductivity, Temperature, BOD, DO.
- Air quality data was also collected from the same location from where water samples were collected
- Data for air and sound were collected during the field visit in other projects of EIA. Water sample was collected for water quality testing.

Progress:

- Samples collected for water, air and sound quality were analyzed for different parameters as required in different projects.

Current status of the project: Ongoing.

Externally funded : Six

1. Title : Ecological studies on Grasslands of Bandhavgarh Tiger Reserve with special reference to wildlife management.

Project ID : ECO/P/E/12-13/24
Project period : 2 years (from July. 2013- June 2015)
(extension from July 2015 to June 2018)
Sponsoring Agency : APCCF, (Research Extension & Lokvaniki),
M.P. Bhopal
Principal Investigator : Dr. R.K.Pandey
Associate : Dr. (Mrs) Satvant Kaur Saini(till Oct. 2014)
Mr. Shailendra Nema
Mr. Vijay Haldkar
Mr. Shiv kumar Kourav (from 20 Feb. 2015)



Objectives:

- Identify the governing /responsible factors for qualitative/ quantitative changes.
- Develop suitable strategy for development of grassland habitat and suggest methods for qualitative sustainable management of existing grasslands with reference to wildlife management.

Activities carried out during the year:

- Qualitative assessment of 27 grasslands of various dimension in different localities of Bandhavgarh Tiger Reserve were made in Tala, Kalwah and Magdhi ranges. Phytosociological data of all grassland were collected and analyzed.
- Selected two grasslands for detailed experimentation of various treatments eg. Fire, grazing, weeding etc. in 96 experiment plots, in each selected site viz; Bathan of Tala range and Kudrakherwa in Kalwah range.
- 3rd year data of various treatments in open and protected plots were collected as per the project design.
- Phyto-sociological study to understand the prevailing community structure in selected grasslands was made by adopting standard ecological methods and various analytical parameters.
- Status of grass and available weed species found in grasslands and evacuated area of habitation and arable lands after village relocation were assessed.
- Assessment of palatable grass species of the area to determine utility percentage of grasslands was made.
- Analysis of data using SPSS is done to understand which treatments out of 32 different types of treatments given in selected plots of Bathan of Tala range and Kudrakherwa in Kalwah range are giving best results.
- Photographs and plant specimens of grass species of various grasslands were collected and processed for preparation of herbarium.
- Interim draft report is prepared and will be submitted soon.

Progress:

- Field work and data analysis with consultation of field officer Bandhavgarh Tiger Reserve is in progress.

Current status of the project: Ongoing

2. Title : Development of technology for conservation and sustainable management of wild medicinal plants and NTFPs through community participation in Shahdol Forest circle of Madhya Pradesh.

Project ID : ECO/P/E/14-15/01
Project period : 3 years (from April 2014-March 2017)
Sponsoring Agency : APCCF(Research Extension & Lokvaniki), M.P. Bhopal
Principal Investigator : Dr. R. K. Pandey
Associate : Mr. Shailendra Nema

Objectives:

- To develop a technology to determine sustainable harvesting limit of commercially important wild medicinal plants which are being collected from natural forest ecosystem with active participation of local dependent community.



- Ecological studies & inventory of commercially imp. Wild medicinal and other utilizable NTFPs in potentially rich forest ecosystem.
- Determination of SHL of the selected commercially important medicinal plants & NTFPs on priority basis with community participation.
- To organize training programme for users communities for sustainable harvesting/management of wild medicinal plants and other NTFPs in JFMCs areas.

Activities carried out during the year:

- Harvesting of utilizable plants parts in experimental plots for selected species. *Terminalia chebula* (Harra), *Andrographis paniculate* (Kalmegh), *Phyllanthus cedrras patensis* (Bhui aonla) and *evalvulus alsinoides* (Shankh pushpi) in all the selected forest protection communities sites i.e., Lapri, mithi, Navatok community in Chandaure Beat of Ajhmer Range in North Shahdol forest division and Ghanghatr sarriti (Community) in Umaria Forest division of Shahdol Forest Circle.
- Data on phenological studies, regeneration status were collected to assess the regeneration potential and sustainable harvesting limits of selected medicinal plants and NTFPs i.e. *Gloriosa superba*, *Terminalia chebula*, *Buchanania lanzan*, *Andrographis paniculata*, *Phyllanthas maderaspatensis* and *Evalvulus alsinoids* in experimental plots.
- Two field training in selected site were organized to motivate the JFMCS members to develop skill and capabilities uses communities.
- Analysis of field data is in progress.

Important Findings:

Determination of sustainable harvesting limits for selected species i.e. Kalmegh, Shankhpushpi, Bhui aonla is in progress.

- Field training to members of selected JFMCS is in progress for their skill and capability development. Observation on regeneration status and psychology of JFMC members are being made regularly, moreover, utilizable plants parts of the selected species were also harvested after completion of first year. As per the experimental design and after maturity of the seeds various parameters like, size of seeds, no. of the seeds/leaves etc. were also recorded.

Current status of the project: Ongoing

3. Title : Integrated management of diseases of economically important tree species Dhawada, Bija and Achar occurring in forests of M.P.

ID No.	:	TI/P/E/13-14/03
Project period	:	April 13 – March 2016 (Project extend up to Dec. 2016)
Sponsoring Agency	:	APCCF (Research & Extension and Lokvanki) M.P., Bhopal
Principal Investigator	:	Dr. Jyoti Singh
Associate	:	Mrs. Anupama Goswami

Objectives:

- Survey of infected areas of forests to identify the intensity of diseases in relation to seasonal variations.
- Collection, isolation and identification of pathogens found on the affected trees and seedlings.
- To standardize integrated management practices to control diseases occurring in Dhawada, Bija and Achar
- Preparation of working manual to field officers for remedial measures.



Activities carried out during the year:

- Collection of samples from selected sites.
- Isolation/ examination/ identification of pathogens by prescribed methods in laboratory (*in-vitro*) condition.
- Integrated management of diseases by conducting field trials in winter, summer and rainy season.
- Data analysis.
- Preparation of working manual.

Progress:

- Isolation and identification is done.
- Observation of given treatment in laboratory is in progress.
- Survey of infected areas of forests of selected sites was done in rainy, winter and summer season to identify the intensity of diseases in relation to seasonal variations is in progress.
- For examination of fungus samples of infected leaves, bark, root, stem and soil samples of 30cm, 60cm and 90 cm depth were collected & isolation is done and identification of pathogens found on the affected trees is done.
- Experiment of field trials is in progress.
- Integrated management of disease is in progress by conducting field trials and lab.

Current status of the project: Ongoing.

4. Title : Causes and remedial measures of sal mortality (*Shorea robusta*) in forest areas of M.P.

ID No.	: Eco/P/E/13-14/04
Project period	: April 2013 – March 2016 (Project extend up to Dec. 2016)
Sponsoring Agency	: APCCF (Research & Extension and Lokvanki) M.P., Bhopal
Principal Investigator	: Dr. Jyoti Singh
Associate	: Mr. Krishna Kumar Patel

Objectives:

- Collection of samples (soil, root, bark etc.) from selected sites.
- Examination of samples (soil, root, bark etc.) in laboratory and different experiments of remedial measures.
- Data collection to study effect of fungal attack, soil, girth at breast height, coppicing and climatic conditions.

Activities carried out during the year:

- Collection of samples from selected sites.
- Examination of samples in laboratory and different experiments of remedial measures.
- Effect of different experiments of remedial measures in winter, summer and rainy season.
- Data collection to study effect of mycoflora, GBH, height and climatic conditions.
- Data analysis.
- Preparation of working manual for field staff.

Progress:

- Survey and collection of samples (soil, root, bark and stem) from selected sites is completed for rainy, winter and summer season.
- Isolation and Identification is done.



- Examination of samples (soil, root, bark etc.) in laboratory and its different experiments of remedial measures is in progress.
- Data collection to study effect of girth at breast height, Height of affected trees and climatic condition of study site is in progress.
- Different experiments of remedial measures in different study sites are in progress.
- Data collection of Impact of edaphic and biotic factors is in progress.
- Data analysis is in progress.

Current status of the project: Ongoing.

5. Title: *e/; i n s k LVW ekbfuax dkj i k j s k u fy0 } k j k f o f i k k u f t y k a (Datia, Raisen, Bhind, Khargone, Gwalior) e a j r [k u u D y L V I l d s v l r x r i l r k f o r j r [k n k u k a d k i ; k b j . k i i k k o e f ; k a d u , o a i ; k b j . k h ; i i k k o i a t k u A*

ID No.	:	ECO/P/E/15-16/09
Project period	:	Six months
Sponsoring Agency	:	मध्यप्रदेश स्टेट माइनिंग कारपोरेशन लिमिटेड, भोपाल, मध्यप्रदेश
Principal Investigator	:	Dr. R.K. Pandey
Advisor	:	Dr. P.K. Shukla
Empanel Expert (HG &GEO)	:	Mr. R.K. Choubey Mr.R.P. Soni
Associate	:	Dr. Pratibha Bhatnagar Dr. Uday Homkar Dr. Jyoti Singh Dr. S.K. Masih Dr. Sachin Dixit Dr. S.S. Raghuvanshi Mr. Awadhesh Sharma Mr. Anirudhwa Sarkar Mr. Rakesh Jain Mr. Vijay Haldkar Mrs. Madhuri Shrivastava Mr. Vinay Kori Mr. Sishupal Singh Mehta Mr. Shailendra Nema Mr. Jeeshan Ali Mr. Kundan Sharma Mr. Krishna Kumar Patel Mrs. Anupama Goswami Mr. Shiv Kumar Kourav Mrs. Snehlata Mishra Mr. Akshay Jain Mr. Vivek Awasthi

Objectives:

- ग्वालियर संभाग के भिण्ड एवं दतिया जिले के रेत समूह के 19 रेत खदानों का EIA/EMP का SEAC भोपाल से पर्यावरणीय स्वीकृति प्राप्त करना।
- होशंगाबाद संभाग के तीन रेत समूह के अंतर्गत 9 रेत खदानों EIA/EMP करना एवं SEAC भोपाल से पर्यावरणीय स्वीकृति प्राप्त करना।



- रायसेन जिले के 1 खदान समूह के 3 रेत खदानों का EIA/EMP करना एवं SEAC भोपाल से पर्यावरणीय स्वीकृति प्राप्त करना।
- खरगोन जिले के तीन रेत खदान समूह के अंतर्गत 14 रेत खदानों का EIA/EMP करना एवं SEAC भोपाल से पर्यावरणीय स्वीकृति प्राप्त करना।

Activities carried out during the year:

- Field work of base line data on biodiversity, socio-economic, air, water, noise for environmental impact assessment of mining on area coming within 10 km of the sand cluster mine done.
- EIA/EMP related field data collection work is in progress

Progress:

- Analysis of data for EIA/EMP collected on biodiversity, socio-economic, air, water and noise for environmental impact assessment is in progress.

Current status of the project: Ongoing

6. Title : Preparation of Wildlife Conservation Plan for Jagannathpur OCM of SECL, Bhatgaon Area, Chhattisgarh.

ID No.	: ECO/P/E/15-16/10
Project period	: Jan. 2016 to March 2017
Sponsoring Agency	: Jagannathpur OCM, SECL, Bhatgaon Area, Chhattisgarh.
Principal Investigator	: Dr. R.K. Pandey
Associate	: Mr. Kundan Sharma Dr. Jyoti Singh Mr. Shailendra Nema Mr. Vijay Haldkar

Objectives:

- To assess the impact on flora, fauna and wildlife habitat due to proposed Jagannathpur OCM.
- To assess the impact on sustained wildlife, corridor values and life requisite parameters within 10 km radius of the project sites.
- To suggest mitigative measures for conservation/protection and improvement of flora, fauna and wildlife and its habitats.

Activities carried out during the year:

- The basic information and maps of the project site were collected during reconnaissance survey of the area.
- Floral and faunal assessment was done in 5 sub-impact zones viz 0-1 km, 1-3 km, 3-5 km, 5-7 km and 7-10 km within 10 km radius from the project sites.
- Wildlife habitat evaluation was done during the survey. Sustained wildlife and their habitats were assessed through the direct and indirect methods. Detailed study for basic habitat requirement of wildlife being food, water and cover were considered for impact assessment.
- Assessment of environmental impact of developmental activities on wildlife and their habitat within the impact zone was carried out by adopting standard methods like habitat suitability index (HSI), quantification of wilderness and more recent modeling approach was applied for habitat evaluation. Two approaches was followed to evaluate wild life habitats.
- Data for socio-economic impacts of inhabitants and their bovine were collected to assess the dependency on forest resources for their livelihood in the prevailing forest ecosystem.



Progress:

- Data collected from field work are analysed and interim report has been prepared and submitted to the funding agency.

Current status of the project: Ongoing.

Other significant achievements/ contributions:

Presentation of research paper as key presenter-

- Fifth International Conference on Plants and Environment Pollution (ICPEP-5) "Invasion of weed species in water reservoir of Sanjay Gandhi Thermal Power Station, Madhya Pradesh, India" held in Lucknow (UP), from 24-27 February, 2015.
- Participated and presented research paper on in 4th International Conference on Biodiversity held at LAS Vegas, USA on 15-17 June 2015.
- Participated in "International Multi Disciplinary Academic Conference (IMAC) in support of UN ESCO's 10th Anniversary celebration, Thailand 2015" held at Thailand, Bangkok 02-06 November, 2015.

3.4. FOREST GENETICS, PLANT PROPAGATION AND BIOTECHNOLOGY BRANCH

Mandate

1. Standardization of propagation protocol using biotechnological applications of tree & medicinal plant species.
2. Production of quality planting material by using biotechnological tools.
3. Germplasm evaluation of medicinal plants through chemoprofiling.
4. Cryopreservation of rare and endangered medicinal plants.
5. Genetic diversity assessment of different species using molecular marker techniques.
6. Species specific identification through molecular marker technique for plant and wild animals.
7. Consultancy /training in the field of plant tissue culture and biotechnology.

Staff

Dr. S.K. Tiwari : Scientist and Head
Amit Pandey : Sr. Research Officer

Project staff

Mr. Shailendra Singh Yadav : Research Associate
Mr. M.P. Goswami : Senior Research Fellow
Mr. Pankaj Saini : Field Assistant
Mr. Vineet Mehra : Field Assistant

Projects completed during the year:

Internally funded : Nil

Externally funded : One

1. National Seminar on Recent advances in research and development in medicinal and aromatic plants - a country scenario.

On-Going Projects during the year:

Internally funded : Nil

Externally funded : Three



1. Genetic diversity assessment of *Boswellia serrata* and standardization of micro clonal propagation protocol through biotechnological interventions for the production of elite planting material.
2. Standardization and multiplication of clonal propagation protocol for commercially important forestry species *Anogeissus pendula*
3. Development of integrated biotechnological package by genetic diversity assessment using molecular characterization, chemoprofiling, standardization of micropropagation and cryopreservation protocol of four RET species.

Newly Initiated project during the year:

Internally funded : Nil

Externally funded : One

1. Quantitative determination of bio-active compounds of highly threatened medicinal plant species through chemoprofiling and standardization of propagation techniques using biotechnological interventions for their conservation.

Regular Activities

On-going: One

1. Training on plant biotechnology and plant tissue culture.

Completed projects during the year : One

1 Title : National Seminar on Recent advances in research and development in medicinal and aromatic plants - a country scenario

Project ID : GEN/P/E/2012-13/17
 Project period : Oct., 2014 to Nov., 2015
 Sponsoring Agency : National Medicinal Plants Board, New Delhi
 Principal Investigator : Dr. S. K. Tiwari,
 Co-PI : Amit Pandey

Objectives:

- To organize National seminar on recent advances in research and development in medicinal and aromatic plants - a country scenario

Findings:

In this two day seminar which was organized on 27-28 November 2015, more than 150 participants across the country participated including forest officers from various states., scientists from different research institutions such as CIMAP, & NBRI, Lucknow, RFRI Jorhat, IHBT Palampur, NIPGR, New Delhi, IISER Mohali, IIHR ,Bangalore, FRI Dehradun, Institute of Sciences Mumbai, BSI Allahabad, TFRI, SFRI Jabalpur etc. Academicians from various universities & colleges, such as YSP University Solan, TNAU, Coimbatore, University of Calcutta, AMU Aligarh, Jamia Hamdard University Delhi, Govt. Aruvadic College Patiala, CCS Haryana Agriculture University, Sher-e -Kashmir University Jammu, Hislop College Nagpur, DV Science College Gondia, MPKV, Rahuri, JNKVV & RDVV Jabalpur etc. representatives of Emami Limited, CCD North CG & Jabalpur NGOs SHWEP Bhopal, farmers from Bihar , Orissa, CG, MH & MP, researchers and students. The papers were published in the form of souvenir and the same was released during inaugural session. Theme wise total four oral sessions and one poster session were organized in this two days seminar. 12 eminent scientists, professors, forestry professionals were invited for delivering key note address and as resource persons.

Current status of the project: Completed



Ongoing Projects : Four

1. Title: Genetic diversity assessment of *Boswellia serrata* and standardization of micro clonal propagation protocol through biotechnological interventions for the production of elite planting material

Project ID : GEN/P/E/2012-13/05
Project period : April 2012 to March 2015 (Extended Dec., 2015)
Sponsoring Agency : M.P. Minor Forest Produce Federation Ltd., M.P., Bhopal
Principal Investigator : Dr. S. K. Tiwari
Co-PI : Amit Pandey
Research Associate : Shailendra Yadav

Objectives:

- Identification of potential pockets of *Boswellia serrata* from different agroclimatic zones of Madhya Pradesh.
- Study regarding genetic variations of *Boswellia serrata* within and between populations and at individual levels.
- Identification of genetically diversified population and elite genotypes for further studies.
- Standardization of the clonal propagation protocols for the production of quality planting material from elite genotypes.

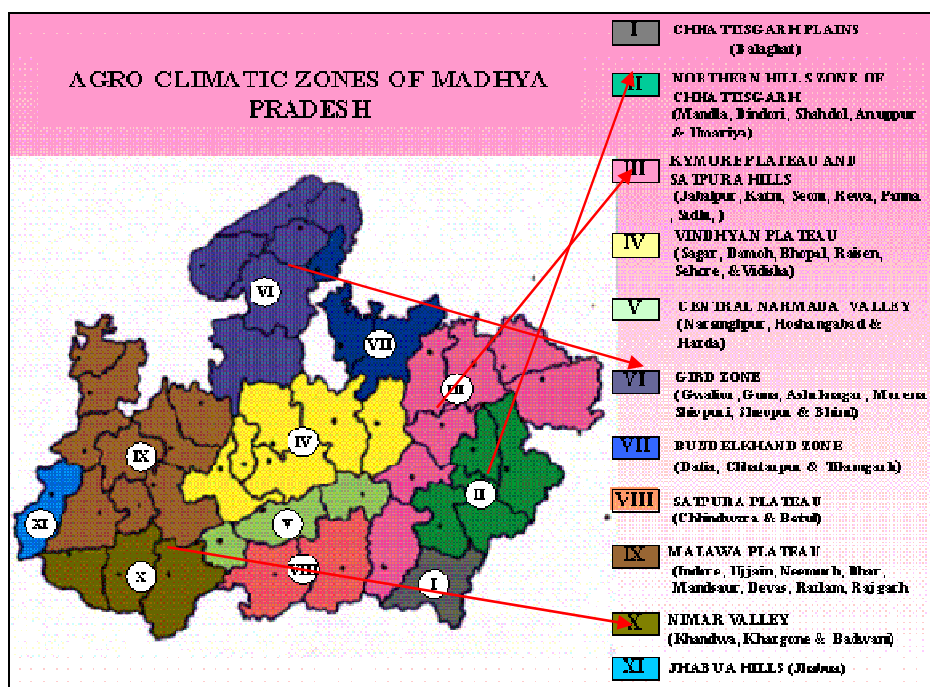
Activities carried out during the year:

I. Identification of Potential Pockets and collection of population: Survey was done for the identification of potential pockets of the designated species in different agro-climatic zones of Madhya Pradesh. Table- 1

Table-1 - Potential pockets in different agroclimatic zones

Agroclimtic zone	Forest Division	Accessions collected
Gird Region	Shivpuri, Sheopur kala,	30
Nimar Valley	Khandwa, Burhanpur	30
Northen hill zone of Chattisgarh	Dindori, Anuppur, Umaria	35
Kaimur plateau and Satpura hills	Jabalpur	10





Cuttings were collected from identified populations of Shivpuri, Sheopur kala, Khandwa, Burhanpur, Dindori, Anuppur, Umaria and Jabalpur. The cuttings were placed in mist chamber for further multiplication. The young leaves from the cutting were the source material of DNA extraction for the analysis of genetic diversity assessment as well as a source of explants collection for micro propagation.

II. Genetic Diversity Assessment: Genetic diversity stands for all living things on earth. It refers to the range of variations among a set of entities and is commonly used to describe variety and variability of plant in terms of genetic diversity, biodiversity, species diversity and ecological diversity. In simple terms, Genetic diversity is the vast variety of natural plant existing in any region. Molecular markers work by highlighting differences (polymorphism) within a nucleic sequence between different individuals.

DNA Isolation protocol

Young leaves (1g wt.) grinded in *Pestle & Mortar* using liquid nitrogen (LN₂) to convert the leaves into fine powdered form. The powder transferred in 1.0 ml of CTAB buffer containing 100mM Tris (pH 8.0), 20mM EDTA (pH 8.0), 1.4 M NaCl, 2.5% CTAB (w/v), (Promega) .In this solution 1% PVP (Calbiochem) and 10mM B-mercaptoethanol (Merck) added freshly. It was mixed vigorously by vortexer and incubated at 60±5 °C for 30 minutes followed by treatment with equal volume of chloroform: isoamylalcohol (24:1) (Amresco). This mixture was centrifuged (Eppendorf, AG Germany) at 5125x g for 15 minutes at room temperature. After centrifugation the upper phase (supernatant) was transferred to a fresh autoclaved centrifuge tube and then 1/10 volume of 3M sodium acetate (pH 5.2) and ½ volume of 5M NaCl (Promega) was added to it. DNA was precipitated using 0.6 volume chilled isopropanol (Promega) and pelleted by centrifugation at 5125X g for 10 minutes at 4°C. The supernatant was decanted and the DNA pellet was washed with 70% ethanol (Merck). The crude DNA pellet was air dried and suspended in 500µl of 0.5ml high salt TE buffer (10mM Tris pH 8.0, 1mM EDTA, 1M NaCl) (Promega).

DNA Verification: The isolated genomic DNA was verified using 0.8% Agarose gel (Promega) through electrophoresis (Genetix).



Amplification of isolated DNA : The isolated genomic DNA was amplified through PCR reaction which were carried in 0.2ml Polypropylene PCR tubes (Axiva) using thermal cycler EP gradient Master Cycler (Eppendorf, AG Germany). Each 20 µl reaction mixture contain, 1X Taq buffer (100mM Tris-Cl in pH 9, 500mM KCl, 15mM MgCl₂ and 0.1% gelatin (Promega), 2.5 mM MgCl₂, 0.2 µl dNTPs (Promega), 20 pmols Oligonucleotide primers (IDT Avantor), 1U Taq DNA polymerase (Promega) and 20 ng template DNA.

This reaction mixture was subjected to the three final PCR steps through (denaturation, annealing and extension) as initial denaturation at 94^oC for 5 minutes. followed by 45 amplification cycles, each consisting of 30seconds at 94^oC (denaturation step), 1 min at 37^oC (annealing step) and 2min at 72^oC (extension step) with final extension of 10 min. at 72^oC. The amplification products were separated on 1.5% w/v agarose gel (Promega) and stained with 0.7µg/ml Ethidium bromide solution (Promega). DNA ladders of 1 kbp (Promega) were mixed and used as mol wt. marker for comparison of amplified product. Gels were photographed through Gel Documentation System Geneview 645C, (Genetix). All reactions were repeated thrice to confirm the results.

Among 15 RAPD molecular markers/ primers were tested for genetic diversity assessment within and between the populations of this species from different agroclimatic zones of Madhya Pradesh. Out of 15 RAPD markers 9 were responded for assessing genetic diversity as shown in following gel images. The populations from Gird region specifically Shivpuri showed greater polymorphism as compared to other the populations from other agroclimatic zones, which signifies that the population of this species from Shivpuri can be used for further genetic improvement programme.

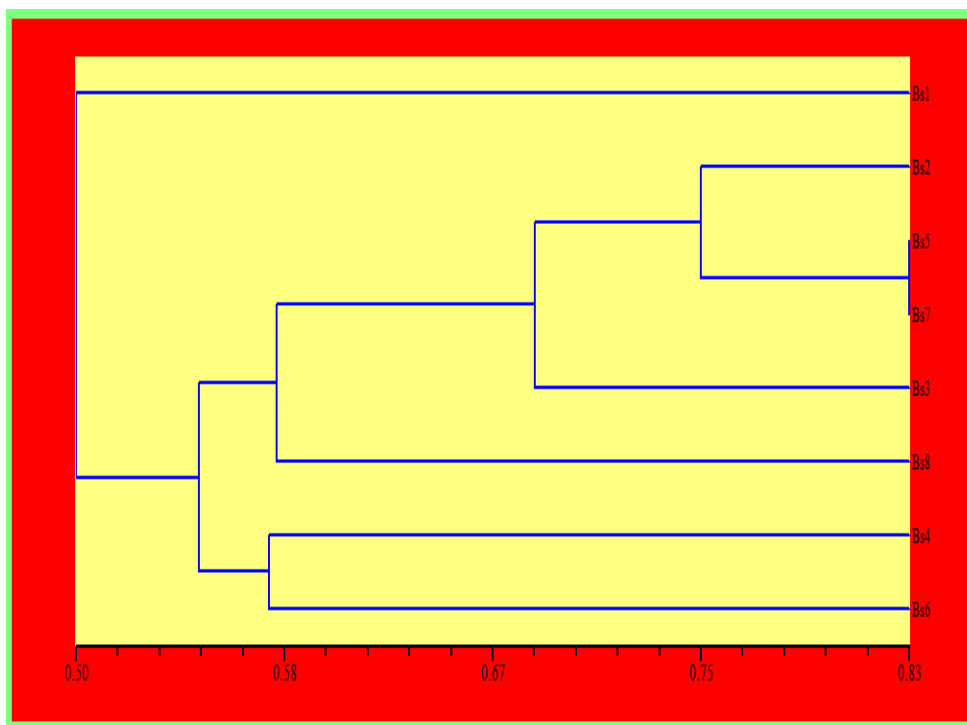
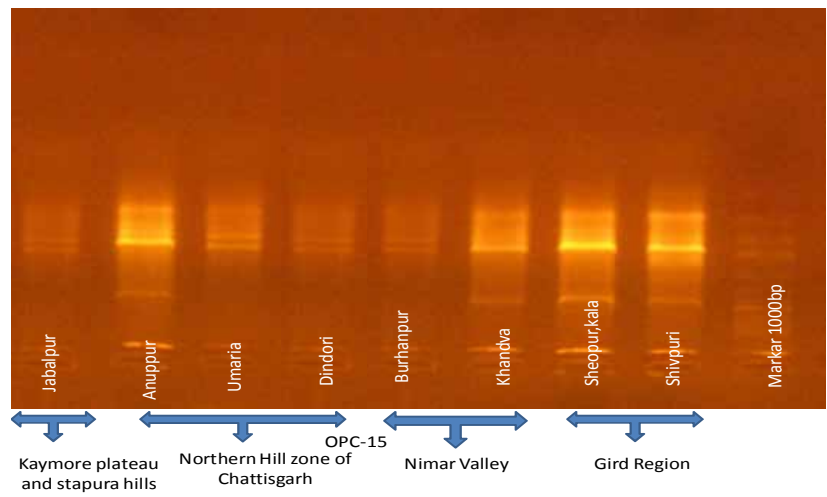
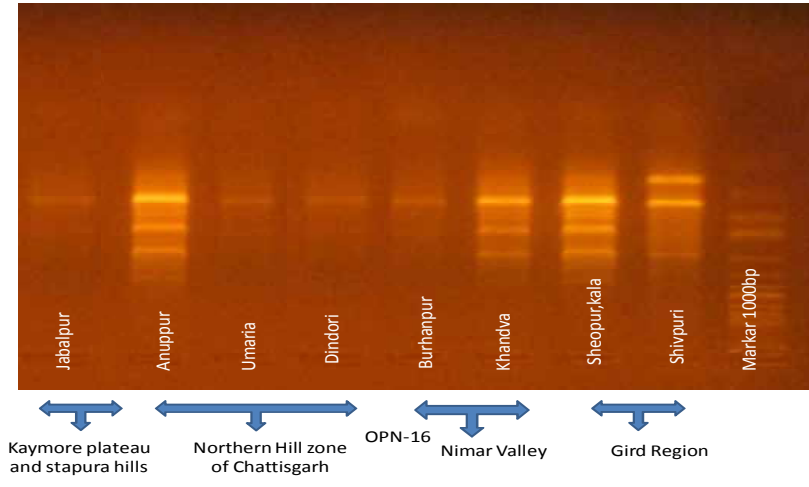
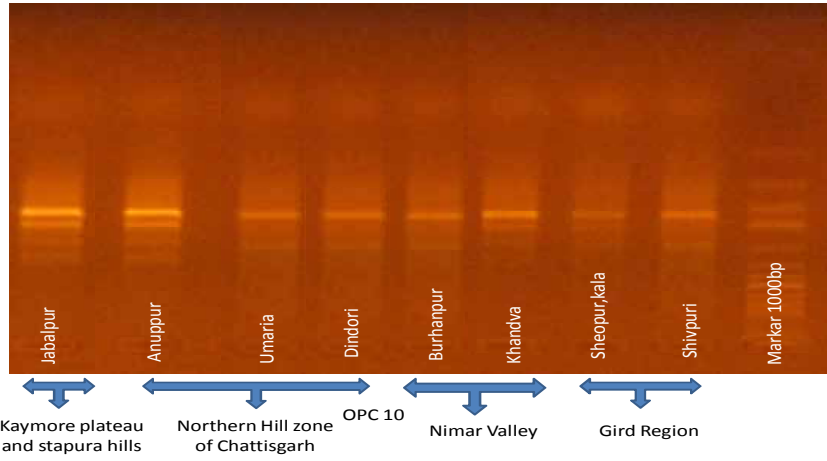
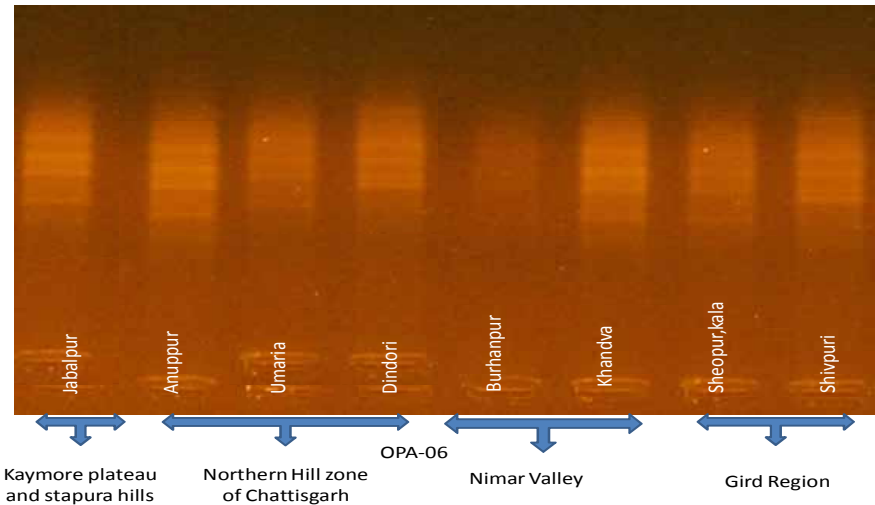
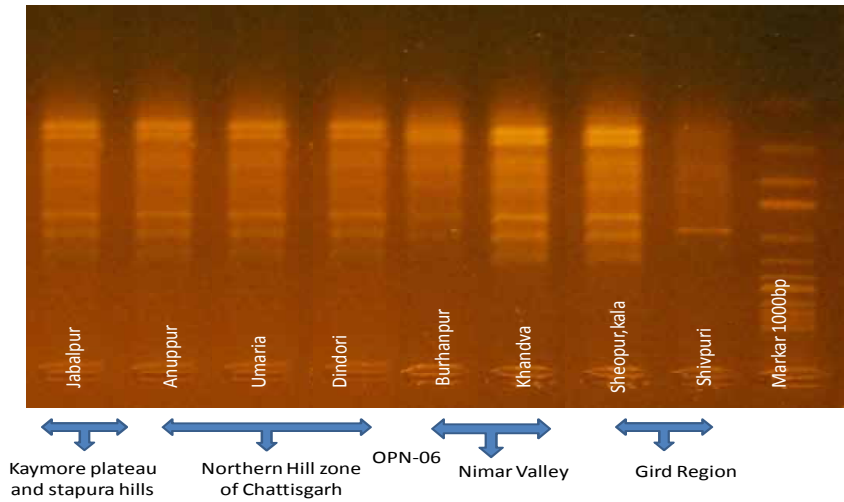
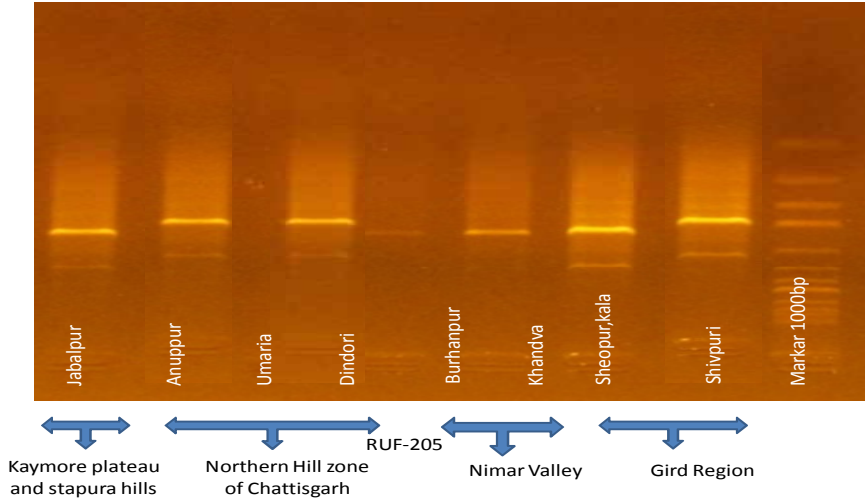


Fig. 4: UPGMA based Dendrogram showing diversity among different germplasm collected from different agroclimatic zone of Madhya Pradesh.





iii. Standardization of micropropagation protocol: An attempt has been made for standardizing micropropagation protocol from nodal explant of identified source as shown in below mentioned figures but the success from mature explants were very poor and the cultures died after second sub culturing.



Current status of the project: Ongoing

2 Title : Standardization and multiplication of clonal propagation protocol for commercially important forestry species *Anogeissus pendula*.

Project ID	:	GEN/P/E/2012-13/17
Project period	:	June 2012 to May 2015 (Extended upto May 2016)
Sponsoring Agency	:	APCCF, (Research Extension & Lokvaniki) M.P., Bhopal
Principal Investigator	:	Dr. S. K. Tiwari
Co-PI	:	Amit Pandey

Objectives:

- To identify potentially rich areas of *A. pendula* and identification of candidate plus trees from different forest areas of M.P.
- To standardize clonal propagation protocol through macro and micropropagation technique from known phenotypic resource.
- To standardize hardening procedure for higher survival and establishment rate.
- Production of 5000 plants to refine the propagation protocol.
- To prepare field manual of macropropagation techniques to raise the plants by forest department.

Activities carried out during the year:

1. Collection of propagation material: Working plans of Sheopur, Shivpuri, Guna and Gwalior forest division were referred for the identification of potential pockets. After this, tentative survey was made to find out the potentially rich areas as prescribed in the various working plans. The propagation materials (stem branch cuttings and explants) were collected from the natural population as the areas mentioned in table 1. The cuttings were properly packed in gunny bags so as to maintain the moisture around them.



Table 1- Potentially rich areas.

Name of forest Division	Potentially rich areas ranges/places	Number of candidate plus trees
Shivpuri	Pahori	4
	Duda Mahua	3
	Karera	5
	Satanwada	3
Seopurkala	Sasipura	5
	Seopur	4
	Karahal	2
	Budhara	5
Guna	Guna	3
	Kolaras	2
Gwalior	Gwalior	4
Tikamgarh	Orcha	8
Chattarpur	Chattarpur	2
Panna	Panna	2
SFRI campus	SFRI campus	3

II. Maintenance of collected germplasm in mist chamber/ polypropagators. The collected germplasm was maintained in mist chamber/ polypropagators for further research.

III. Standardization of clonal propagation protocol: Clonal propagation protocol has been standardized by the following techniques.

a. Macropropagation: The clonal multiplication protocol through macropropagation has been standardized by using young juvenile stem branch cuttings and new sprouts of cuttings. The different lengths (20-25 cm) and thickness (0.5-2.5 cm) of cuttings were categorized and treated with different concentration of root promoting hormones such as IBA and NAA (100 ppm to 2000 ppm) for different durations so as to optimize the maximum rooting response (table-2&3). The treated cuttings were kept in mist chambers/ polypropagators along with optimizing the duration of intermittent misting. The relative humidity of these chambers was set approximately 90 to 95 percent so as to avoid the water loss from the cuttings. The optimum temperature (35to 40⁰C) of these chambers was again synchronized along with the frequency of misting. After root induction the rooted cuttings (stacklings) were shifted in ploythene bags (1:1:1 FYM) for hardening in shad net conditions.

Types of cuttings:

Hard wood



Semi hard wood



Table -2 Hormonal concentrations:

Root promoting hormones	Ranges	Manufacturing comp.	duration of time for treatment
Indol-3 butyric acid-(IBA)	100 ppm to 2000ppm	Sigma	10 to 40 min
α -Naphthylacetic acid (NAA)	100 ppm to 2000ppm	Sigma	10 to 40 min

Placement of cuttings under polypropagators: The treated cuttings were placed in polypropagators on medium grade pure sand with following congenial physical conditions:

- Temperature: 35^o to 45^oC.
- Humidity: 80 to 90% with intermittent spraying of water.
- Spraying frequency 3 to 4 times in summer and 2 to 3 times in other seasons.

Table - 3 Experimental designs for Macropropagation:

Hormona l group	Treatments	Sub-treatments (Time of treatment in min.)				No. of cuttings / Sub treatment
Control						50
IBA	100 PPM (T1)	10 (T1a)	20 (T1b)	30 (T1c)	40 (T1d)	50
	200 PPM(T2)	10 (T2a)	20 (T2b)	30 (T2c)	40 (T2d)	
	500 PPM(T3)	10 (T3a)	20 (T3b)	30 (T3c)	40 (T3d)	
	1000 PPM(T4)	10 (T4a)	20 (T4b)	30 (T4c)	40 (T4d)	
	1500 PPM(T5)	10 (T5a)	20 (T5b)	30 (T5c)	40 (T5d)	
	2000 PPM(T6)	10 (T6a)	20 (T6b)	30 (T6c)	40 (T6d)	
NAA	100 PPM (T7)	10 (T7a)	20 (T7b)	30 (T7c)	40 (T7d)	50
	200 PPM(T8)	10 (T8a)	20 (T8b)	30 (T8c)	40 (T8d)	
	500 PPM(T9)	10 (T9a)	20 (T9b)	30 (T9c)	40 (T9d)	
	1000 PPM(T10)	10 T10a)	20 T10b)	30 (T10c)	40 (T10d)	
	1500 PPM(T11)	10 (T11a)	20 T11b)	30 (T11c)	40 (T11d)	
	2000 PPM(T12)	10 (T12a)	20 T12b)	30 (T12c)	40 (T12d)	

Observations: The rooting response from the cuttings were recorded at weekly interval .The interim findings are presented as below.

Transfer and shifting of stacklings: After the successful rooting from the cuttings, the rooted cuttings were sifted in 1:1:1 mixture of soil, sand and FYM and were maintained initially in partial shade and then transfer in open place.

Findings:

The macropropagation protocol of *Anogeissus pendula* (Kardhai) has been successfully developed through stem branch cuttings. The rooting responses were recorded in the cuttings which were collected in different areas (table 1). The result of the macropropagation study are given in table 4 & 5 which reveal that the different auxins (IBA and NAA) concentrations and their treatment timings plays a significant role for root induction. **It was observed that the hard wood cuttings showed better rooting response than the semi hard wood cutting in medium grade sand.** The rooting response has not been observed when the cuttings were collected during the months of Oct. to Dec. However, the rooting initiation was observed in the cuttings which were collected during the months of Feb to Sept. In these cuttings the root initiation were started after 30 to 35 days and optimum rooting was observed during April to June (60 to 70 days) .**The maximum rooting response was observed 33% (fig. in semi hard wood cuttings while 20% in hard wood cuttings when treated with IBA 1000 ppm solution for 20 minutes.** Other concentration of IBA showed moderate to poor rooting



response in both size of cuttings. On the other hand NAA showed poor rooting response in both the size of cuttings as compared to IBA. (Table 4 & 5). No rooting responses were observed in control.

Table no. 4 : Effect of different ppm concentration of IBA and timings on the rooting percentage from the different types of cuttings

Treatments IBA	Time of treatment	No. of days for optimum rooting	No. of root/ cutting		Root length (in cm)		% rooting	
			Semi Hard wood cuttings	hard wood cutting	Semi Hard wood cuttings	hard wood cutting	Semi Hard wood cuttings	hard wood cutting
Control			Nil	Nil	Nil	Nil	Nil	Nil
T1	T1a	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T1b	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T1c	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T1d	60-70	Nil	Nil	Nil	Nil	Nil	Nil
T2	T2a	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T2b	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T2c	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T2d	60-70	Nil	Nil	Nil	Nil	Nil	Nil
T3	T3a	60-70	1	2	2	2-4	4	3
	T3b	60-70	2	2	4	4-6	6	6
	T3c	60-70	1	1	1	2	3	4
	T3d	60-70	Nil	Nil	Nil	Nil	Nil	Nil
T4	T4a	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T4b	60-70	4-6	4-6	20-25	4-6	14	12
	T4c	60-70	25-30	6-8	30-35	8-10	33	20
	T4d	60-70	2-4	2-4	2-6	2-6	9	8
T5	T5a	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T5b	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T5c	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T5d	60-70	Nil	Nil	Nil	Nil	Nil	Nil
T6	T6a	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T6b	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T6c	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T6d	60-70	Nil	Nil	Nil	Nil	Nil	Nil

Table no. 5: Effect of different ppm concentration of NAA and timings on the rooting percentage from the different types of cuttings

Treatments NAA	Time of treatment	No. of days for optimum rooting	No. of root/ cutting		Root length (in cm)		% rooting	
			Semi Hard wood cuttings	hard wood cutting	Semi Hard wood cuttings	hard wood cutting	Semi Hard wood cuttings	hard wood cutting
Control			Nil	Nil	Nil	Nil	Nil	Nil
T1	T1a	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T1b	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T1c	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T1d	60-70	Nil	Nil	Nil	Nil	Nil	Nil

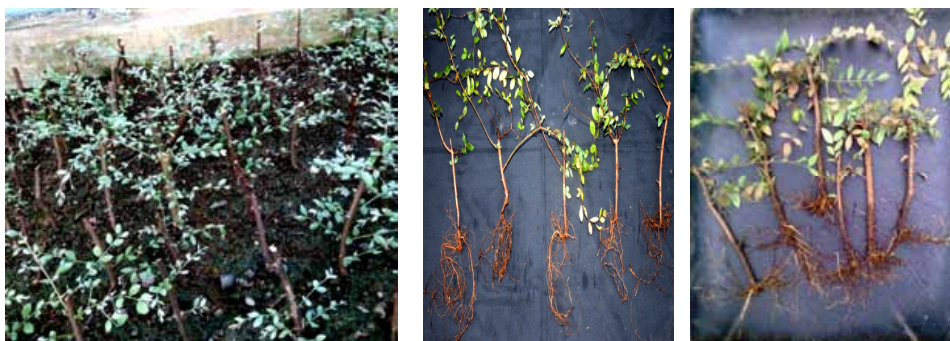


Treatments NAA	Time of treatment	No. of days for optimum rooting	No. of root/ cutting		Root length (in cm)		% rooting	
			Semi Hard wood cuttings	hard wood cutting	Semi Hard wood cuttings	hard wood cutting	Semi Hard wood cuttings	hard wood cutting
T2	T2a	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T2b	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T2c	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T2d	60-70	Nil	Nil	Nil	Nil	Nil	Nil
T3	T3a	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T3b	60-70	2	2	3-4	4-5	2	4
	T3c	60-70	1	1	1	1	3	3
	T3d	60-70	Nil	Nil	Nil	Nil	Nil	Nil
T4	T4a	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T4b	60-70	2-3	4-6	2-3	2-3	8	6
	T4c	60-70	3-4	2-3	4-5	2-4	15	12
	T4d	60-70	Nil	Nil	Nil	Nil	Nil	Nil
T5	T5a	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T5b	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T5c	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T5d	60-70	Nil	Nil	Nil	Nil	Nil	Nil
T6	T6a	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T6b	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T6c	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T6d	60-70	Nil	Nil	Nil	Nil	Nil	Nil

Protocol for clonal multiplication through macropropagation of *Anogeissus pendula* (Kardhai) through stem branch cuttings is mention below.

1. Cuttings length 7 to 8 " semi hard wood type
2. Thickness 6-8 mm
3. IBA treatment 1000 ppm for 30 min.
4. Success percent 33%

Paper has been presented in International conference on biological Sciences and engineering organized by Higher Education Forum, Seoul, South Korea, from 6-8th Jan 2016.



b. Micropropagation: The target of this objective has not been achieved so far for standardization of micropropagation protocol.



An attempt has been made for standardizing the micropropagation technique of this species through nodal explants collected from adult tree for optimizing the best morphogenetic response on MS culture medium. Micropropagation studies of this species from explants of adult tree have not been reported so far. Various combinations and concentration of plant growth regulators such as BAP, IAA were supplemented in the culture medium. The best morphogenetic response in terms of shoot induction from nodal explant were observed when the MS medium was supplemented with a combination of BAP 3.0mg/l + IAA 2.0mg/l. On an average 3 to 4 young shoots per explant were emerged from the nodal explant. It was observed that the multiplication rate of this species through micropropagation is very difficult and slow also, when the explants are collected from mature trees for its cloning. The *in vitro* regenerated shoots were sub cultured on the same combination and it was observed that the micropropagated shoot were turned more healthy and green up to the size of 3 to 4 cm. However after second sub culturing the *in vitro* regenerated shoots were turned brown and gradually dried. It is essential to develop suitable micropropagation protocol for this recalcitrant species for large scale plant production.



Current status of the project: Ongoing

3. Title: Development of integrated biotechnological standardization of micropropagation and cryopreservation protocol of four RET species (*Berberis aristata*, *Swertia angustifolia*, *Embelia tsjeriam-cottam*, *Saraca asoca*)

I. D. No. : GEN/P/E/14-15/02
 Period : April 2014 to March 2017
 Sponsoring agency : National Medicinal Plants Board, New Delhi
 PI : Dr. S. K. Tiwari,
 Co-PI : Amit Pandey
 Project associates : Manish Puri Goswami
 :

Objective:

- Collection of wild germplasm of four RET targeted species.
- Standardization of chemoprofiling technique using HPLC for the quantitative determination of active alkaloid.
- Genetic diversity assessment of through molecular markers for the identification of genetically diversified populations and genotypes.
- Multiplication of chemically rich and genetically diversified population /genotypes for the production of elite planting material.
- Development of appropriate cryopreservation technique for long term conservation of elite planting material.
- Preparation of technical manual for the extension of evolved technologies.



Targeted Species - *Barberis aristrata*, *Embelia tsjerium cottom*, *Saraca asoka* & *Swertia aungustifolia*

Activities carried out during the year:

Collection of germplasm

S. No.	Source of Germplasm	Name of species	Total no of collected germplasm			Cod for DNA
			Plants	Cuttings	Seeds	
State - Maharashtra						
1	Borivali forest area Maharashtra	<i>Embelia tsjerium cottam</i>	Nil	90	Nil	1
2	Tekawari, Rang- Murbad, Maharashtra		4	60	Nil	2
3	Naneghat Range- Murbad, Maharashtra		4	55	Nil	3
4	Maljiwara Thane Maharashtra		Nil	50	Nil	4
5	Gambhirgarh Rang- Saywan, Maharashtra		Nil	80	Nil	5
6	Tungreswer Rang- Saywan, Maharashtra		Nil	65	Nil	6
7	Mahabeleswer Rang- Mahabeleswer Maharashtra		8	90	Nil	7
8	Sudhagarh Rang- Sudhagarh Maharashtra		Nil	65	Nil	8
State - Chhattisgarh						
9	Dugali, Rang- dugli District- Dhamtari Chhattisgarh(CG-1)	<i>Embelia tsjerium cottam</i>	Nil	368	Nil	9
10	Jabarra, Rang- dugli District- Dhamtari Chhattisgarh (CG-2)		Nil	294	Nil	10
11	Nagari -1, Rang- dugli District- Dhamtari Chhattisgarh (CG-3)		Nil	298	Nil	11
12	Nagari -2, Rang- dugli District- Dhamtari Chhattisgarh (CG-4)		Nil	397	Nil	12
13	Rang- Dantewara District- Dantewara Chhattisgarh (CG-5)		Nil	476	Nil	13
State - Karnataka						
14	Gopaldaswami hill	<i>Embelia tsjerium cottam</i>	Nil	85	Nil	13
15	Gundalupeth		Nil	55	Nil	14



S. No.	Source of Germplasm	Name of species	Total no of collected germplasm			Cod for DNA
			Plants	Cuttings	Seeds	
State - Tamilnadu						
1	Kodaikanal-1 Tamilnadu	<i>Saraca asoca</i>	2	50	Nil	1
2	Kodaikanal-2 Tamilnadu		2	54	Nil	2
3	Madisasollai Tamilnadu		Nil	50	Nil	3
4	Melpallum Tamilnadu		Nil	45	Nil	6
5	Palani Tamilnadu		Nil	80	Nil	7
6	Satyamagalum-1 Tamilnadu		2	55	Nil	9
7	Satyamagalum-2 Tamilnadu		Nil	60	Nil	10
8	Satyamagalum-3 Tamilnadu		Nil	50	Nil	11
9	Satyamagalum-4 Tamilnadu		2	68	Nil	12
State – Kerala						
10	Munnar road forest area-1 Kerala	<i>Saraca asoca</i>	2	50	Nil	4
11	Munnar road forest area-2 Kerala			50		5
State -Karnataka						
12	Gundalupeth, tample Karnataka	<i>Saraca asoca</i>	Nil	50	Nil	8
State - Madhya Pradesh						
13	Vetinary college Jabalpur	<i>Saraca asoca</i>	Nil	60		
14	Gwarighat Jabalpur		Nil	80		
State- Maharastra						
15	Borivali forest area Maharastra	<i>Saraca asoca</i>	4	64	Nil	

S. No.	Source of Germplasm	Name of species	Total no of collected germplasm		
			Plants	Cuttings	Seeds
State - Tamilnadu					
1	Kodaikanal-1 Tamilnadu	<i>Swertia aungustifolia</i>	5	Nil	Nil
2	Kodaikanal-2		8	Nil	Nil

S.No.	Source of Germplasm	Name of species	Total no of collected germplasm		
			Plants	Cuttings	Seeds
State - Madhya Pradesh					
1	Doopgarh (Nagdwari)	<i>Berberis aristata</i>	5	200	Nil
2	Foot hill of Pachmarhi		2	150	Nil



The works of other objectives are in progress as.

a. Identification of quality germplasm through HPLC: HPLC system repaired Aug.2015. After this samples have been prepared for the isolation of alkaloids from the collected material. The presence of alkaloid from the prepared samples has been confirmed with Dragendorff solution. Alkaloid estimation through HPLC work is in progress.

b. Genetic diversity assessment: Screening of primers for the designated species work is progress. 4 primers for *Saraca asoka* have been identified for assessing its genetic diversity.

c. Clonal propagation:

(i) Micropropagation: Micropropagation technique has been standardized for *Embelia tsjerium cottom*, *Barberis aristrata*. However refining of the protocol is in progress. *In vitro* multiplication of *Swertia aungustifolia* is in progress. Cultures showed poor morphogenetic response in terms of multiplication during IIIrd sub culturing. *Saraca asoka* is very difficult to multiply by this method. After Ist sub culturing the cultures turned yellow due to presence of phenolic compounds.

(ii) Macropropagation: Macropropagation technique through stem branch cuttings have been successfully standardize for *Barberis aristrata*, *Embelia tsjerium cottom*. *Saraca asoka* showed very poor rooting response. The plants of first two species have been successfully hardened.

Current status of the project: On-going

Newly initiated project during the year: One

1. Title: Quantitative determination of bio-active compounds of highly threatened medicinal plant species through chemoprofiling and standardization of propagation techniques using biotechnological interventions for their conservation.

I. D. No.	:	GEN/P/E/15-16/03
Period	:	May, 2015 to April, 2018
Sponsoring agency	:	APCCF (Reseach & Extension) M.P. Bhopal
PI	:	Dr. S. K. Tiwari,
Co-PI	:	Amit Pandey
Project associates	:	Shailendra Yadav
	:	Pankaj Saini

Objective:

- Collection of germplasm of medicinal plants of 3 categories of viz. critically endangered, endangered and near threat from different forest areas of M.P.
- Standardization of HPLC techniques through chemical profiling (chemoprofiling) for quantitative determination, estimation of bioactive compound (alkaloid) and to constitute a chemical fingerprint library.
- Multiplication of identified germplasm by standardizing micro and macro propagation protocol in order to produce approximately 200 plants of each species.
- Standardization of cryopreservation protocol for long term conservation of targeted species.
- Obtain the patenting for international recognition
- Preparation of technical manual for the technology studies on the targeted species.

Activities carried out during the year:

Germplasm of *Butea superba* have been collected from MP, CG. The collection of germplasm and quantitative determination of secondary metabolites of proposed species is in progress.



Current status of the project: On-going

Regular Activity:

1. Title : Trainings on Biotechnology and Plant tissue Culture.

Type of training	No. of students
15 days	Nil
30 days	3
3 months	2
4-6 months (PG, Dissertation)	5

New protocols/clone/varieties developed:

(a). Macropropagation techniques: *Anogeisus pendula*, *Boswellia serrata*, *Embelia tsjerium cottom*, *Barberis aristrata*.

Other significant achievements/contributions:

Wood forensic study has been standardized for *Tectona grandis* (teak) using DNA finger printing technology. The stumps and logs of this species have been collected from Mandla Forest Division and wood forensic study has been successfully established. However isolation of DNA from different ages is in progress. Apart from this wild animal samples have been also identified successfully through species specific molecular markers.

3.5 FOREST MENSURATION AND STATISTICS BRANCH

Mandate

1. Measurements of growth for computing volume and finding the development of crop stands, for different species, in different quality classes and in different climatic zones of the state.
2. Designing of experiment and analysis of data for all branches of the Institute.

Staff

S. K. Jain : Assitant Director
Smt. Richa Seth : Sr. Research Officer
Shri Shishupal Singh Mehta : Forester

Project Staff

Smt. Sakshi Seth : Computer Operator

Projects completed during the year:

Internally funded : Nil

Externally funded : One

1. Revised form factor tables for important miscellaneous timber tree species of Madhya Pradesh.

Ongoing projects

Internally funded : Nil

Externally funded : Nil

Newly Initiated project during the year

Internally funded : Nil

Externally funded : Nil

Regular Activity:

Ongoing: One

Newly initiated regular activity during the year: Nil

1. Measurement of sample plots due in the year 2013-14.



Completed project during the year: One

1. Title : Revised form factors table for important miscellaneous timber tree species of Madhya Pradesh.

I. D. No. : MEN/P/E/ 11-12/12
Period : Oct 2011 - Sept 2013
Sponsoring agency : APCCF (Production) M.P., Bhopal
PI : Shri S.K. Jain
Co-PI : Smt. Richa Seth

Objective:

• **Long term objectives of the project**

Other than teak and sal, demand for various miscellaneous timber species has increased substantially due to shortage in availability of timber of teak and sal and increase in demand of timber for various purposes. The small wood of any species which was earlier considered useless and unmarketable is now finding pronounced use and demand for furniture, carpentry and other timber oriented purposes. Therefore preparation of these tables is necessary for estimation of timber and fuel volume obtained from important miscellaneous species.

Activities carried out during the year:

- Data of Betul, North Balaghat, South Balaght, West Balaght, Dewas, Harda, South Seoni, North Seoni, West Chhindwara & Sehore was rearranged as per requirement of the project and analysis in SPSS.
- Final reports for Dewas, Harda, Mandla and Seoni division (North Seoni and South Seoni) have been prepared and sent to the concerned DFO.

Current status of the project: Completed

Newly initiated projects: Nil

Regular activity:

On-going: One

1. Title : Measurement of sample plots due for measurement in the year 2015-16.

I. D. No. : ID.No. MEN/RA/1/08
Period : Regular
Sponsoring agency : Internal
PI : Shri S.K. Jain
Co-PI : Smt. Richa Seth

Objective:

- Determination of the crop increment at all stages of development of even aged crop.

Activities carried out during the year:

- As per schedule for 2015-16 measurement of all 14 plots have been completed.

Current status of the project: Ongoing



3.6 SEED TECHNOLOGY BRANCH

Mandate

- Collection of quality seeds from identified superior genetic sources.
- Seed storage.
- Seed certification.
- Research on seed biology, pollination biology, physiology and biochemistry.
- Contribution to the knowledge of seed technology with regard to enhanced germination and longevity of seeds.

Staff

Dr. Archana Sharma	:	Scientist- D and Head
Mrs. Manjula Parihar	:	Lab Assistant
Shri Anand Prakash Agrawal	:	Field Assistant

Project Staff

Mrs Anju Kathel	:	Junior Research Fellow
Shri Ramkumar Kahar	:	Junior Research Fellow
Shri Abhishek Kumar Gupta	:	Computer Operator

Completed Projects

Internally funded : Nil

Externally funded : Three

1. Effect of Vermicompost and Neem cake on plant growth of some forestry species.
2. Training and Demonstration Programme on seed technology and management of seed production areas for field foresters
3. Documentation and Development of Packages of Seed and Nursery Techniques for Some Important Indigenous Species.

Ongoing Projects :

Externally funded : One

1. Standardization of seed and nursery techniques for production of quality planting stock of important indigenous species.

Internally funded : One

1. Documentation of developed seed technology, nursery and planting techniques of important forestry tree species.

Regular Activities : One

1. Seed testing and certification

Completed projects during the year

Externally funded : Three

1. Title : Effect of Vermicompost and Neem cake on plant growth of some forestry species.

Project ID	:	SD/P/E/ 12-13/16
Project period	:	June,2012- June, 2014 (Extended till March, 2015)
Sponsoring Agency	:	APCCF, (Research Extension & Lokvaniki) M.P. Bhopal
Principal Investigator	:	Dr. Archana Sharma



Objective:

- To compare the effect of vermicompost, FYM (farm yard manure) and neem cake on plant growth and biomass production of Aonla, Khamer and Teak seedlings and also to determine the optimum doses of these fertilizers and neem cake.

Activities carried out during the year :

- Measurement of root and shoot length, biomass of seedlings.
- Testing of potting mixture after the completion of the experiment.
- Observation on survival percentage of plant.
- Data analysis and report writing

Findings:

<i>Species</i>	<i>Treatment (poly-pot mixture)</i>	<i>Survival %</i>	<i>Seedling growth increment (%) against control</i>
<i>Tectona grandis</i> (Teak)	T0 (only soil)	45	164.41
	T7 (Soil, sand Vermicompost (1:1:1) and Neem cake (50g))	78	
<i>Gmelina arborea</i> (Khamer)	T0 (only soil)	40	137
	T5 (soil + sand + FYM (1:1:1) with Neem cake (100g))	73.33	
<i>Emblica officinalis</i> (Aonla)	T0 (only soil)	66.67	140.56
	T8 (Soil, sand Vermicompost (1:1:1) and Neem cake (100g))	93.33	

Current status of the project : Completed

2. Title : Training and Demonstration Programme on seed technology and management of seed production areas for field foresters.

ID No. : SD/P/E/14-15/04
 Period : August, 2014- July, 2015
 Funding Agency : APCCF,(Research Extension & Lokvaniki) M.P. Bhopal
 P.I. : Dr. Archana Sharma
 Project Staff : Abhishek Kumar Gupta

Objective :

- The objective of this training course was to provide a basic understanding of the topics viz; seed stand, establishment of seed production area (SPA), seed collection, knowledge of seed maturity, seed extraction and cleaning, insect and disease problem, seed storage, method of seed lot sampling, test for moisture, purity, weight, germination and vigor, rapid seed viability estimate, seed certification, pre sowing treatments, seed dormancy and basics for nursery.

Activities carried out during the year

- Training and demonstration programme for 100 field foresters of 15 forest divisions and 02 R&E centers on "Seed technology and management of seed production areas" at SFRI.
- Report writing and submission



Progress:

- Field officers were invited from 60 territorial divisions and 11 Research and Extension centers. Training programme was conducted on topics of seed technology, and management of seed production areas in 05 phases. Out of total invited 400 participants 322 participated and trained with related topics. Under the 03 days training programme group discussion and demonstration programme also conducted and observations were reported with reference to knowledge of seeds related to species, quality of seeds, planting stock and viability analysis. All trainees informed that they used seeds from unknown source. Plantations suffered due to don't have the knowledge of seed quality parameters, seed longevity, viability of the seeds and fundamentals of nurseries and seed production areas. So, the training was very useful for future plantation and production of quality planting stock. All trainees suggested that this type of training programme should be organized time to time for improvement in quality seed collection and plant production.

Current status of the project : Completed

3. Title : Documentation and development of packages of seed and nursery techniques for some important indigenous species.

Project ID : SD/P/E/ 12-13/14
Project period : June, 2012- June, 2015 (Extended upto December, 2015)
Sponsoring Agency : APCCF, (Research Extension & Lokvaniki) M.P. Bhopal
Principal Investigator : Dr. Archana Sharma

Objectives:

- To standardize seed and nursery techniques of indigenous species to raise quality seedlings.
- To promote plantations of indigenous species in afforestation programme.

Activities carried out during the year

- Various pretreatment applied in stored seeds to hasten seed germination and standardization of best treatment.
- Observation recorded on seed germination and seedling growth.
- Standardization of doses of organic/inorganic fertilizers to plants under nursery stages.
- Vegetative propagation by cuttings
- Different hormonal concentration will be tried to standardized protocol for vegetative success.
- Standardization of doses of the insecticides and pesticide to prevent of pests and diseases in nursery stock.
- Observations recorded on growth parameters, rooting response and survival percentage of seedlings.
- Data analysis, report writing and submission.

Finding:

After completion of various experiments following results were drawn for selected species:

Species Name	Best pretreatment	Best Storage condition	Best seed sowing media with condition	Best potting mixture	Best before
<i>Semecarpus anacardium</i>	Seed soaking in 5% conc. of H ₂ SO ₄ for 10 minutes	Seed stored at 4°C temperature	Seed sowing in nursery bed as ratio 1:1:1 of soil, sand and FYM	Soil, sand, FYM 1:1:1 + 20gm Azotobacter	12 months
<i>Careya arborea</i>	Seed soaking in 500 ppm IBA for 10 minutes	Seed stored at 4°C temperature	Seed sowing in germination tray using pure sand	Soil, sand, FYM 1:1:1 + 20gm Rhizobium	15 days



Species Name	Best pretreatment	Best Storage condition	Best seed sowing media with condition	Best potting mixture	Best before
<i>Bauhinia vahalii</i>	Seed soaking in 5% conc. of H ₂ SO ₄ for 10 minutes	Seed stored at 4°C temperature	Seed sowing in germination tray using pure sand	Soil, sand, FYM 1:1:1 + 60gm Rhizobium	12-15 months
<i>Mitragyna parviflora</i>	Seed soaking in cold water for 96 hours	Seed stored at 4°C temperature	Seed sowing in germination tray using pure sand	Soil, sand, FYM 1:1:1 + 2gm Potash	15-18 months

Current status of the project : Completed

Ongoing Projects :

Externally funded : One

1. Title : Standardization of seed and nursery techniques for production of quality planting stock of important indigenous species.

Project ID : SD/P/E/15-16/02
 Project period : June, 2015–Jun, 2019
 Sponsoring Agency : APCCF, (Research Extension & Lokvaniki) M.P. Bhopal
 Principal Investigator : Dr. Archana Sharma
 Project Staff : Anju Kathel
 : Ramkumar Kahar
 : Abhishek Kumar Gupta

Objectives:

- To standardize seed techniques for enhancing seed germination and seed longevity of seeds for production of quality seedlings
- To standardize nursery technique through advance and systematic scientific methods for raising quality seedlings of targeted species.
- To compare the effect of Vermicompost, FYM (Farm Yard Manure), neem cake and other bio-fertilizers on plant growth, survival and biomass production of targeted species.
- To standardize the poly pot size/root trainers for better seedling growth and highest survival percentage.
- Find out color of poly-pot for better growth and survival of seedlings.
- To prepare a technical brochure of developed techniques to raise the quality plants of targeted species.
- Extension of the developed technique through published brochure.

Targeted Species

1. *Adina cordifolia* (Haldu)
2. *Adunsonia digitata* (Khurasani Imli)
3. *Terminalia bellerica* (Bahera)
4. *Terminalia chebula* (Harra)
5. *Sapindus trifoliatus* (Reetha)

Activities carried out during the year:

- Recruitment of project staff



- Literature survey
- Estimation of seed quantity of raising seedlings of the experiment.
- Collection of seeds.
- Preparation of sowing media
- Seed sowing in different conditions with different sowing media
- After collection seeds were stored in different containers and open conditions.
- Store seeds were tested at the three months intervals from the point of view of seed longevity and germination potential.
- Fresh and stored seeds were tested with various pretreatments to enhance the germination potential.
- Seed germination potential was tested in different condition and in different sowing media.

Progress

- ✓ Project staff recruited.
- ✓ Literature searched related to past work on seed and nursery techniques of targeted species.
- ✓ Seeds of *Adina cordifolia* (Haldu), *Terminalia bellerica* (Bahera), *Terminalia chebula* (Harra) and *Adansonia digitata* (Khurasani Imli) were collected from identified superior sources.
- ✓ Observation was recorded on morphological and physiological parameters of collected seeds.
- ✓ Seeds of targeted species were stored in different containers and temperatures.
- ✓ Fresh and stored seed were tested with various pretreatments.
- ✓ Seed germination potential was tested in different sowing media and in deferent conditions.
- ✓ Observations were recorded on germination potential, seedling growth and biomass.

Current status of the project : Ongoign

Internally funded : One

1. Title : Documentation of developed seed technology, nursery and planting techniques of important forestry tree species.

Project ID : SD/P/I/13-14/08
 Project period : July, 2013-June, 2014 (Extended upto March, 2016)
 Sponsoring Agency : Internal
 Principal Investigator : Dr. Archana Sharma

Objective:

- To prepare a field guide related to seed technology, nursery and planting techniques of 50 forestry species.

Activities carried out during the year

- Seed, nursery and plantation techniques of about 35 species have been recorded through published and unpublished literature on following lines:
 - ✓ Seed viability period/ life span
 - ✓ Dormancy Period (if any)
 - ✓ Germination potential
 - ✓ Appropriate storage method
 - ✓ Best before – in Month



- ✓ Pretreatment before seed sowing
- ✓ Media for germination
- ✓ Seed sowing month
- ✓ Seed quantity for raising 100 plants
- ✓ Appropriate method for seed sowing
- ✓ Disease and control measure in nursery stage
- ✓ Potting mixture
- ✓ Poly bag size / root trainers
- ✓ Spacing
- ✓ Pit size
- ✓ Plant height for plantation
- ✓ Irrigation and maintenance
- ✓ Utility
- ✓ Any other

Progress :

- Report writing is under progress and will be submitted in the form of field manual.

Current status of the project : On-going

Regular Activities :

1. Title : Seed testing and certification

Project ID : SD/P/I/13-14/20
 Project period : Regular
 Sponsoring Agency : Internal
 Principal Investigator : Dr. Archana Sharma

- 07 Seed samples of Teak and Khamer were received from identified sources and were certified with tested standards.
- 72 samples of treated teak seeds were tested with moisture and viability.
- 4755.24 quintal teak seeds were collected from identified superior sources.
- 1482.48 quintal seeds were treated with scientific manner.
- 372.90 quintal treated teak seed disposed to R&E centers and 1109.58 quintals in stock.
- 1077.25 quintal untreated seed were also sold to R&E Centers and other state and 405.80 quintal in stock in the godown.

Procurements (of important scientific equipments) during the year:

- Teak seed treating machine.

Plant raised / disposed off during the year – give species wise list:

Species	Raised	Sold	Balance
Mundi	2218	1535	683
Mahul	400	205	195
Mahua	44		44



Species	Raised	Sold	Balance
Bans	115		115
Kumbhi	1109	1080	29
Sagon	40		40
Khamer	20		20
Garari	11		11
Bhilwa	355	340	11
Total	4312	3160	1148

Remaining 1148 plants handed over to Biodiversity Branch.

New protocols / clones / varieties developed:

- Doses of biofertilizers in potting mixture were find out and recommended for better growth, survival and biomass of seedlings of *Tectona grandis* (Teak), *Gmelina arborea* (Khamer) and *Emblica officinalis* (Aonla).
- Seed longevity and germination potential enhanced by appropriate technology in various species viz; *Mitragyna parviflora*, *Bauhinia vahalli*, *Careya arborea*, *Semicarpus anacardium* and *Tectona grandis* seeds.

Other significant achievements :

- 01 book and 06 brochures published, useful for field foresters for successful plantation.
- Established and strengthened the infrastructure of teak seed processing, testing, packaging and storage unit.
- Germination potential increased by various pre-sowing treatment in *Semicarpus anacardium*, *Mitragyna parviflora* and *Bauhinia vahlii*. The finding would be useful for forest managers to promote plantation and indigenous species in Afforestation programme.
- Demonstration of technologies to field foresters from different forest divisions and students of Agriculture University under various training programmes on Testing of seed purity, seed sampling, seed viability, seed grading, seed germination and oil estimation and Establishment and management of Seed Production Areas.
- Broadcasting in Vividh Bharti programme "Chalti Rahe Zindagi" on (1) Applications of Biotechnology in Seed Technology (2) Significance of biotechnology in better crop production.

3.7 SILVICULTURE BRANCH

Mandate:

1. Development and standardization of nursery and planting techniques of different forestry species.
2. Development of technology for afforestation and eco-restoration of stress sites.
3. Contribution to the knowledge of silviculture of forestry species.
4. Determination of suitable thinning regimes for plantation of forestry species.
5. Determination of sustainable harvesting practices of timber and bamboo species (harvesting intensity, time, etc.)
6. Evaluation of impact of various silvicultural systems and evolution of new systems of management in the context of changed environment.
7. Studies on the effects of grazing and fire on forest eco-system.
8. Evaluation of plantations raised by the state forest department and forest development corporation.



9. Evaluation of the quality and impact of various development activities of the state forest department.
10. Provision of soil testing services to the SFD, FDC and other users.
11. Production of quality planting material.

Staff

P. N. Mishra	:	Dy. Director
Raghvendra Bisen	:	Asst. Director
Dr. Pratiksha Chaturvedi	:	Sr. Research Officer
Vinay Kori	:	Forest Guard

Project Staff:

Amardeep Rajak	:	Computer Operator
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Completed Projects during the year :

Internally funded: Nil

Externally funded: Nil

On-going projects

Internally funded: One

1. Study on felling cycles of *Dendrocalamus strictus*.

Externally funded: One

1. म. प्र. राज्य वन विकास अभिकरण द्वारा विभिन्न वन विकास अभिकरणों में वित्तीय वर्ष 2012-13 के वर्षा ऋतु में हुए वृक्षारोपण कार्यों का अनुश्रवण मूल्यांकन किये जाने के संबंध में।

Newly initiated projects during the year: Nil

Regular activities

On-going: One

1. Analysis of soil samples

Projects completed during the year:

Externally funded: Nil

Internally funded: Nil

On-going projects

Internally funded: One

1. Title: Study on felling cycles of *Dendrocalamus strictus*.

Project ID	:	SIL/P/E/04-05/08
Project period	:	July 2004 - June 2017
Sponsoring Agency	:	Internal
Principal Investigator	:	Raghvendra Bisen
Co-PI	:	Dr. Pratiksha Chaturvedi

Objective:

- To determine the most appropriate felling cycle for *Dendrocalamus strictus*.

Activities carried out during the year:

- Bamboo felling for one and three year intervals in T₁, and T₃ treatment plot was done for study.



Interim Findings:

1. Two year treatment gave better yield than others followed by T₁, T₃, T₄ in descending order.
2. T₁ (one year interval) has more number of Karla production followed by T₂, T₄, and T₃ in descending order.
3. T₄ had a maximum number of matured culms (Pakia) due to maximum felling interval.

Current status of the project: On-going

Externally funded: One

1. **Title:** म. प्र. राज्य वन विकास अभिकरण द्वारा विभिन्न वन विकास अभिकरणों में वित्तीय वर्ष 2012–13 के वर्षा ऋतु में हुए वृक्षारोपण कार्यों का अनुश्रवण मूल्यांकन किये जाने के संबंध में।

Project ID	:	SIL/P/E/15-16/08
Project period	:	06 Months (Sept. 2015 – Feb 2016)
Sponsoring Agency	:	APCCF, JFM/FDA, Bhopal
Principal Investigator	:	Raghavendra Bisen
Co-PI	:	Dr. Pratiksha Chaturvedi

Objectives:

- To promote peoples participation in afforestation works and forest management.
- Checking forest degradation and loss of bio-diversity.
- Ecological sustainability, environmental conservation and eco-development of project areas.
- To develop the degraded forest wastelands by appropriate afforestation activity.
- Assisting natural regeneration in degraded areas with good root stock.
- Ensuring sustainable use of forest produce obtained from the regenerated areas.
- To develop water resources through soil and moisture conservation efforts and water harvesting.
- To develop public awareness for forests as beneficial resource and use of its produce for the maximum benefit.
- Employment generation for the poor sections of society particularly the women SC/ST and landless labourers inhabiting forest.

Activities carried out during the year:

- Field work of all 15 Divisions completed.
- Interim reports of all 15 forest divisions submitted

Important findings:-

- On the basis of overall grading the work of Jabalpur, Katni, E. Mandla, W. Mandla, Dindori, Jhabua, Dhar, E. Chhindwara, W. Chhindwara, S. Chhindwara, Badwaha, Khargon, Sehore & Sidhi were found to be very good whereas the works of Rewa has been found to be good.



Overall Grading of various FDAs

S. No.	Forest Circle	Name of FDAs	Overall Project Grade
1	Jabalpur	Jabalpur	Very Good
2	Jabalpur	Katni	Very Good
3	Jabalpur	E. Mandla	Very Good
4	Jabalpur	W. Mandla	Very Good
5	Jabalpur	Dindori	Very Good
6	Indore	Jhabua	Very Good
7	Indore	Dhar	Very Good
8	Chhindwara	E. Chhindwara	Very Good
9	Chhindwara	W. Chhindwara	Very Good
10	Chhindwara	S. Chhindwara	Very Good
11	Khandwa	Badwaha	Very Good
12	Khandwa	Khargone	Very Good
13	Bhopal	Sehore	Very Good
14	Rewa	Sidhi	Very Good
15	Rewa	Rewa	Good

Current status of the project: On-going

Regular activities

Internally funded: One

1. Title : Analysis of soil samples:

ID No. : SIL/ RA/15

PI : Shri Vinay Kori

Objective:

- Physico–chemical analysis of soil samples received from forest department, MPRVVN Ltd, private agencies, NGO's and various branches of the institute.

Activities carried out during the year:

502 soil samples were received from forest department, MPRVVN Ltd., private agencies (NGO's) and various branches of the institute. These were analysed for their physical and chemical properties and nutrients status for various parameters viz. moisture, pH, EC, organic carbon%, organic matter, available nitrogen, phosphorus, potassium, calcium, sodium, water holding capacity, textural class, bulk density, specific gravity, etc. Soil analysis reports were sent to the concerned agencies and various branches of the institute.

Current Status of the project: Ongoing

Other significant achievements/contributions

Tranining was given on soil sampleing & analysis for field staff of forest department organized by Jabalpur Forest Division on 11th March 2016. (Lecture delivered by Dr. Pratiksha Chaturvedi & Vinay Kori)



3.8 SOCIAL ECONOMICS AND MARKETING BRANCH

Mandate

The branch conducts research on social, economic, utilization and marketing aspects related to forestry. The broad areas of research are:

Social Economics

Forestry in the context of socio- economic development and tribal economy.

People's participation in JFM and other forestry programmes.

Marketing

Marketing of forestry products.

Marketing information service.

Utilization

Forest based industries and rural development.

NWFP processing

Archive

Maintenance of Forest Archive.

Restoration and preservation of old records.

Staff:

Dr. Pratibha Bhatnagar	:	Scientist and Head
Dr. G.S. Mishra	:	Sr. Research Officer
Mr. Alok Raikwar	:	Technical Assistant
Mr. Vijay Bahadur Singh	:	Technical Assistant

Project Staff

Mr. Rajesh Barman	:	Sales Promotion Representative
Mr. Mukesh Gawane	:	Sales Promotion Representative
Mr. Nitin Jaiswal	:	Sales Promotion Representative
Mr. Ramdeen Bhalavi	:	Senior Research Fellow
Mr. Balram Lodhi	:	Senior Research Fellow
Ms. Shubhangi Khatri	:	Computer Operator

Completed projects during the year

Internally funded: Nil

Externally funded : Two

1. Strengthening of MIS Cell at SFRI and establishment of five regional marketing analysis centres in Madhya Pradesh.
2. Standardization of primary processing and drying techniques of NWFPs including medicinal plants.

Ongoing projects

Internally funded : Nil

Externally funded : Two

1. Compilation of 50 years of forestry research in SFRI (1963-2013).
2. Network project on conservation of lac insect genetic resources.



Newly initiated projects during the year

Internally funded: Nil

Externally funded: Nil

Projects completed during the year

Externally funded: Two

1. Title: Strengthening of MIS cell and establishment of five regional market data collection and analysis Centers in Madhya Pradesh.

Project ID : SEM/P/E/11-12/01
Project Period : May 2011 – Apr 2015
Sponsoring Agency : MP MFP Federation, Bhopal
Principal Investigator : Dr. Pratibha Bhatnagar
Project Associates : Ms. Radhika Urmalia
: Mr. Rajesh Barman
: Mr. Mukesh Gawane
: Mr. Nitin Jaiswal

Objectives :

- Collect and analyze market information.
- To assess market demand for medicinal plants.
- Market promotion.
- Market research and intelligence.

Activities carried out during the year

Table 1: Details of MIS centres and markets

Zones	Centres	Markets/Districts
Eastern	Katni	Rewa, Shahdol, Umaria, Katni Satna, Chhatarpur, Tikamgarh and Sidhi.
Southern	Chhindwara	Chhindwara, Betul, Harda, Seoni, Hoshangabad and Narsinghpur.
Central	Bhopal	Bhopal, Vidisha, Sehore, Raisen, Shajapur, Raigarh.
Northern	Shivpuri	Shivpuri, Sheopur, Morena, Gwalior, and Guna
Western	Indore	Indore, Khandwa, Jhabua, Dhar, Dewas, Ujjain, Ratlam and Neemuch
Nodal Centre	MIS Cell, SFRI	Jabalpur, Mandla, Dindori, Balaghat, Sagar, Damoh, Panna, and national market.

1. Market information

- Periodical market surveys were conducted and collected national, state level, district & village level markets in Madhya Pradesh, Maharashtra and Chhattisgarh was done. Volume 11 to 15 of Van Dhan Newsletter were published and disseminated. Demand study for Ayurvedic industries was undertaken.

2. Market promotion



Table 2 : Market Promotion workshops organised

S. No.	Name of MIS Center	Workshop Date	Number of Participants
1.	Jhinhri Range ,Katni	16 April -2012	109
2.	Shivpuri	April -2012	71
3.	Indore	20 June-2012	13
4.	Chhindwara	27 November-2012	63
5.	Manpur Range, Umaria	11 January -2014	60
6.	Harrai Range, Chhindwara	12 November-2014	23
7.	Sangrampur Range, Damoh	31 January,2014	32
8.	Chhindi village, Chhindwara	14 November,2014	70
9.	Chauraha village, Satna	15 December,2015	44

3. Market research

A Number of research works were undertaken which are mentioned below:

- Grade standards for 27 NTFPs were documented.
- Value chain analysis of 10 important medicinal plants was completed.
- Price trends of 65 important medicinal species were prepared.
- Analysis of prices collected from 2001-2014 was done for 58 species.
- Directory of traders and ISM Industries was updated.

Current status of the project: Completed

2. Title : Standardization of primary processing and drying techniques for selected medicinal species and NWFPs

Project ID : SEM/P/E/11-12/25
Project Period : 1st Jan.2012 to Dec. 2015
Sponsoring Agency : APCCF (R/E & Lok Vaniki), MP Bhopal
Principal Investigator : Dr. Pratibha Bhatnagar

Objectives :

- To standardize primary processing and drying techniques of NWFPs including medicinal plants of commercial importance.
- To find optimal drying conditions.

Finding :

Drriage protocols for 14 medicinal plants and NWFPs were standardized as given in table 3.



Table : 3 Driage percentage of medicinal plants under different treatments.

S. No.	Botanical Name	Part	Method	Driage %			
				Sun	Solar	Shade	Oven
1	<i>Phyllanthus niruri</i>	Whole plant	drying	54.5	57.5	48.0	-
2	<i>Baccopa monnier</i>	leave	drying	88.7	89.3	88.7	-
3	<i>Gloriosa superba</i>	seed and rhizome	drying and processing	82-89	-	77.4-84.0	80.0-84.0
4	<i>Gymnema sylvestre</i>	leaves	drying	62.0	62.8	62.8	-
5	<i>Celastrus paniculatus</i>	seed	drying	16.6	-	18.6	
6	<i>Mucuna pruriens</i>	seed	drying	75.0	77.33	61.22	-
7	<i>Acorus calamus</i>	root	drying	69.33	68.46	66.06	-
8	<i>Eclipta alba</i>	whole plant	drying	82.75	83.50	80.55	-
9	<i>Costus speciosus</i>	tuber	drying	66.00	64.26	59.13	-
10	<i>Lepidium sativum</i>	seed	drying	9.23	9.33	4.56	-
11	<i>Asparagus racemosus</i>	root	drying	80.8	81	-	80.86
12	<i>Cassia fistula</i>	fruits and seed	drying	25.5		22.5	
13	<i>Curcuma caesia</i>	tuberous root	drying	60.0-74	-	55.0-59.0	-

Current status of the project: Completed

Ongoing projects

Internally funded : Nil

Externally funded : Two

1. Title : Compilation of 50 years of forestry research in SFRI (1963-2013)

Project ID : SEM/P/E/12-13/03
 Project Period : 1st May 2012 to April 2013.
 Sponsoring Agency : APCCF, (R/E & Lok Vaniki), MP Bhopal
 Principal Investigator : Dr. Pratibha Bhatnagar

Objective:

- To compile research experiments undertaken for the past fifty years (1962-2013)

Activities carried out during the year:

- Compilation of research work was completed and report writing is in progress.

Current status of the project: on going

2. Title : Network project on conservation of lac insect genetic resources.

Project ID : SEM/P/E/14-15/05
 Project Period : 2015-2017
 Sponsoring Agency : Indian Institute of Natural Resin and Gums, Ranchi
 Principal Investigator : Dr. Pratibha Bhatnagar



Objectives:

- Conduct survey of the area for the lac insect and host plants
- Collect and conserve lac insect under *ex-situ* condition
- Carry out on farm trials on lac cultivation technologies
- Training of adopted/selected farmers in collaboration with IINRG for *in-situ* conservation.
- Conduct need based and location specific studies on lac insects /or host plants

Activities carried out during the year:

1. Survey of the area for the lac insect and host plants in Madhya Pradesh

Survey of occurrence of lac insects in Madhya Pradesh was done in 19 districts as given in Table 4 and four districts of Maharashtra state given in Table 5.

Table.4 : Block wise occurrence of lac insect in Madhya Pradesh

S. No.	District	Blocks in which lac insect were found	Block in which host plants found
1	Mandla	Nainpur, Bichhiya, Mohgaon, Ghughri, Narayanganj and Niwas.	Palas, Ber and Sitaphal, Gular, Aam, Sagon, and Babool
2	Seoni	Kurai, Barghat, Keolari, Lakhnadon, Dhanora and Seoni	Palas, Ber, Kusum, Akashmoni.
3.	Balaghat	Waraseoni, Ialburra, Parswara, Baihar, Katangi, Balaghat, Lanji and Birsa	Palas, Kusum and Ber
4.	Shahdol	Jaitpur, Gohparu, Jaisinghnagar	Palas
5.	Anuppur	Jaithari, Anuppur	Palas
6.	Dindori	Bajag, Sahpur and Dindori	Kusum and Pipal
7.	Narshinghpur	Chichli,	kusum
8.	Hoshangabad	Bankhedi, Pipariya	kusum
9.	Chhindwara	Tamia, Jamai, Jumnardev and Parasia	Palas and Kusum
10.	Harda	Timarni	Pipal
11.	Betul	Chicholi	Palas
12	Umaria	Manpur	Palas
13	Indore	Hatod, Mhow, Indore and Sanwer	Pipal and Palas
14	Alirajpur	Jobat, Alirajpur and Khatewara	Pipal and Siris
15	Jhabua	Jhabua	pipal
16	Neemch	Manasa, Neemuch and Ramgarh	Pipal
17	Mandsaur	Bhanpur, Mandsaur, Shamgarh and Dalonda	Pipal
18	Dewas	Chhipra	Pipal
19	Ratlam	Jaora	Pipal



Table 5: Block wise occurrence of lac insect in Maharashtra

S.No.	District	Blocks in which lac insect were found	Block in which host plants found
1.	Gondia	Gondia, Devri, Goregaon, Tirora, Aamgaon and Salekesa	Palas
2.	Bhandara	Tumsar, Bhandara	Palas
3.	Chandrapur	Barora, Brahampuri	Palas
4.	Gadchiroli	Dhanora, Mormagaon	Palas

2. Establishment of lac insect field gene bank

The sowing of *Flemingia macrophylla* and *Flemingia semialata* was done for mass multiplication in nursery beds and later transplanted in polybags and earthen pots. A new plot was established for lac insect gene bank in the SFRI ornamental nursery. A block plantation of *Flemingia semialata* in 2x2 m spacing was also undertaken.

Flemingia spp. raised in pots showed good growth and plants reached upto 3 to 4 feet. These were inoculated with brood lac from Palas, Ber and Kusum trees. The insects emerged are in pre adult stage on the plants. District wise/ block wise tagging was done on plants and accession numbers allotted.

Lac insect was observed in all important routes identified earlier with varying densities. The insect was found both in forest and in revenue land and also on farmer's field. It has been observed during extensive survey in potential areas that suitable price of lac is the main problem of farmers and lac production samitee. The other problem is high temperature during summer months. A host plant patch has been noticed for *in situ* conservation of lac.

In most districts and in most of the routes, palash lac was found in higher number with different diversities in Seoni, Balaghat and Mandla and kusmi lac was found in higher numbers in Bankhedi (Hoshangabad), Chichli (Narsinghpur) and Dindori.

With the sample specimen of brood lac collected from different sites and host plants, a standard size herbarium has been made and labelled for identification of lac insects and host plants.

Height and collar girth of *Flemingia macrophylla* and *Flemingia semialata* was measured by tape and digital calliper Table 6. GPS data was transferred to GIS Cell

Vermi compost was mixed with soil of potted plants for growth of host plant. Irrigation was being given to host plants very carefully. Temperature is being measured every day at regional lac insect gene bank.

Table - 6. Average height and collar girth of host plant in gene bank in Madhya Pradesh.

S. No.	District name	Host plant	Height (m)	Collar and girth (mm)
1.	Mandla	<i>F. macrophylla</i>	1.55	12.51
2.	Balaghat	<i>F. macrophylla</i>	1.35	10.90
3.	Seoni	<i>F. macrophylla</i>	1.59	13.72
4.	Hoshangabad	<i>F. semialata</i>	1.37	15.50
5.	Dindori	<i>F. semialata</i>	1.44	15.05
6.	Chhindwara	<i>F. semialata</i>	1.43	11.63
7.	Betul	<i>F. macrophylla</i>	1.41	11.00
8.	Shahdol	<i>F. macrophylla</i>	1.82	13.36
9.	Narsinghpur	<i>F. semialata</i>	1.39	14.31
10.	Harda	<i>F. macrophylla</i>	1.74	11.82
11.	Anuppur	<i>F. macrophylla</i>	1.87	14.18



3. Studies on predators and parasites of lac

The presence of dead larvae of predator's viz., *Eublema mabilis* and *Holococera pulvereana* was also noticed in lac encrustation. Besides, the presence of parasitoids like *Parecthodryinus clavicornis*, *Eupelmus chardiae* was observed. It has been observed that lac insects secrete fungal sugar droplets due to fungal infection. Fungicide (Babeston) has been sprayed into lac culture in regional lac insect field gene bank.

4. Training of adopted/selected farmers in collaboration with IINRG for in-situ conservation

Training and extension material

- Posters for training awareness on lac cultivation were made.
- Some field level forest staff were apprised about the lac insect, its cultivation and gene bank
- Shri Deepak Khandekar, Addl. Chief Secretary (Forest), Govt. of Madhya Pradesh visited the field gene bank and was apprised about the Network Project on lac Conservation.
- Farmers were given extension material and training on lac cultivation.

5. 3rd Coordination Committee Meeting of the NP CLIGR

Third Coordination Meeting was organised in State Forest Research Institute, Jabalpur on 28th-29th January, 2016 in which eight Network Cooperating Centers along with lead Centre IINRG, Ranchi (Jharkhand) participated. Field visit to lac insect gene bank at SFRI was done. A field visit was also arranged at farm and Bhedaghat Dr K.K. Sharma, Director and Coordinator of the Network project chaired the meeting.

Current status of the project: on going

3.9 TREE IMPROVEMENT BRANCH

Mandate

1. To select, document and maintain the plus trees.
2. To raise seedling and clonal seed orchards.
3. To conduct progeny trials.
4. Tree breeding.
5. To raise quality planting stock.
6. To study reproductive biology of trees.
7. To propagate rare and endangered species.

Staff

Dr. Sachin Dixit	:	Sr. Research Officer & Branch Incharge
Dr. Jyoti Singh	:	Sr. Research Officer
Sunil Rajak	:	Forester

Project Staff

Krishna Kumar Patel	:	JRF
Anupama Goswami	:	JRF
Nitin Kumar Verma	:	Computer Operator

Completed project during the year

Internally funded : Nil

Externally funded : One

1. Selection of superior races of Khamer (*Gmelina arborea*) through clonal propagation

On-going projects



Internally funded : Nil

Externally funded : One

1. Establishment of Bamboosetum and Bamboo Interpretation Centre at SFRI Jabalpur

Regular activities : Eight

1. Identification, documentation and maintenance of plus trees of important tree species.
2. Maintenance of progeny trials (Half-Sib) of *Tectona grandis*.
3. Maintenance of Seedling seed orchard of *Gmelina arborea*.
4. Maintenance of clonal orchard of *Zizyphus jujuba*.
5. Maintenance of germplasm of fruit bearing species
6. Maintenance of seedling seed orchard of khamer
7. Maintenance of clonal germplasm of *Madhuca latifolia* (Mahua)
8. Provenance trial of Litsea (*Litsea glutinosa*).

Completed projects during the year :

Externally funded : One

1. Title : Selection of superior races of Khamer (*Gmelina arborea*) through clonal propagation

Project ID	:	TI/P/E/12-13/02
Project Period	:	April, 2012 - March, 2015 (Extended upto March 2016)
Sponsoring Agency	:	APCCF(R/E & Lokvaniki) MP Bhopal
Principal Investigator	:	Dr. Sachin Dixit
Co-PI	:	Dr. Jyoti Singh

Objectives:

- To identify superior germplasm of *Gmelina arborea* form natural forest and plantations of M.P. and Chhattisgarh.
- To establish clonal plants in the field.
- To prepare second generation of clonal plants of superior races.
- Maintenance of clonal plants.
- Recording of growth data.

Findings:

- A total of 20 plus trees were selected in different parts of Chhattisgarh and Madhya Pradesh.
- A total of 1299, 3804 and 3299 cuttings were tried in year 2013, 2014 and 2015 respectively to know the sprouting and rooting behaviour of the species.
- The survival is recorded very poor i.e. 0.9 and 1.1% in 2014 and 2015 respectively.
- The maximum sprouting was observed in 2000 ppm as compare to other tried combination (treatment) i.e. 1000 ppm,, 1500 ppm and 5000 ppm of IBA.
- Sprouting behaviour of Khamer cutting has no significant effect on rooting. In other words, it has no correlation with its rooting behaviour.
- Cuttings of Khamer is almost failed to root in all the tried treatments.
- March month favours to root but not economical feasible while May month supports profuse sprouting but fail to root.



- Further study is recommended with various concentrations and combinations of root hormone i.e. IBA, IAA and NAA to find the sprouting and rooting behaviour of mature cuttings of the species.

Current status of project: Completed

Ongoing project;

Externally funded : One

1. Title : Establishment of Bamboosetum and Bamboo Interpretation Centre at SFRI Jabalpur.

Project ID : TI/P/E/10-11/01
 Project Period : April 2010 – March 2011 (Extended upto March, 2017)
 Sponsoring Agency : MP Forest Department, Bhopal
 Principal Investigator : Dr. Sachin Dixit
 Co-PI : Dr Jyoti Singh

Objectives :

- To establish bamboo interpretation centre at SFRI to exhibit information about bamboo and its utilization.
- To enrich and maintain the existing bambusetum of SFRI.

Findings :

- Bamboo interpretation centre was established at SFRI campus. A total of 74 bamboo articles were collected from various parts of Madhya Pradesh. Bamboo articles are maintained with treatment of boric acid and borax. This solution is very effective protection measure against borers, termites and fungi.
- The bambusetum was established at SFRI campus, Jabalpur in early nineties. A total of 13 Bamboo species were introduced at that time in the bambusetum which has approximately an area of 2 ha. A total of 9 new species was introduced during 2015-16 in the bambusetum. a total of 22 species are being maintained in the bambusetum.

Current status of project: Ongoing

Regular Activities

1. Title : Identification, documentation and maintenance of plus trees of important tree species.

PI : Dr. Sachin Dixit
 ID No. : TI/RA/I/09

Objective:

- To create a source of genetically superior material to be used in future tree improvement programmes.

Achievements:

- Previously selected plus trees of different forest tree species have been documented.
- Plus trees of Haldu (1) and Baheda (1) were identified, selected and documented.

2. Title : Maintenance of progeny trials (Half-Sib) of Tectona grandis.

PI : Dr. Sachin Dixit
 ID No. : TI/RA/I/13

Objective:

- To select best performing clones to get improved genetic material.



Achievement:

- Growth data on height and girth of trees raised in progeny trials were collected along with phenological behavior. These data reflect the trend of different tested progenies and indicate that BBC-15 has the best performance over others followed by KEKC-2, NRLC-17 and BBC-15, respectively.

3. Title : Maintenance of Seedling seed orchard of *Gmelina arborea*.

PI : Dr. Sachin Dixit
ID No. : TI/RA/I/19

Objectives:

- To establish broader genetic base through seeds of selected plus trees.
- Progeny testing of half-sib families.
- To get quality seed for further tree improvement work.

Achievements:

- Plantation was established in 0.5 ha area in July 2005 at SFRI campus. A total of 480 plants of 30 families were raised. Average girth and height of plantation is 29.2 cm and 5.6 m. flowering and fruit setting has been observed in few trees. Brush shoot clearance and Bordeaux mixture were pasted in trunk for insect pest control.

4. Title : Maintenance of clonal orchard of *Zizyphus jujuba*.

PI : Dr. Sachin Dixit
ID No. : TI/RA/I/25

Objective:

- Maintenance of clonal orchard of *Zizyphus jujuba* as germplasm/gene bank for further propagation for agroforestry

Achievements :

- Weeding and soil working was done and fencing was repaired in the orchard.
- Bordeaux mixture has been applied in trees of the orchards.
- A total of 29.8 kg Ber fruit of 10 varieties was collected during the year. The maximum number of fruit (294) was produced in Banarsi and Triloka variety while it is recorded the least (78) in Amaravati. Similarly, one fruit was weighed the maximum (17.7 g) in Banarsi variety and the minimum (9.9 g) in Amaravati variety. Average weight of one fruit in the orchard is recorded as 14.6 g.

5. Title : Maintenance of germplasm of fruit bearing species

PI : Dr. Sachin Dixit
ID No. : TI/RA/I/26

Objectives:

- Germplasm bank of fruit bearing species as genetic resource.
- The germplasm can be used for plant production through clonal multiplication and seed.

Achievements :

- Weeding & soil working was done and fencing repaired in the orchard.
- Bordeaux mixture has been applied in trees of the orchards.
- A total of 120 no. of Bael (36 kg) collected from germplasm bank.



6. Title : Maintenance of seedling seed orchard of khamer

PI : Dr. Sachin Dixit
ID No. : TI/RA/I/27

Objectives :

- Maintenance of seedling seed orchard as a genetic resource.
- Quality seed production and clonal propagation.

Achievements :

- Plantation was established in 0.25 ha area in July 2002 at SFRI campus. A total of 345 plants were raised. Brush shoot clearance and Bordeaux mixture were pasted in trunk for insect pest control. Area was fenced by barbed wire. Three trees were marked as a candidate plus tree from the orchard.
- Average girth and height of plantation is 45.8 cm and 11.3 m. flowering and fruit setting has been observed in few trees.

7. Title : Maintenance of clonal germplasm of Madhuca latifolia (Mahua)

PI : Dr. Sachin Dixit
ID No. : TI/RA/I/28

Objective :

- To maintain the germplasm bank of Mahua for training and motivation

Achievements :

- Clonal orchard has been established in SFRI campus. A total of six clones are maintained.
- Weeding, soil working and insecticides were applied.
- Average girth and height of clonal plants were recorded as 5.08 cm, 0.3 m; 19.7 cm, 2.04 m; 20.6 cm, 2.28 m; 18.42 cm, 1.66 m; 20.0 cm, 1.91 m and 17.24 cm, 2.1 m of Damoh, SFRI-1, SFRI-2, SFRI-3, SFRI-4 and SFRI-5, respectively. No flowering and fruiting was noticed.

8. Title: Provenance trial of Litsea (Litsea glutinosa).

PI : Dr. Sachin Dixit
ID No. : TI/RA/I/30

Objective :

- Provenance trial of *Litsea glutinosa* to conserve its germplasm.

Achievements :

- Seedling of eight provenance (places) were planted in 3 replication at the spacing of 3m x 3m. A total of 120 plants were raised at SFRI campus.
- Rewa provenance is performed the best with maximum height and girth (3.37 m and 21.7 cm) over other tried provenances. Lalbarra provenance shows the poor performance in this agro-climatic zone.

Other significant achievements/contributions during the year both individual and in group by the branch -

- Attended the "XIV World Forestry Congress 2015" held at Durban, South Africa
- Training for Forest Official (Forest Guard, Dy. Ranger etc.) from different forest divisions of Madhya Pradesh



3.10 WILDLIFE BRANCH

Mandate

1. Monitoring & evaluation of wildlife & their habitats
2. Study on ecology & conservation of wildlife including herbivores, carnivores & avifauna of the state
3. Impact of wildlife on human habitation & vice-versa
4. To prepare the wildlife management plan
5. Serve as a nodal agency to compliment management authorities for scientific inputs
6. To develop wildlife forensic laboratory
7. Documentation & dissemination of information on wildlife conservation

Staff

Dr. Anjana Rajput	:	Senior Research Officer and Head
Mr Mayank Verma	:	Research Officer

Project Staff

Dr. Aniruddha Majumder	:	Research Associate (Wildlife Biology)
Mr. S.K. Zeesan Ali	:	Research Associate (GIS Analyst)
Mr. Sandeep Singh Bhandari	:	Project assistant cum typist
Miss Durga Choudhary	:	Project assistant cum typist
Mr. Avdhesh Kumar Singh	:	JRF
Mr. Jitendra Singh	:	JRF
Mo. Ashad Mansoori	:	Field assistant

Completed project during the year :

Internally funded: Nil

Externally funded: One

1. Estimation of carrying capacity of grazing in different forest types and canopy densities in Jabalpur Forest Division of M.P.

On-Going Projects :

Internally funded: Nil

Externally funded: Five

1. Phase-IV monitoring and evaluation of wildlife and their habitats for sustainable management and development in the protected areas of Madhya Pradesh
2. Impact of tourism on environmental, ecological, and socio-economic dynamics, in and around the tiger reserves of Madhya Pradesh
3. Study on agricultural crop damage by wild animals and its management in Hoshangabad circle of Madhya Pradesh”
4. Evaluation of impact of rehabilitation of pardhi children in panna district of Madhya Pradesh with reference to the wildlife conservation
5. DNA based monitoring of Tigers presence and their movements in kanha- Pench corridor of M.P.

Newly Initiated Projects : Nil



Regular activities : Nil

New initiated during the year: Nil

Completed projects during the year :

Externally funded : One

1. Title : Estimation of carrying capacity of grazing in different forest types and canopy densities in Jabalpur Forest Division of M.P.

Project ID : SIL/P/E/09-10/07
Project Period : 2011 - Dec2014 (Project extended up to Dec 2015)
Sponsoring Agency : Madhya Pradesh Forest Department (Development Wing)
Principal Investigator : Mayank Makrand Verma
Research Associate : S.K Chaubey (Field Assistant)

Objectives :

- To estimate the carrying capacity of grazing.
- To prepare an inventory of palatable and non palatable grass species
- To study the effect of grazing & browsing on the regeneration of tree, shrubs, herbs and grasses.

Activities carried out during the year:

- Socio economic survey of villages falling under five km periphery from eco reference sample plots completed.
- Data computation and analysis in SPSS software completed.
- Report writing work completed.
- Final project report has been submitted to funding agency.

Important findings/ interim findings, if any:

Recommendations- Stratum wise recommendations for carrying capacity of grazing for Jabalpur forest division as shown below in table : Carrying capacity is the maximum stocking rate possible while maintaining or improving vegetation or related resources.

Variable Stratum code	Avg. Annual forage production per ha. in Qt. (within protected area)	Permissible carrying capacity in Animal Unit /ha/day basis	Permissible carrying capacity in ha. / Animal Unit /day basis
THP	9.06	0.24	4.02
MHP	6.2	0.16	5.8
THU	3.54	0.09	10.36
MHU	5.31	0.14	6.87
THH	5.54	0.15	6.5



Variable Stratum code	Avg. Annual forage production per ha. in Qt. (within protected area)	Permissible carrying capacity in Animal Unit /ha/day basis	Permissible carrying capacity in ha. / Animal Unit /day basis
MHH	6.27	0.17	5.82
TMP	19.64	0.53	1.85
MMP	19.9	0.54	1.83
TMU	4.75	0.13	7.6
MMU	14.32	0.39	2.54
TMH	12.02	0.32	3
MMH	17.37	0.47	2.1
TLP	36.36	0.99	1
MLP	47.43	1.29	0.76
TLU	19.1	0.52	1.91
MLU	34.43	0.94	1.06
TLH	9.65	0.26	3.78
MLH	11.1	0.30	3.2

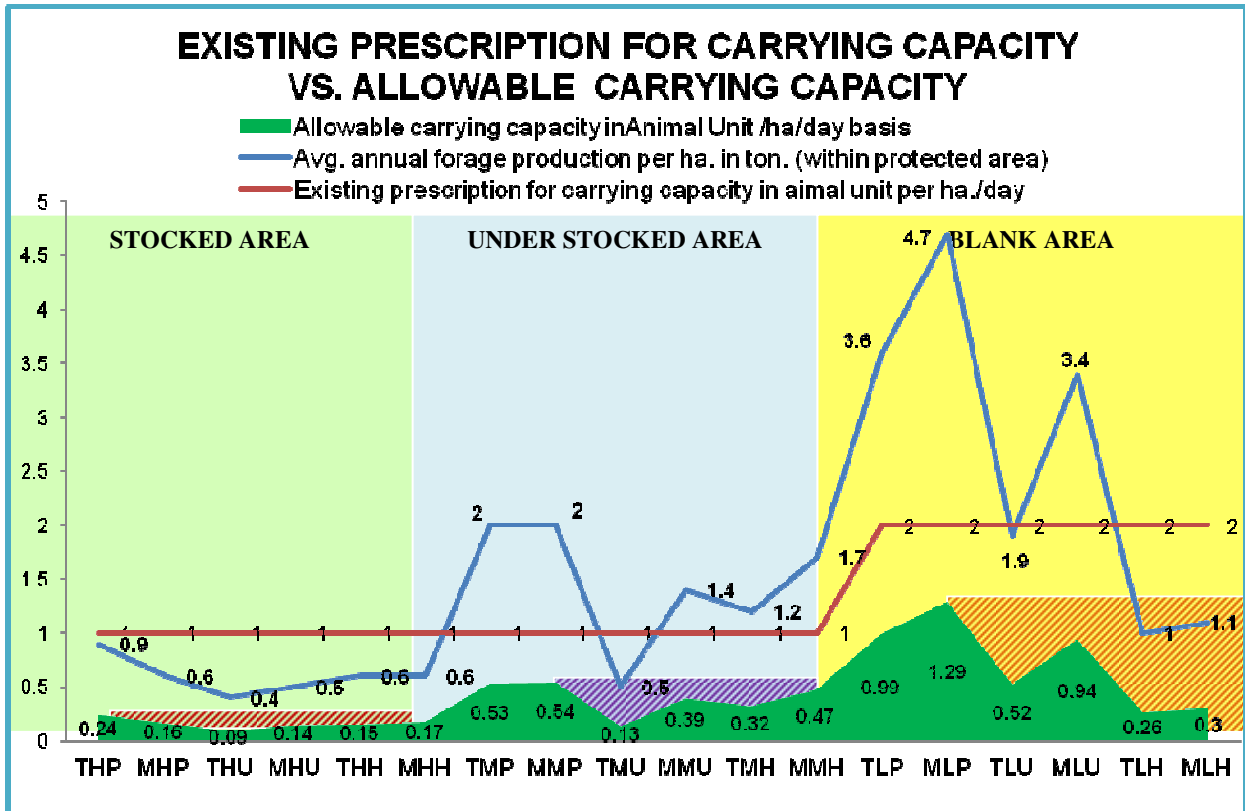
First word of stratum code- T=Teak Forest Type, M=Miscellaneous Forest Type,

Second word of stratum code- H=High Canopy Density, M=Middle canopy density, L=Low canopy density.

Third word of stratum code- P= Plain Topography, U= Undulating Topography, H= Hilly Topography.

We have estimated carrying capacity of grazing individually max possible 18 stratum of Jabalpur division. We have discussed before that all stratum represents specific combination of forest type, canopy density and topography classes as variables of study. For example, THP is encoding here T for Teak forest type, H for High canopy density, P for Plain topography. Carrying capacity of grazing calculated of each stratum on annual forage productivity basis of the unit forest area (hectare). Then unit area forage production is multiplied by total area of stratum. Find out total forage production annual basis of each stratum multiplied with allowable forage utilization factor, which is 0.5., by getting this deducted amount of forage divided by one animal unit per day forage requirement (5kg) for 365 days. Obtained value is ecological sustainable stocking rate. These ecological sustainable stocking rates (ESSRs) values divided by total area of specific stratum to derive allowable carrying capacity of each stratum in animal unit per hectare per day basis. One another way to express carrying capacity is in hectare per animal unit per day is obtained when total stratum area in hectare divided by ESSR value.





There are mainly three classes of canopy density which influences forage production Low C.D., Mid C.D. and High C.D., High Canopy Density (Stocked areas) belonging stratum carrying capacity estimated 0.09 to 0.24 animal unit per hectare while existing prescription for carrying capacity is 1.0 animal unit per hectare. Within this class of canopy density, grazing capacity can be improve by *Latana camara* moping, and *Hyptis suaveolens* (L.) eradication work, immediately seed broadcasting of *Pennisetum pedicellatum* Grass required after the mopping and mechanical weed eradication.

Middle Canopy Density (Under stocked) belonging stratum carrying capacity estimated 0.13 to 0.54 animal unit per hectare while existing prescription for carrying capacity is 1.0 animal unit per hectare. within this class of canopy density grazing capacity can be improve by *Latana camara* moping, *Hyptis suaveolens* (L.) and *Xanthium strumarium* eradication work. Soil moisture conservation work along with broadcasting of palatable grasses like *Dichanthium annulatum*, *themedra quadrifolia*, *iselima laxum*, *Apluda mutica*, *chloris barbata* and *Heteropogan contortus* immediately after weed eradication required.

Low Canopy Density (Blank areas) belonging stratum carrying capacity estimated 0.26 to 1.29 animal unit per hectare while existing prescription for carrying capacity is 2.0 animal unit per hectare. Grazing capacity can be improve by *Latana camara* moping, *Hyptis suaveolens* (L.) , *Parthenium hysterophorus* and *Xanthium strumarium* eradication work within this class of canopy density. Soil moisture conservation work along with broadcasting of palatable grasses like *Dichanthium annulatum*, *themedra quadrifolia* sp., *iselima laxum*, *Apluda mutica*, *Heteropogan contortus*. and *chloris barbata* immediately after weed eradication required. This class of canopy density belonging areas are major source of forage production but due to uncontrolled grazing these areas have lost their capacity to produce fine palatable grass forage while producing huge biomass of weeds. Protection from free ranging cattle and weed eradication programme should taken on priority basis along with immediate seed broadcasting of wild palatable grasses. Mosaic fire treatment for weed removal before the flowering up to next 5 subsequent



year is here strongly prescribed. Produced grass forage may be distributed only for the purpose of stall feeding but strictly after the flowering period. Stall feeding culture should be promoted through free supply of forage by forest department.

Norms for permissible limits of grazing in forests have been fixed by the state forest department on the basis of legal classification of forest i.e. Reserve and Protected forest. For reserve forest (RF) the norm is one cattle unit per hectare of forest area whereas it is two cattle units per hectare in case of protected forest. The rationale behind these differential norms seems to be two fold. First, it is assumed that R.F.s are in general, better stocked with higher canopy density as compared to P.F.s. Therefore, availability of grass under heavier shade will be less in R.F.s. The second reason lower permissible limit of grazing is that RFs are less burdened with rights and concessions including those of related to cattle grazing and more stringent protection measures are applicable. However, it has been observed that in many cases, the situation with regard to density of stocking is not what is expected and PFs may sometimes have better canopy density and consequently less abundance of grasses. Therefore, it is recommended that while determining carrying capacity of grazing, ecological considerations should prevail over the legal classification of forest.

I. Transfer of Technology to the field-

We have studied about carrying capacity of Jabalpur forest division to determine the initial carrying capacity based on three year's study. Initial carrying capacity as described in recommendation and conclusions are enough to determine the carrying capacity of different stratum of Jabalpur forest Division. Carrying capacity can finally adjusted by long term monitoring to adjust the seasonal climatic impact. We have developed following suitable methodology to estimate the carrying capacity of forest division for proper grazing management based on field experience during study. This methodology can be adopted to estimate carrying capacity of other divisions of Madhya Pradesh.

- To make a digital map of forest type, canopy density and topography as a unit of compartment of whole forest division in Arc map GIS software. Data [obtained from a detailed inventory or a health assessment] should be associated with each polygon and will be used to populate the Arc View attribute table.
- To establish the Grass Land Management Unit (GLMU) separately under the supervision of DFO and under consultation of Regional Working Plan Officer. GLMU should have a liability of continuous monitoring of vegetation at different 18 strata of division. Regular data collection from 18 protected sample plots regarding annual forage production, phytosociology status of grass and forbs to make a site wise inventory of each site with temporal changes. It will give direction to forest managers to decide the management factors in allowable % of forage during adjustment in carrying capacity of each stratum.
- Protection of Each sample plot should ensure by complete watch ward provision lastingly. It could be through chain link fencing, maintenance and placing an employee for day and night watches.
- Long term monitoring is required to fix carrying capacity of stratum based on annual forage production, vegetation composition, weed and invasive species status and soil factors with erosion rate, succession trend. According to these data, carrying capacity can be determined and can be fixed for each stratum of any forest division, however long term regular monitoring is required to fix the carrying capacity, to eliminate short term impact of temporal seasonal factor. It influences the annual forage production i.e. rainfall and other anthropogenic and climatic factors etc. In the current study, we have estimated carrying capacity of each stratum of Jabalpur Forest Division based on two to three years monitoring at the initial level. It is recommended that while determining carrying capacity of grazing, ecological considerations should prevail over the legal classification of forest.
- Grazing land management unit will be responsible to avoid early spring grazing when plants are most vulnerable; distribute animals as evenly as possible across the landscape and balance livestock requirements with the available forage. When Grazing land management unit determine the number of



head that can be supported by a given site, for a given period of time and fix the stocking rate which is the balance among the livestock's monthly forage utilization requirements, the plant production and the ecology of the site.

II. **Some prescriptions to mitigate the deficit between demand and supply of forage.**

- The fact came out from the study that major part of Jabalpur forest division is occupied by *Hyptis suaveolens* (L.) , *Cassia tora*, *Parthenium hysterophorus* and *Latana camara* those excessively reduced the forest productivity in terms of grazing capacity of division therefore weed eradication programme should be conducted by grazing management unit. It is found that some wild grasses like *iselima laxum*, *themedra quadrifolia*, *Apluda mutica* and *chloris barbata* that's become extinct from existing grazing land of division due to heavy grazing of these most preferred palatable grasses. These grasses have the capacity to create biotic control of weeds due to parameters observed during study, such as their vigor to dominant in germination, growth, and capture the sun light etc. hence reintroduction of these species with additional input of seed sowing are recommended with effective protection. It will confirm the enhancement of annual palatable forage production. It is necessary to increase the net ground primary productivity of forestland. Fire treatment must to be adopted in high weed infestation areas before the flowering.
- Grazing land management unit should be appoint a person known as "Gau Mitra" in VFC of each village and make him responsible to ensure rotational deferred grazing as working plan provision. Dairy farming of milk breed cattle like sahiwal, Gir, Red Sindhi, Rathi, Gangatiri and Jersey, Murrah with Stall-feeding approach, it should be promoted and monitored by "Gau Mitra" through involving the local stakeholders. **Genetic improvement of non-descript zebu cattle by crossbreeding programme** should be implement extensively. The most rapid and effective approach to genetically improve the largest chunk of non-descript zebu cattle population is through crossbreeding with exotic dairy cattle breeds particularly in milk shed areas around peri-urban towns. Green Forage Production must be taken up as a first management goal.
- Fodder cultivation should be promoted in private, revenues, VFC allotted lands. Silviculture development work must be taken on priority basis in PF compartments of forest .Green forage farming work should be promoted by technical assistance, subsidy on bank loans etc means of backer appreciations. JFM committees should advise to initiate grass, forbs, forage and fodder production in their allotted blank areas near the village.
- These different legal classes of land should be promoted for cultivation of *Pusa Joint Napier Grass*, *Berseem or Egyptian clover (Trifolium alexandrinum)*, *Pusa joint anjan grass*, *Bothriochloa*, *Dichanthium*, *Cynodon*, *Panicum*, *Pennisetum*, *Cenchrus*, *Lasiurus* ,*sudan grass*, *Lucerne (Alfalfa)*, *Jowar/Chari (Sorghum) Sorghum bicolor Pusa Chari*, *Hybrid Bajra /pearl millet* , *Pennisetum glaucum*, *cowpea UPC 5286*, *Lablab bean* etc. forage producing tree sp. Like *Anjan (Hardwickia binata)*, *Kardhai (Anogeissus Pendula)*, *Prosopis juliflora*, *subabul (Leucaena leucocephala)* etc should be planted under pasture development. Major forage genera exhibiting forage biodiversity include legumes like *Desmodium*, *Lablab*, *Stylosanthes*, *Vigna*, *Macroptelium*, *Centrosema* etc., grasses like *Bothriochloa*, *Dichanthium*, *Cynodon*, *Panicum*, *Pennisetum*, *Cenchrus*, *Lasiurus* etc should be cultivate. Browse able tree plants such as *Leucaena*, *Sesbania*, *Albizia*, *Bauhinia*, *Cassia*, *Grewia* etc. must be introduced in the pastures of range.

Jabalpur district have more than 40,000 ha. barren land and 8030.79 ha. orange area approximately. These types of an area in addition available nearby 70 % with the comparison of Jabalpur forest division area. Grazing Land Management Unit should plan to execute silvi pasture activity near the village periphery. Fodder production is a component of the farming system and efforts need to be made for increasing the forage production in a farming system approach. It is suggested to grow forage grasses and fodder trees along village roads and panchayat lands, bunds - a non-competitive land use system. Use of participatory techniques to identify the problems and to carry out the improvement programme along with In-depth studies on forage based agro forestry systems and



controlled grazing to maintain the productivity of pasture (grazing should be allowed as per carrying capacity) are some other solutions to this problem. These mitigate interventions are prescribed to compensate the surplus nearly 2.3 times grazing load on forest land comparative to existing carrying capacity of Jabalpur Forest Division.

Current status of project: Completed

Ongoing projects:

Externally funded : Four

1. Title : Phase-IV monitoring and evaluation of wildlife and their habitats for sustainable management and development in the protected areas of Madhya Pradesh

Project ID : WL/P/E/15-16/01
Project Period : Two years (May,15-April, 17)
Sponsoring Agency : PCCF (WL) MP Bhopal
Principal Investigator : Dr. G. Krishnamurthy
Co-PI : Dr. Anjana Rajput
Research Associate : Dr. Aniruddha Majumder
Mr. Sk Zeeshan Ali

Objectives :

- To monitor the tigers, co-predators, prey and their habitats in Protected Areas.
- To strengthen/improve the facilities and equipment services for monitoring and data interpretation.
- To assess the spacio-temporal changes in population dynamics, wildlife habitats, occupational patters and animal-men conflicts to facilitate managers for sustainable management.
- Assess and document growing tiger-human conflict; design and implement action- oriented conflict reduction measures.
- Develop capacity building of personals of wildlife protected areas.
- To compliment management authorities for developing adequate management as nodal agency.
- To organize national/International conferences/workshops to analyze the issues related to wildlife management.

Activities carried out during the year:

- Recruitment of Project Staff
- MoU signed between SFRI and Wildlife Institute of India (WII) to exchange data on support for monitoring of tiger and prey population in Madhya Pradesh
- SFRI Team undergone 14 days training on various software and wildlife population monitoring techniques at WII, Dehradun
- Participated in workshop at Kanha Tiger Reserve on Phase-IV monitoring of tiger, co-predator, prey and habitat- jointly organized by Kanha Tiger Reserve and Madhya Pradesh Forest Department
- Organized workshop for the frontline staff of various Pas of Madhya Pradesh on handling various advanced population monitoring equipments at SFRI
- Trained - Computer operators from Madhav National Park and Bandhavgarh Tiger Reserve on entering wildlife population data in Tiger Monitoring software.
- Attended workshop on SPSS packages at SFRI

Current status of project: Ongoing



2. Title : *Impact of Tourism on Environmental, Ecological, and Socio Economic dynamics, in and around the Tiger Reserves of Madhya Pradesh*

Project ID : WL/P/E/15-16/13
Project Period : Two years (Jan.,16 to Dec., 17)
Sponsoring Agency : APCCF (Research, Extension and Lok Vaniki)
M.P Bhopal
Principal Investigator : Dr Anjana Rajput
Co-PI : Dr G Krishnamurthy
Associates : Mr Awadesh Kumar Singh
Ms Durga Choudhury

Objectives:

- Study the status of tourists after fixing the carrying capacity of the tiger reserves
- To assess the environmental impact, including impact on existing wildlife corridor function due to mushrooming of resorts
- To assess the economic benefits of tourism and socio- cultural impact on local communities/inhabitants
- To encourage the eco -resort through resorts grading based on the eco-friendly criterion
- To suggest mitigation for minimizing the adverse impact of tourism in tiger Reserves

Activities carried out during the year:

- Recruitment of project staff
- Field study design is completed
- Data collection initiated.
- Attended workshop on SPSS packages at SFRI

Current status of project: Ongoing

3. Title : *Study on agricultural crop damage by wild animals and its management in Hoshangabad circle of Madhya Pradesh.*

Project ID : WL/P/E/15-16/12
Project Period : Two years (Jan.,16 to Dec., 17)
Sponsoring Agency : APCCF (Research, Extension and Lok Vaniki) M.P. Bhopal
Principal Investigator : Dr Anjana Rajput
Co-PI : Dr G Krishnamurthy
Associates : Mr Jitendra Singh
Md Ashad Hussain Mansoori

Objectives:

- To estimate the crop damage through direct and indirect method and find out the correlation factor to evaluate the crop damage cost.
- To assess the effect of treatments of animal repellents to reduce the crop damage.
- To assess the socio-economic impacts of crop damage and to resolve the conflicts of farmers.
- To suggest the mitigation measures to minimize the crop damage.



Activities carried out during the year:

- Recruitment of project staff
- Field study design is completed
- Data collection initiated.
- Attended workshop on SPSS packages at SFRI

Current status of project: Ongoing

4. Title : Evaluation of impact of rehabilitation of pardhi children in panna district of Madhya Pradesh with reference to the wildlife conservation

Project ID : WL/P/E/15-16/04
Project Period : One year (Jan. 16 to Dec., 16)
Sponsoring Agency : APCCF (Research, Extension and Lok Vaniki) M.P. Bhopal
Principal Investigator : Dr. Anjana Rajput
Co-PI : Dr. G.Krishnamurthy
Project Assistant : Mr Parmar

Objectives:

The main objectives of the present study are:

- To assess the impact of Pardhi children rehabilitation plan on beneficiaries and their parents in the Panna district of Madhya Pradesh
- To identify the key indicators of the impact of rehabilitation plan
- To examine the process of planning, implementation and monitoring and changes occurred over a period of time
- To suggest policy measures for the overall development of the Pardhis in context to control the wildlife crime.

Activities carried out during the year:

- Recruitment of project staff
- Field study design is completed
- Data collection initiated.

Current status of project: Ongoing

5. Title : DNA based monitoring of Tigers presence and their movements in kanha- Pench corridor of M.P.

Project ID : ID.No. /P/E/ 12-13/09
Project Period : 2012 - 2015
Sponsoring Agency : APCCF (Research, Extension and Lok Vaniki)
M.P., Bhopal
Principal Investigator : Mayank Makrand Verma

Objectives:

- Non- invasive genetic analysis to establish tiger presence, minimum tiger numbers and distribution using DNA extracted from non- invasively collected faecal samples from Kanha- Pench corridor of Madhya Pradesh.



- Assessment of the importance of corridor in maintaining genetic exchange between Kanha and Pench source population of tiger in Madhya Pradesh.
- To study on functionality of Kanha-Pench corridor for genetic exchange.

Activities carried out during the year:

- Information collected regarding cattle kill by tigers during last five years from concern seven forest divisions.
- Collection of Tigers scat with their geo reference locations completed. 162 samples have been sent to C.C.M.B. for genetic analysis.
- Identification & documentation of sign marks of tiger presence completed.
- Survey on presence of tigers and their habitat suitability completed.
- Molecular characterization of individual tigers through DNA profiling is completed.
- GIS based map formulation regarding functionality assessment of corridor is completed.

Important findings/ interim findings, if any:

Critical Tiger habitat identified on the basis of consistent tiger presence, water availability, natural shelter and low anthropogenic interference within corridor.

(Presence noticed based on scat, pugmark, kill, scrape sign mark and direct sighting)

Following compartments identified Highly suitable as tiger habitat

S. No.	Division	Range	Number of compartments
1.	South Seoni Forest	Rhukad Range	8
		Kurai Range	8
		Ari Range	3
		Barghat range	4
		Kanhiwada range	3
2.	South Balaghat Forest	Katangi Range	3
		Lalburra range	3
		Lougor range	18
3.	North Balaghat Forest	North lamta Range	5
		South Lamta	2
4.	West Mandla Forest	Bamhni Range	3
5.	Barghat project	Bahrai Range	3
		Keolari range	2
6.	Lamta project	Lalburra Range-	6
		Lamta padrganj Range	3
7.	Mohgaon project	Nainpur range-	3
		Chiraidongri range	5



Pugmark of Tiger cub identified in Lougur range compt 97, Kurai Range Sakata beat compt 224, Lalburra Range Sonewani beat compt 447, Lamta Project Range beat south Kota, compt 340.

Current status of project: Ongoing

Procurements (of the important scientific equipments)

- 1) White Flash Camera
- 2) Infra Red Camera
- 3) GPS
- 4) Compass
- 5) Immobilization Equipments
- 6) Radio-Collar
- 7) Laser Range Finder
- 8) Computer and workstation for GIS mapping

3.11 AGRO-FORESTRY BRANCH

Mandate

1. Documentation of existing agro-forestry systems for different agro-climatic condition.
2. Impact assessment of agro-forestry technologies on natural resource management and livelihoods.
3. Study of social, anthropological and economic issues of agro-forestry with special reference to tribal and women.
4. Strengthening agro-forestry database development programme and to serve as a repository of information.

Staff

Dr. G. S. Mishra : Senior Research Officer and Head

Project Staff

Mr. Pradeep Kumar Kanojia : JRF

Mr. Virendra Kumar Bind : Field Assistant

Completed project during the year :

Internally funded: Nil

Externally funded: Nil

On-Going Projects :

Internally funded: Nil

Externally funded: One

1. मध्यप्रदेश में प्रमुख गोंदों के संग्रहण के ऑकड़ों का संकलन एवं प्राथमिक संग्राहकों पर सामाजिक आर्थिक प्रभाव' ।

Newly Initiated Projects : Nil

Regular activities : Nil

New initiated during the year: Nil

Ongoing projects during the year :

Externally funded : One



1. Title : मध्यप्रदेश में प्रमुख गोंदों के संग्रहण के ऑकड़ों का संकलन एवं प्राथमिक संग्राहकों पर सामाजिक आर्थिक प्रभाव”

Project ID : SEM/P/E/13-14/18
Project Period : April 2014 to March 2017
Sponsoring Agency : APCCF, (R/E & Lok Vaniki), MP Bhopal
Principal Investigator : Dr. G. S. Mishra
Associate : Shri Pradeep Kumar Kanojiya, JRF
Shri Virendra Kumar Bind, Field Assistant

मन्तव्य ; %

1. प्रजातिवार गोंद संग्रहण क्षेत्र एवं मात्रा का ऑकलन।
 2. जिलेवार गोंद संग्रहण की प्रचलित विधि, गोद उत्पादन में होने वाली कमी एवं वृद्धि के कारणों का ऑकलन।
 3. गोद की विपणन प्रक्रिया, बाजार एवं कीमत निर्धारण प्रक्रिया का अध्ययन।
 4. विभिन्न प्रजाति की खाद्य एवं अखाद्य गोंदों के परम्परागत औषधीय उपयोग का अध्ययन।
- 31 एप्रिल 2016 रोज़ की जाँच ; कस्तूरक धीरे धीरे की जाँच %
 1. खाने की जाँच (कस्तूरक धीरे धीरे) %

द्वितीयक साहित्य एवं जानकारी के आधार पर डिण्डोरी, मण्डला, बालाघाट, शिवपुरी, श्योपुर, मुरैना, ग्वालियर, सिवनी, छिन्दवाड़ा, नरसिंहपुर, उमरिया, शहडोल, अनूपपुर, सतना, रीवा, बैतूल, खण्डवा, बुरहानपुर, बड़वानी, झाबुआ, अलीराजपुर, अशोकनगर, गुना, सीहोर, देवास, होशंगाबाद जिलों में प्रारम्भिक सर्वेक्षण कर गोंद संग्रहण क्षेत्रों की पहचान का कार्य पूर्ण।
 2. सामाजिक आर्थिक सर्वेक्षण के लिए अध्ययन विधि (Research Methodology) तैयार कर सामाजिक आर्थिक सर्वेक्षण हेतु गाँवों के चयन का कार्य पूर्ण।
 3. सामाजिक आर्थिक सर्वेक्षण : शिवपुरी, डिण्डोरी, मंडला, टीकमगढ़, कटनी, उमरिया, ग्वालियर एवं मुरैना जिले में चयनित गोंद संग्रहण क्षेत्रों (गाँव) के गोद संग्राहक आदिवासियों का साक्षात्कार लेकर ऑकड़े एकत्र किये गये।

Current status of project: Ongoing



Chapter - 4
EXTENSION, TRAINING AND CONSULTANCY BRANCH

Mandate

1. Dissemination of forestry research technologies evolved by the institute.
2. To act as a nodal agency for co-ordination and extension activities.

Staff

P. N. Mishra, SFS : Dy. Director (Extension)
Anirudhwa Sarkar : Senior Research Officer

Activities

- Publication of Annual Research Report, Annual Action Plan of the institute and training modules.
- Organization of trainings, workshops, meetings, seminars and conferences
- Participation in 'Kissan Mela', herbal fairs' and public events.
- Providing logistic support and co-ordination with different branches and allocation of ID Nos. to research projects.
- Maintenance of xeroxing, operation of audio-visual equipment's, public address system and binding etc.
- Providing desired information to the users through correspondence, consultancy and visits.
- Preparation of Annual Administrative Report and Annual Statistical Report of the institute for the M.P. Forest Department.
- Providing I.D. Nos. to all research projects, compilation of information of research projects of the institute for periodical monitoring of their progress.
- Participation in monitoring and evaluation activities of FDA's and sand mines for environmental impact assessment.
- Organization of trainings and audit for ISO certification 9001: 2008 of the institute.
- Organizing calibrations of lab equipments of the institute.
- Preparation and issuing ID and visiting cards to the staff of the institute.

Dissemination of information through publications

a. Annual Action Plan

The Annual Action Plan of the institute for the year 2015-2016 was compiled and prepared on quarterly basis from April 2015 to March 2016 and progress of the works were monitored and evaluated by conducting review meetings of each branch after the end of each quarter.

b. Annual Research Report

The Annual Research Report for 2014-2015 was prepared, published, and disseminated to all the stakeholders.

c. Dissemination of research technologies and strengthening of extension linkages.

- i) 03 on field training programmes on transfer of technology based on the output of research projects, developed by the institute to the field staff of Research and Extension Circle of Indore, Jhabua & Ratlam were conducted in the respective circles which was attended by 283 participants.
- ii) Trainee Forest Range Officers posted in various forest divisions of M.P. and forest guards from Forestry Training School Panchmarhi, Lakhnadon, Shivpuri and Betul visited the institute during the year as a part of their course curriculum. They were acquainted with the research activities of the institute by class room lectures and visit to various laboratories, mist chambers, shade net houses, gene bank, botanical garden, nurseries, museum and herbarium, located in the campus.



Visit of dignitaries at officials

Dr. Gauri Shankar Shejwar, Hon'ble Forest Minister, Govt. of M.P. visited the institute as the chief guest in the National Seminar on medicinal and aromatic plants on 27th November, 2015. Shri Deepak Khandekar, Additional Chief Secretary, Govt of M.P. visited the institute on 2nd January, 2016. Shri M. Hussain, PCCF (Research), Maharashtra visited the institute on 28th May, 2015 to know the research activities of SFRI. A team of SDO's and RFO's from Aurangabad Forest Division, Maharashtra visited the institute on 30th December, 2015 to have an appraisal about the Seed Treatment techniques being adopted by the institute.

Organization of meeting

S. N.	Meeting	Place	Date of organization
1.	29 th meeting of Board of Governors	Bhopal	21 st July, 2015
2.	42 nd meeting of Research Advisory Committee	Jabalpur	16 th July, 2015
3.	Meeting for technical evaluation of following wildlife monitoring equipments purchased for various PAs of Madhya Pradesh through international e-tenders in presence of Technical Committee formed by Director SFRI 1. White Flash Camera 2. Infra Red Camera 3. GPS 4. Compass 5. Immobilization Equipments 6. Radio-Collar 7. Laser Range Finder	SFRI	7 th December 2015, 11 th January 2016
4.	Market promotion meeting of NTFP's	Chaouraha village at Satna Distt.	12 th August, 2015
5.	3rd coordination committee meeting on Network project on conservation of lac insect genetic resources.	SFRI	28 th -29 th , January, 2016
6.	Van Mela	Bhopal	11 th -15 th December, 2015
7.	Kissan Bans Sammelan	Ratangram, Raisen	6 th August, 2015
8.	Tendu Patta Maha Sammelan	Bhopal	7 th February.,2016

Organization of Seminars/Symposiums/Workshops

S.N.	Topic	Organized by	Date	Participants
1.	Invasive weed management in the forest and grassland of wildlife protected areas.	SFRI	13-14 Feb. 2016	Forest officers, Park Managers, Scientist, Academicians, Scholars and SFRI staff
2.	संयुक्त वन प्रबंधन समिति द्वारा अकाष्टीय वनोपजो का प्राकृतिक वन क्षेत्रों में सतत् विदोहन पद्धति का निर्धारण एवं प्रबंधन तकनीक का विकास	SFRI at Amjhor Range, Shahdol	23 Jan.2016	Dr. R.K. Pandey Dr. Jyoti Singh Mr. Shailendra Nema, Mrs. Anupama Goswam



S.N.	Topic	Organized by	Date	Participants
3.	संयुक्त वन प्रबंधन समिति द्वारा अकाष्टीय वनोपजो का प्राकृतिक वन क्षेत्रों में सतत विदोहन पद्धति का निर्धारण एवं प्रबंधन तकनीक का विकास	SFRI at Ghunghuti Range, Shahdol	25 Jan.2016	Dr. R.K. Pandey Dr. Jyoti Singh Mr.. Shailendra Nema, Mrs. Anupama Goswami Mr. Kundan Sharma
4.	National Seminar on Recent advances in research and development in medicinal and aromatic plants-a country scenario	Forest Genetics & Bio-technology Branch, SFRI	27 th -28 th Nov. 2015	Forest officers, Park Managers, Scientist, Academicians, Scholars and SFRI staff
5.	Wildlife Week on Theme "Living with Wildlife".	Wildlife Branch, SFRI	8 th Oct., 2015	Officers, Scientists, SROs, Scholars and wildlife conversationists from Jabalpur
6.	One day workshop on handling various wildlife equipments	Wildlife Branch, SFRI	9 th Feb., 2016	Forest Officials and staff from various PA's of Madhya Pradesh, scientists, SROs and Scholars from SFRI, Media personnel
7.	6 th K.P. Sagreya Memorial Lecture on "Landscape Approach to Conservation of Biological Diversity" by Dr. V. Sawarkar, eminent wildlife scientist	Wildlife Branch, SFRI	21 st March, 2016	Forest officials and staff from Madhya Pradesh Forest Department, Professors and students from JNKVV, SFRI and TFRI staff, Veterinarian from parks and Centre for Wildlife Forensic and Health Jabalpur

Organization of trainings

S.N.	Name of the programme	Organized by	Date	Organized for	No. of participants
1.	Working with SPSS	SFRI in collaboration with RDVV, Jabalpur	14-16 March, 2016	Data analysis on SPSS software	Technical staff of SFRI
2.	Plant Biotechnology/ Plant Tissue Culture Training/ dissertation Programme	Forest Genetics Plant Propagation and Biotechnology Division, SFRI	April, 15 to March 16	Under Graduate, Post Graduate, and self motivated students	10 participants were imparted training.
3.	Establishment, maintenance and periodic measurement of sample plots.	M.P. Forest Department & SFRI	April 2015 - March 2016	Trainee Forest Rangers	13 from Guna, South Seoni,



S.N.	Name of the programme	Organized by	Date	Organized for	No. of participants
				Students of B.Sc. forestry from JNKVV Jabalpur	North Seoni, Balaghat, Badwani and Katni divisions 25 Students
4.	Training and demonstration on "Establishment and management of seed production areas, seed collection, testing, processing, storage, pretreatment and nursery management."	Seed branch SFRI	22-24 May, 2015 17-19 June, 2015	Field foresters of 07 Forest Divisions and 02 R&E Centers Field foresters of 08 Forest Divisions	46 41
5.	Training on seed collection, processing, storage, pre-treatment and nursery management.	Seed branch, SFRI	22-24 May, 17-19 & 23 25 June, 02, 29 Jul, 06 Aug, 2015, 04 Jan, 01, 04 Feb., 2016	Forest Guard of Shivpuri, Balaghat, Forest ranger, Bandhavgarh Lakhnadaun, Student of JNKVV, Jabalpur	-
6.	Organized training to deploy and handle Cuddeback C1 Camera Trap in field at Bandhavgarh Tiger Reserve	Wildlife branch, SFRI	3 and 4 March, 2016 6 -7 March, 2016 8-9 March, 2016	Forest staff of Bandhavgarh Tiger Reserve Forest staff of Sanjay Tiger Reserve Forest staff of Panna Tiger Reserve and Research Scholars of Wildlife Institute of India	15 10 5



Trainings/workshops/meetings attended by officers/scientists and research staff of the institute.

S.N.	Name of the programme	Organized by	Date	Participants
1.	National Seminar on Recent Advances in Research and Development in Medicinal and Aromatic Plants - A Country Scenario	State Forest Research Institute, Jabalpur (M.P.)	27-28 November 2015	Shri S. K. Jain Smt. Richa Seth Dr. O.P. Chaubey Dr. Archana Sharma Dr. Pratiksha Chaturvedi Dr. Sachin Dixit, Sr. Research Officer Dr. A.K. Sharma
2.	6th K.P. Sagreiya Memorial Lecture "The Landscape approach for conservation of Biological diversity"	State Forest Research Institute, Jabalpur (M.P.) and Society for Tropical Forestry Scientists, Jabalpur (M.P.)	21 March 2016	All Officers of Jabalpur Forest Circle, Officers, Scientist, Technical persons of SFRI Jabalpur
3.	Three day training workshop on "Working with SPSS"	State Forest Research Institute, Jabalpur (M.P.)	14-16 March, 2016	20 Technical Staff of SFRI
4.	National Seminar on "Invasive weed management in the forest and grassland of wildlife protected areas"	State Forest Research Institute, Jabalpur (M.P.)	13-14 February, 2016	All Officers of Jabalpur Forest Circle, Officers, Scientist, Technical persons of SFRI Jabalpur
5.	Scheme for Accreditation EIA Consultant Organization (Version 3) as Accredited EIA Coordinator	New Delhi	30-31 July 2015	Dr. R.K. Pandey, Dr. Pratibha Bhatnagar, Dr. Anjana Rajput, Shri Amit Pandey
6.	ISO Certification quality manual preparation and record keeping training programme	State Forest Research Institute	29 th Sept. 2015 12-16 th Oct. 2015 26 th -28 th Oct. 2015	All Officers, Scientist, Technical persons of the institute
7.	International Symposium on Municipal Solid Waste Management	Andhra Pradesh Technology Development and Promotion Centre (APTDC) and Confederation of India Industry, Hyderabad (A.P.)	9 th October 2015	Dr. R.K. Pandey Mr. Shivkumar Kurav
8.	International Multi Disciplinary Academic Conference (IMAC) in support of UN ESCO's 10th Anniversary celebration, Thailand 2015	UN ESCO's Thailand, Bangkok	02-06 November, 2015	Dr. R.K. Pandey



S.N.	Name of the programme	Organized by	Date	Participants
9.	Professional Development Programme (PDP) on "Review of Environment Impact Assessment (EIA) Reports.	Engineering Staff College of India (ASCI), Autonomous Organ of The Institution (India),	07-08 January, 2016	Dr. R.K. Pandey
10.	Participated in National Seminar on "Dissemination of Agro Technology of Important Medicinal Plants Development through NMPB- Issues and Challenges".	National Medicinal Plants Board Ministry of AYUSH in association with Chaudhary Brahm Prakash Ayurvedic Charak Sansthan, Najafgarh, New Delhi-73,	28-29 February, 2016	Dr. R.K. Pandey
11.	Invasive weed management in the forest and grassland of wildlife protected areas.	M.P. Forest department & State Forest Research Institute, Jabalpur	13-14 February. 2016	All staff of the Forest Ecology & Environment Branch
12.	Standing Committee Meeting Regarding Presentation of Proposal on National Seminar on Climate Change and Role and Responsibilities of Communities for adaptation and mitigation	MPCDM Agency, Bhopal Paryavaran Parisar, E-5, Arera Colony Bhopal-462016, M.P.	26 February, 2016	Dr. Jyoti Singh
13.	Advanced training Programme on "Pollution Monitoring Techniques and Instrumentation.	Pollution Monitoring Laboratory, Centre for Science and Environment, New Delhi	14-18 March, 2016	Dr. Jyoti Singh
14.	रोपणी में लगने वाली संभावित बीमारियों एवं उनका उपचार	SFRI, Jabalpur	29 March 2016	Dr. Jyoti Singh
15.	Predator and prey monitoring and use of various software at Wildlife Institute of India, Dehradun	Wildlife Institute of India, Dehradun	3-14 August, 2015	Shri R. Bisen, Dr. Anjana Rajput, Mr. Rakesh Jain, Smt Richa Seth, Shri Mayank Verma, Shri A. Sarkar, Shri Anirudha Majumdar, Shri Zeeshan Ali
16.	Advanced Hands on Training Programme on "Microbiology and Molecular Biology"	Centre of Excellence in Biotechnology, M.P. COST, Bhopal	14-18 Dec. 2015	Mr. Krishna Kumar Patel Mr. Kundan Sharma Mrs. Anupama Goswami



S.N.	Name of the programme	Organized by	Date	Participants
17.	8 th Euro Biotechnology Congress	OMICS groups, Frankfurt, Germany	18-20, August, 2015	Dr. S.K. Tiwari
18.	International workshop on Medicinal and aromatic plants 22nd Dec. 2015	MPMFP, Bhopal	18-24 December, 2015	Dr. S.K. Tiwari
19.	International Conference on Life Sciences and Biological Engineering	Higher Education Forum, Seoul, South Korea	5-7 January 2016	Dr. S.K. Tiwari & M.P. Goswami
20.	One day talk and interactive session on "Application of Molecular Markers for Forensic Identification in Wildlife Crime" by Dr. Ajay Gaur	SFRI, Jabalpur and CCMB, Hyderabad	23 April 2015	All Officers, Scientist, Technical persons of the institute
21.	Program on Science Administration and Research Management	Department of Science & Technology, Govt. of India	17-28 August, 2015	Dr. Archana Sharma
22.	National Workshop on "Higher Education social responsibilities & Bio-Designing: Three Dimensional Assets for Developing Jabalpur as a Smart City"	Bio-Design Innovation Centre & Department of Biological Science RDVV, Jabalpur	29 March, 2016	Dr. Archana Sharma
23.	Training on "Role of scientists in environment and natural resources management" (Sponsored by DST)	Indian Institute of Forest Management, Bhopal M.P.	16 th to 20 th February 2015	Dr. Pratiksha Chaturvedi
24.	Training on "Instrumentation"	Tropical Forest Research Institute, Jabalpur M.P.	23 rd to 27 th February 2015	Dr. Pratiksha Chaturvedi
25.	International Workshop on "XIV World Forestry Congress 2015" held at Durban, South Africa	Food and Agriculture Organisation of the United Nations (FAO)	7 to 11 September 2015	Dr. Sachin Dixit, Dr. Uday Homkar Dr. Anjana Rajput
26.	Scheme for Accreditation of EIA Consultant organizations Version 3	SFRI	1 st September 2015	Dr. Anjana Rajput
27.	Conservation of Lac Insect Genetic Resources	SFRI	28 th -29 th September, 2016	Dr. Anjana Rajput
28.	Quality manual preparation for ISO9001: 2015 certification of this Institute	SFRI	29 September, 2015	Dr. Anjana Rajput Dr. Aniruddha Majumder
29.	Workshop on Phase-IV Monitoring of Tiger and Co-predators	Kanha Tiger Reserve and Madhya Pradesh Forest Department	8 th -9 th January 2016	Dr. G. Krishnamurthy Mr. R. Bisen Dr. Anjana Rajput Dr. Aniruddha Majumder Mr. Sk. Zeeshan Ali



S.N.	Name of the programme	Organized by	Date	Participants
30.	Panel discussion on Workshop on Medicinal and aromatic plants research: A way forward October 01, 2015.	Medicinal and Aromatic plants Association of India (MAPAI) and Directorate of Medicinal and Aromatic Plants Research Anand (GJ)	01 October, 2015.	S. K. Tiwari
31.	National Training Programme on Entrepreneurship Development Programme and Management for scientists and technologist with the Government Sector, sponsored by Ministry of Science and Technology , New Delhi	Entrepreneurship Development Institute of India, Gandhinagar, Ahemdabad, (GJ)	7 th -11 th December 2015	Anirudhwa Sarkar



Chapter - 5
DOCUMENTATION BRANCH

Mandate

1. Documentation of research information/results.
2. Documentation of technical literature on forestry research activities of the Institute.
3. Maintenance of ledger files.
4. Providing research information to the users.

Staff

Shri S. K. Jain	:	Asst. Director
Shri K. L. Verma	:	Senior Research Officer
Dr. S. Chakravarty	:	Ledger Assistant

Activities

1. Maintenance of general and specific ledger files. At present, 250 general and 173 specific ledger files are being maintained. The research findings published in various journals/bulletins and reports, etc. were photocopied and added regularly in the respective ledger files.
2. Documentation of technical literature on forestry research.
3. Documentation of research articles published in different Journals, Magazines, Newsletters, Bulletins, Vaniki Sandesh, Annual Research Report and Extension series.
4. Documentation of final reports of the projects financed by external agencies.
5. Publication of quarterly journal "Vaniki Sandesh", technical bulletins and extension series.
6. Sale of SFRI publications.

A quarterly journal "Vaniki Sandesh" covering articles on forestry research in the institute and elsewhere is published by the institute. Vaniki Sandesh is circulated to officers of the state forest department, research institutes, universities and individuals. The annual subscription is fixed at Rs. 150/- for individuals and Rs. 300/- for institutions.

Sale of Publications

The institute has published 67 technical bulletins and 48 extension series till date which are available for sale.

Journal Section

The branch is well furnished with a reading room. During the year 14 journals were subscribed for reference to the users.

Achievements during the year

1. Four issues of Vaniki Sandesh (Vol. 6 New No. 1-2) were published.
2. 13 project reports were documented.
3. A sum of Rs. 10355/- was received from the sale of bulletins, extension series, Vaniki Sandesh and Van Dhan.
4. 14 periodicals were received and displayed.
5. 279 articles were selected, photocopied, classified and filed into ledger files.
6. 149 damaged pages of ledger files were replaced by xerox copies.



**Periodicals subscribed during the year
2015-2016**

S. N.	Name of the Journal
1.	PTI Science Service
2.	Economic and Political Weekly
3.	Indian Journal of Forestry
4.	Journal of Non Timber Forest Products
5.	Journal of Economic & Taxonomic Botany Additional series no 44, 45 & 46
6.	The Indian Forester
7.	TIDEE
8.	Journal of Tropical Forestry
9.	Indian Phyto-pathology
10.	Journal of Mycology and Plant Pathology
11.	वनधन व्यापार (संस्थान द्वारा प्रकाशित)
12.	वानिकी संदेश (संस्थान द्वारा प्रकाशित)
13.	Heritage Amruth
14.	Journal of soil and water conservation

S.F.R.I PUBLICATIONS

1. Technical bulletins

S N.	Bulletin No.	Title	Year	Price
1	2	Volume Table of <i>Terminalia tomentosa</i> for M.P.	1963	70.00
2	4	Yield Table of Sal for M.P.	1966	70.00
3	5	Seed Directory vol. I	1967	30.00
4	9	Standard Volume Table of Teak for S.Chhindwara in M.P.	1971	70.00
5	10	Family <i>Ranunculaceae</i> to <i>Polygonaceae</i> in M.P. (Monograph of 13 family)	1971	25.00
6	11	Teak growth tables of different ecological forest types in M.P.	1971	70.00
7	12	Standard volume tables of <i>Boswellia serrata</i> for Nimar tract in M.P.	1971	70.00
8	15	Bark Table for <i>Boswellia serrata</i>	1971	25.00
9	16	Family <i>Linaceae</i> to <i>Berseraceae</i>	1974	25.00
10	18	Species for plantation in M.P. (Reprint)	1977	100.00
		मध्यप्रदेश में वृक्षारोपण के लिये उपयुक्त प्रजातियां	1977	100.00
11	22	Bamboo Plantation	1986	50.00
12	23	Fuel wood removal by headloads-A case study of Jabalpur	1987	20.00



S N.	Bulletin No.	Title	Year	Price
13	24	Eucalyptus cultivation in M.P. – JTF	1987	25.00
14	26	Socio-economic Potential of Minor Forest Produce in M.P.	1991	75.00
15	28	Material for forest flora of Madhya Pradesh	1996	150.00
16	29	Tissue culture protocols for Teak, Neem & Khamer	1997	150.00
17	30	Growth statistics of forest plantations	1997	75.00
18	31	Medicinal plant of M.P. distribution, cultivation & trade	1998	200.00
19	32	Local Volume Table for Teak, Sal and other species	1997	60.00
20	33	Price Trends of some medicinal plants	1998	80.00
21	34	Biological Diversity of SFRI premises	1998	50.00
22	35	Seed production in Teak Seed Orchards in M.P.	1998	100.00
23	36	Seed certification protocol of forest tree species	1998	75.00
24	37	Tissue culture protocols for important medicinal plants of M.P.	1998	30.00
25	38	Macro-propagation protocol of some tree and medicinal plants species.	1998	40.00
26	39	Yield and stand tables of teak in Madhya Pradesh	1998	200.00
27	40	An Annotated Bibliography of Bamboo	1999	50.00
28	41	Status survey of Non Timber Forest Produce in primary Tribal Markets: A case study in Amarkantak Plateau.	1999	100.00
29	42	Application of laboratory seed testing results in nursery practices.	2000	50.00
30	43	म0प्र0 में भिलवा का सामाजिक आर्थिक विश्लेषणात्मक अध्ययन।	2000	100.00
31	44	Silviculture research in M.P.	2000	150.00
32	45	Handbook of Bamboos with particular reference to M.P.	2002	80.00
33	46	औषधीय पौधों की खेती की प्रचार प्रसार पत्रिका।	2003	150.00
34	47	Medicinal herbs in trade: a study of safed musli, (chlorophytum species) in Madhya Pradesh	2003	20.00
35	48	Collection, processing and marketing of <i>Buchanania lanzan</i> in Madhya Pradesh	2005	20.00
36	49	मध्यप्रदेश के महत्वपूर्ण आयुर्वेदिक पादप	2005	70.00
37	50	आंवला वृक्षारोपण एवं आर्थिक महत्व	2008	50.00
38	51	उच्च गुणवत्ता के बीज एकत्रीकरण, भण्डारण, उपचारण, प्रमाणीकरण तथा बीजोत्पादन क्षेत्रों के चयन एवं प्रबंधन पर दिग्दर्शिका।	2008	50.00
39	52	Floral Diversity of Kanha Tiger Reserve	2009	900.00
40	53	Nursery and Planting technique of Tree Species	2010	100.00
41	54	Forest Glossary for All (English – Hindi)	2010	50.00
42	55	वृक्षारोपण मार्गदर्शिका	2011	150.00



S N.	Bulletin No.	Title	Year	Price
43	56	संग्रहित लाख में समय के साथ वनोपजों में होने वाली कमी का अध्ययन	2014	-
44	57	Status of natural gum and gum oleo-resin of M.P.	2014	
45	58	बीज प्रक्षेत्र का चयन, बीज उत्पादन क्षेत्र की स्थापना, प्रबंधन, बजी संग्रहण, भण्डारण, उपचारण, परीक्षण एवं रोपणी प्रबंधन	2014	-
46	59	वानिकी में मेक्रोक्लोनल प्रोपेगेशन तकनीक द्वारा वृक्ष एवं औषधीय प्रजातियों के क्लोनल पौधे तैयार करने की विधियाँ	2014	
47	60	सामुदायिक भागीदारी द्वारा अकाष्टीय वनोपजों के मानचित्रण एवं आकलन विधि मार्गदर्शिका	2015	-
48	61	अकाष्टीय वनोपज सतत् विदोहन एवं प्रबंधन नियमावली	2015	55.00
49	62	महत्वपूर्ण संकटग्रस्त प्रजातियों की रोपणी तकनीक	2015	190.00

2. Extension series

Ext. Series	Title	Year	Price
1.	Teak Seed collection and uses	1981	10.00
2.	वृक्षारोपण में बीजों का महत्व	1981	15.00
3.	म.प्र. में साल रोपण की तकनीक	1991	15.00
4.	पड़त भूमि विकास हेतु उपयुक्त प्रजाति लेडिया	1991	10.00
5.	ईसबगोल	1994	5.00
6.	सर्पगन्धा	1994	5.00
7.	रोसा घास	1995	5.00
8.	A mechanical device for pre sowing treatment of teak seeds	1995	5.00
9.	वृक्षारोपण कैसे करें	1996	25.00
10.	S.F.R.I Publications	1999	40.00
11.	माइकोराइजा (वैम)	1999	-
12.	राजजोबियम	1999	-
13.	एजेटोबेक्टर	2000	-
14.	पी.एस.बी. (फास्फोरस विलायक)	2000	-
15.	आँवला : वनो से किसानों तक	2000	40.00
16.	बाँस : वनो से किसानों तक	2000	40.00
17.	सागौन : वनो से किसानों तक	2000	60.00
18.	खमेर : वनो से किसानों तक	2000	60.00
19.	यूकेलिप्टस : वनो से किसानों तक	2000	50.00
20.	बच (एकोरस केलेमस)	2001	5.00
21.	सतावर (एस्पेरेगस रेसीमोसस)	2001	5.00



Ext. Series	Title	Year	Price
22.	सफेद मूसली (क्लोरोफाइटम बोरिविलियानम)	2001	5.00
23.	कलिहारी (ग्लोरिओसा सुपरबा)	2001	5.00
24.	सनाय (केसिया आगस्टफोलिया)	2001	5.00
25.	सर्पगंधा (रावोल्फिया सर्पेन्टिना)	2001	5.00
26.	अश्वगंधा (विद्यानिया सोमनीफेरा)	2001	5.00
27.	मुश्कदाना (एबलेमासकस मास्केटस)	2001	5.00
28.	लेमनग्रास (सिंबोपोगन फ्लेक्सिपोसस)	2001	5.00
29.	मेन्था या पोदीना (मेन्था आर्वेसिस)	2001	5.00
30.	लघुवनोपजों का प्राथमिक प्रसंस्करण (भाग 1)	2003	20.00
31	लघुवनोपजों का प्राथमिक प्रसंस्करण (भाग 2)	2007	20.00
32	Directory of Medicinal Plants Trades and ISM Industries of Central India	2009	100.00
33	Monograph on <i>Alectra chitrakutensis</i>	2011	60.00
34	Monograph on <i>Ceropegia bulbosa</i> and <i>Ceropegia macrantha</i>	2011	60.00
35	Monograph on <i>Crateva magna</i> and <i>ficus cupulata</i>	2011	60.00
36	Monograph on <i>Dioscorea tomentosa</i> , <i>D. wallichia</i> and <i>d. alata</i>	2011	60.00
37	Monograph on <i>Flemingia stricta</i> and <i>F. paniculata</i>	2011	60.00
38	Monograph on <i>Guggal (Commiphora wightii)</i>	2011	60.00
39	Monograph on Maida tree (<i>Litsea glutinosa</i>)	2011	60.00
40	Monograph on Padri tree (<i>Radermachera xylocarpa</i>)	2011	60.00
41	Monograph on Shyonaka (<i>Oroxylum indicum</i>)	2011	60.00
42	Some ethnic plants in cure of various human diseases	2011	250.00
43	कमरकस (पलाश) गोंद का सतत् विदोहन, प्राथमिक प्रसंस्करण, श्रेणीकरण एवं भण्डारण तकनीकों का प्रदर्शन	2012	-
44	साल बोरर से साल वनो की सुरक्षा	2014	-
45	Education material on conservation, multiplication and utilization of rare, endemic <i>angiosperms</i> and <i>Pteridophytes</i> in Forest Botanic Garden of State Forest Research Institute, Jabalpur (M.P.)	2014	-
46	Education material on Herbarium preparation and its management	2015	-
47	मध्यप्रदेश के वनों में पायी जाने वाली महत्वपूर्ण दुर्लभ प्रजातियों की उपयुक्त रोपणी तकनीकी का विकास	2015	-
48	खमेर शीर्ष सूखन रोग एवं प्रबंधन तकनीकी मार्गदर्शिका	2015	-
49	खनन क्षेत्रों में वनीकरण एवं पारिस्थितिकीय पुर्नस्थापना हेतु तकनीकी मार्गदर्शिका	2015	-

Note: Payment for the above bulletins and extension series may be made by Demand Draft in favour of the Director, State Forest Research Institute, Polipathar, Jabalpur (M.P.) 482008
Payment for the Bulletin No. 24 (Eucalyptus cultivation in M.P.) may be made by D.D. in favour of the Treasurer, Society for Tropical Forestry Scientist, SFRI, Jabalpur.



Chapter - 6
LIBRARY AND INFORMATION CENTRE

Mandate

SFRI library and information center is a prominent library of the state of Madhya Pradesh in the field of forestry. It houses books, reports, Indian Forest Records, Working Plans, Working Schemes, Forest resource surveys and Sanctuary Plans. Apart from the research staff of the Institute, forest officers, scientists and technical staff make use of the library facilities. Students, research scholars from various institutes and universities also visit the library regularly.

The library and information centre maintains literature on forestry and allied subjects. It has books on environment, silviculture, forest protection, mensuration, management, marketing, utilization, social forestry, biodiversity, ecology, botany, tissue culture, tree improvement, law, medicinal plants, wildlife, seed scheme and computer science, etc.

Staff

Shri P.N. Mishra	:	Dy. Director
Shri S. K. Jain	:	Asst. Director
S.S. Raghuvanshi	:	Senior Research Officer
Girish Kumar Shukla	:	Research Officer

Activities

During the year 2015-2016, 35 new books and 10 new working plans were received with the total as under:

1. Books (including 2631 gratis books)	7565
2. Reports (Govt. and NGO's)	382
3. Indian Forest Records	641
4. Working Plans	1438
5. Sanctuary Plans	24
6. Working Schemes	85
7. Forest Resource Surveys	27
Total	10161

Following activities were undertaken during the year.

S. No.	Works	Status
1.	Preparation of book card slips and pasting of book pockets on books	Routine work
2.	Correspondence with users for return of books	Routine work
3.	Provide CAS to users	Routine work
4.	Classification of books and arrangement of classified books	Routine work
5.	Circulation of books, working plans, reports and other reading material	Routine work
6.	Accession of books	35 books added
7.	Data entry of books in Libsoft library software	In progress



Chapter - 7
COMPUTER AND INFORMATION TECHNOLOGY BRANCH

Mandate

1. Application of computers in forestry.
2. Design, development and implementation of computer based information system.
3. Analysis of the forestry based statistical/mathematical data.
4. Analysis of the Geographical Information System (GIS) data.

Staff

P.N. Mishra : Dy. Director
Jyotsna Gupta : Computer In-charge

Objectives

1. To design, develop and implement computer based information system.
2. To design and develop the website of the institute.
3. To provide logistics and maintainance of all the computers of the institute.

Computer Centre

Computer centre has a number of computer systems (Desktop - 55, Laptop - 12) connected to each other via local area network (LAN). The computer system is shared by a router to access World Wide Web information, which is connected by local area network.

Activities carried out during the year

1. Presentation of PowerPoint for BOG, RAC, workshops, meetings, seminars and trainings, etc.
2. Updation of the website of the institute.
3. Providing internet surfing and e-mail facilities to users through LAN.
4. Maintenance of computer equipments viz., computer systems, printers, scanners, LAN, UPS etc.



Chapter - 8

**PUBLICATION OF BOOKS AND PRESENTATION OF RESEARCH PAPERS/ARTICLES BY
SCIENTISTS/RESEARCH PERSONNEL OF THE INSTITUTE**

S.N.	Name of Journal	Title of paper	Author(s)	Vol. No.	Page No.
Paper published in Journals (National and International)					
1.	International Journal of Bio-Science and Bio-Technology	Plant Diversity, Edaphic Status and Population Structure in Different Forest Types of Madhya Pradesh and Chhattisgarh States in India	O.P. Chaubey, Archana Sharma G. Krishnamurthy	(2015) Vol. 7(2)	115-124
2.	-do-	<i>Ex-situ</i> Conservation of Indigenous, Threatened and Ethno-Medicinal Diversity of Forest Species	O.P. Chaubey, Archana Sharma G. Krishnamurthy	(2015) Vol. 7(3)	9-22
3.	-do-	Phyto-diversity and Population Structure in Southern Moist Mixed Deciduous Forest (3B/C2) of Bori Wild Life Sanctuary (WLS) in Madhya Pradesh, India	O.P. Chaubey, Archana Sharma G. Krishnamurthy	(2015) Vol. 7(5)	159-168
4.	-do	Biotechnological Approach of Threatened Species <i>Strychnos Nuxvomica</i> L. to Standardized Nursery Techniques	O. P. Chaubey G. Krishnamurthy	(2015) Vol. 7(6)	13-24
5.	International Journal of Indigenous Medicinal Plants, ISSN: 2051-4263	Preliminary Studies on Clonal multiplication of <i>Berberis aristata</i> (Indian Barberry) by stem branch cutting: An Approach for Ex-Situ Conservation of Endangered Medicinal Plant	S. K. Tiwari, G. Krishnamurthy, S. N. Dhamangaonkar, M.P. Goswami, Pankaj. Saini	Vol., Issue. 1	-
6.	International Journal of Current Research in Biosciences and Plant Biology ISSN: 2349-8080	RAPD Markers for Genetic Diversity Assessment of Critically Endangered Medicinal Plant <i>Commiphora wightii</i> (Arn.) Bhandari	G. Krishnamurthy, S. K. Tiwari, Amit Pandey and S.S. Yadav	Volume 2 Number 8 (August- 2015)	pp. 29- 34
7.	-do-	<i>In Vitro</i> Propagation of <i>Litsea glutinosa</i> (Lour) C.B. Robinson - An Endangered Medicinal Tree in Madhya Pradesh, India	S.K.Tiwari, G. Krishnamurthy, M.P. Goswami, Amit Pandey and P.K. Singhal	Volume 2 Number 12 (Dec-2015)	pp-75-79
8.	-do-	Identification of Wild Indian Elephant <i>Elephas maximus</i> through Species Specific Molecular Markers.	S. K. Tiwari*, G. Krishnamurthy, S.S. Yadav, Amit Pandey and Sachin Dixit	Volume 3 Number 1 (Jan-2016)	
9.	International Journal of Bio Science and Bio Technology	Plant diversity, edaphic status and population structure in different forest types of Madhya Pradesh and Chhattisgarh States in India	Chaubey, O.P., Archana Sharma and G. Krishnamurthy	IJBSBT Vol. 7, No.2 April, 2015	115-124



S.N.	Name of Journal	Title of paper	Author(s)	Vol. No.	Page No.
10.	-do	<i>Ex-situ</i> conservation of indigenous, Threatened and ethno-medicinal diversity of Forest species.	Chaubey, O.P., Archana Sharma and G. Krishnamurthy	IJBSBT Vol. 7, No.3 June, 2015	9-22
11.	-do-	Phyto-diversity and population structure in southern moist mixed deciduous forest of Bori Wild Life in Sanctuary in Satpura Tiger Reserve, India.	Chaubey, O.P., Archana Sharma and G. Krishnamurthy	IJBSBT Vol. 7, No.5 October, 2015	159-168
12.	International Journal of Current Research in Bioscience and Plant Biology	Identification of Wild Indian Elephant <i>Elephas maximus</i> through species specific Molecular Markers.	S.K. Tiwari, G. Krishnamurthy, S.S.Yadav, Amit Pandey and Sachin Dixit	3 (1)	58-61
13.	Journal of Tropical Forestry	Sustainable supply of medicinal plants through domestication in Madhya Pradesh	Pratibha Bhatnagar	32	29-39
14.	-do-	Forest growth, composition, herbaceous biomass and litter production study in Kanha Tiger Reserve	Sachin Dixit and G. Krishnamurthy	Paper accepted	
15.	-do-	Impact of climate change on forest ecosystem services vis a vis sustainable forest resource management	Dr. R.K. Pandey	April-June, 2015 vol.31 (ii).	Pp.1-9.
16.	-do-	Challenges for conservation and sustainable use of wild medicinal plants in natural forest ecosystem in India	Dr. R.K. Pandey	January-March, 2016 vol.32 (i).	pp.1-17.
17.	-do-	Leaf spot and root rot disease of <i>Dalbergia Sisso</i> and its management.	Jyoti Singh, Krishna Kumar Patel	31 (July-Sept. 2015)	72-81
18.	-do-	Pathogens associated with <i>Anogeissus latifolia</i> .	Jyoti Singh & Anupama Goswami	32 (Jan-March 2016)	73-78
19.	-do-	Biomass Production Capacity of <i>Gliricidia Sepium</i>	Dr. Pratiksha Chaturvedi, Kamalika Mohanta Vinay Kori	31	44-53
Papers published from SFRI					
1.	Vaniki Sandesh	Seasonal variation in disease of medicinal plant <i>Tinospora cordifolia</i> (Giloy)	Jyoti Singh & Anupama Goswami	6 (Jan-June 2015)	27-31
2.	Vaniki Sandesh	Volume tables of <i>Tectona grandis</i> (Teak) for Vidisha division.	Richa Seth	Under publication	
3.	Vaniki Sandesh	Volume tables of <i>Shorea robusta</i> (Sal) for East Sidhi division.	Richa Seth	Under publication	



S.N.	Name of Journal	Title of paper	Author(s)	Vol. No.	Page No.
4.	Van Dhan Vyapar	Valuable tree Aegle marmelos and its market	Dr. Pratibha Bhatnagar and Alok Kumar Raikwar	15 (1)	4-6
5.	Van Dhan Vyapar	Price variation of Cassia tora in M.P. and C.G.	Dr. Pratibha Bhatnagar and Alok Kumar Raikwar	15 (1)	7-8
6.	Van Dhan Vyapar	कुसुमी लाख की कीमतों का विभिन्न बाजारों में विश्लेषण	डॉ. प्रतिभा भटनागर एवं आलोक रैकवार	15 (2)	4-5
7.	Van Dhan Vyapar	Ethephon for enhancing gum production and its effect on tree health	Ms. Radhika Urmalia	15 (2)	6
8.	Van Dhan Vyapar	सतावर के बाजार एवं मूल्यों का विश्लेषण	डॉ. प्रतिभा भटनागर एवं आलोक रैकवार	16 (1)	4-6

Papers presented in seminars/ symposiums/ workshops

S. No.	Name of seminars/ symposiums/ workshops	Title of paper	Author(s)	Vol. No.	Page No.
1.	Participated and presented the paper for oral presentation of the national seminar on "Bamboo Reserve Management And Advances In Utilization Options" held at Institute of Wood Science IWST Bangalore from 23-25 February 2016	Improvement intervention in post flowering management of bamboo in Madhya Pradesh	Dr. O.P. Chaubey	Souvenir	-
2.	National Seminar on Recent Advances in Research and Development in Medicinal and Aromatic Plants - A Country Scenario (27-28 November 2015) held at State Forest Research Institute, Jabalpur (M.P.)	"Ethno-Medicinal Diversity of Forest Species"	Dr. O.P. Chaubey and Dr. Archana Sharma	Souvenir	-
3.	XXIII International Grass and Congress, IGC 2015, New Delhi, India, 20-24 November 2015	Dry grassland management in relation to climate change	Dr. O.P. Chaubey, Dr. Archana Sharma, Dr. R. K. Pandey and Dr. G. Krishnamurthy	Souvenir	-



Papers presented in seminars/ symposiums/ workshops					
S. No.	Name of seminars/ symposiums/ workshops	Title of paper	Author(s)	Vol. No.	Page No.
4.	2015 IAABR- Las Vegas International Academic Conference on 25-27 Oct 2015 in Las Vegas, Usa.	"Sustainable development of Degraded Teak Forests "	Dr. O.P. Chaubey, Dr. A.K. Sharma and Dr. G. Krishnamurthy	Souvenir	-
5.	2nd International conference and Exhibition on Biotechnology-2015 that will be held during 03-04 August, 2015 at Leonia International Centre for Exhibitions & Conventions, Hyderabad, India.	Biotechnological approach to standardized nursery techniques of threatened species on <i>Strychnos nux-vomica</i> L.	Dr. O.P. Chaubey and Dr. G. Krishnamurthy	Souvenir	-
6.	Eighth International Conference on Mycorrhiza, from August 3-7, 2015, at the High Country Conference Center in beautiful Flagstaff, Arizona, USA.	"Restore mycorrhiza for sustainable forestry"	Dr. O.P. Chaubey, Dr. Priyanka Bohre, Dr. Archana Sharma, Dr. Jamaluddin and Dr. G. Krishnamurthy	Souvenir	-
7.	Recent advances in research and development medicinal and aromatic plant"	Isolation and chemical control of leaf spot disease-causing pathogens of medicinal plants (<i>Tinospora cordifolia</i> and <i>Jatropha curcas</i>)	Jyoti Singh, Krishna Kumar Patel & Anupama Goswami	Poster presented in National Seminar	
8.	-do-	Development of mass multiplication techniques of <i>Leea macrophylla</i>	Kundan Sharma, Dr. G. Krishnamurthy, Dr. Uday Homkar, Tanvi Telang and Shri Imrat Sen	Poster presented in National Seminar	
9.	-do-	Development of mass multiplication techniques of <i>Dioscorea daemonia</i> through seeds - An approach for <i>ex-situ</i> conservation.	Tanvi Telang Dr. G. Krishnamurthy, Dr. Uday Homkar, Kundan Sharma and Shri Imrat Sen	Poster presented in National Seminar	
10.	-do-	Evaluation of genetic variation in threatened tree species of <i>Boswellia serrata</i> with the help	Dr. S. K. Tiwari, Dr. G. Krishnamurthy,		



Papers presented in seminars/ symposiums/ workshops					
S. No.	Name of seminars/ symposiums/ workshops	Title of paper	Author(s)	Vol. No.	Page No.
		of genetic markers.	Amit Pandey, S.S. Yadav and Avadhesh Sharma		
11.	-do-	An approach for <i>ex-situ</i> conservation of <i>Embelia tsjeriam-cottam</i> linn. A threatened medicinal plant through <i>in vitro</i> multiplication using nodal segment.	Dr.S. K. Tiwari, Dr. G .Krishnamurthy, Amit Pandey, M. P. Goswami and Pankaj Saini		
12.	-do-	Micropropagation of <i>Paederia foetida</i> L. An important medicinal plant.	Dr. S.K.Tiwari, Amit Pandey, Maneesh Puri Goswami, and Pankaj Saini,		
13.	-do-	Micropropagation of <i>Rauvolfia serpentina</i> , a medicinal plant.	Dr. S.K.Tiwari and Fatima Khan		
14.	-do-	Development of mass multiplication techniques of <i>Randia dumetorum</i>	Imrat Sen, Dr. G. Krishnamurthy, Dr. Uday Homkar, Kundan Sharma and Tanvi Telang	Poster presented in National Seminar	
15.	-do-	Enhancing longevity and germination potential of <i>Rauvolfia serpentina</i> seeds	Archana Sharma and G. Krishnamurthy	Published in Abstract book	49
16.	8 th Euro Biotechnology Congress August 18-20, 2015 Frankfurt, Germany	Standardization of clonal macropropagation protocol of <i>Dillenia pentagyna roxb.</i> an important and endangered medicinal tree species through stem branch cuttings	Dr. S. K. Tiwari, Dr. G. Krishnamurthy, Amit Pandey, M. P. Goswami, and Pankaj Saini,	-	-
17.	International Conference on Life Sciences and Biological Engineering, Seoul, South Korea 5-7 January 2016	Standardization of macropropagation technique of <i>Anogeissus pendula</i> a recalcitrant tree species through stem branch cuttings.	Dr.S. K. Tiwari, Dr. G. Krishnamurthy, Amit Pandey, M. P. Goswami, and Pankaj Saini,	-	-
18.	2nd International Conference on Advances in Applied Science and Environmental Technology-ASET, 28-29 August, 2015, Bangkok, Thailand	Seed Technology of <i>Rauvolfia serpentina</i> for enhancing longevity and germination potential	Dr. Archana Sharma and Dr. O.P. Chaubey	Accepted	-
19.	4th International Conferences on Advances in Applied Science and	Germination characteristics and seedling growth of <i>Schleichera oleosa</i> Lour. as affected by various pre sowing treatments	Dr. Archana Sharma and Dr. O.P. Chaubey	Accepted	-



Papers presented in seminars/ symposiums/ workshops					
S. No.	Name of seminars/ symposiums/ workshops	Title of paper	Author(s)	Vol. No.	Page No.
	Environmental Engineering, 26-27 September, 2015 Kuala Lumpur, Malaysia	under storage			
20.	31st ISTA Seed Symposium 15-17 June, 2016, Tallinn, Estonia	Pre sowing seed treatment in <i>Tectona grandis</i> to enhance seed germination and seedling growth	Dr. Archana Sharma	Accepted	
21.	-do-	Effect of various fertilizers, chemicals and hormones on seed production in seed orchards <i>Tectona grandis</i> .	Dr. Archana Sharma	Accepted	
22.	-do-	Effect of different storage condition on seed viability and germination potential of <i>Withania somnifera</i>	Dr. Archana Sharma	Accepted	

Paper published in edited books/ souvenirs					
S. No.	Name of the edited books/ souvenirs	Title of the paper	Author(s)	Vol. No.	Page No.
1.	The edited book titled " <i>Ecological Management of Bamboo Resource in India</i> " (eds. O.P. Chaubey, A. Sharma and G. Krishnamurthy), Aavishkar publishers, distributors Jaipur, Raj. 302 003 India, pp. 194.	Policy issues for sustainable management of Bamboo Forests	Dr. P.K. Shukla Dr. O.P. Chaubey, Dr. Archana Sharma and Dr. G. Krishnamurthy	(2015) Book ISBN No. 978-81- 7910-499-6	14-19
2.	-do-	Ecological management and rehabilitation of bamboo resource.	Dr. O.P Chaubey	(2015) Book ISBN No. 978-81- 7910-499-6	47-58
3.	-do-	Taxonomic identification of bamboo resource	Dr. O.P Chaubey	(2015) Book ISBN No. 978-81- 7910-499-6	177-184
4.	-do-	Bamboo to enterprise development	Dr. O.P. Chaubey	(2015) Book ISBN No. 978-81- 7910-499-6	185-190
5.	The edited book titled " <i>Microbes in Restoration of Waste and Degraded Lands</i> " (eds. Jamaluddin)	Microbial Restoration in Mined-out Areas under Reduced Ecosystem - An overview	Dr. O.P. Chaubey, Dr. Priyanka Bohre and Dr. Jamaluddin	(2016)	-



Paper published in edited books/ souvenirs					
S. No.	Name of the edited books/ souvenirs	Title of the paper	Author(s)	Vol. No.	Page No.
6.	Indian grasslands; opportunities and challenges publication Book chapter of under by IGFRI ICAR, Jhansi.	Grassland management in wildlife protected areas in India.	Dr. R.K. Pandey	-	-
7.	Documentation of traditional health care practices of Central Indian Tribes., M. P. Madhyam, Bhopal	-	Pratibha Bhatnagar and Radhika Urmalia	-	-

Publication of technical bulletins / brochures

S. N.	Name of technical bulletins/ brochures	Authors	Bulletin/ brochure Number	No. of pages
1.	खनन क्षेत्र में वनीकरण एवं पारिस्थितिकीय पुर्नस्थापना हेतु तकनीकी मार्गदर्शिका	Dr. O.P. Chaubey and Dr. G. Krishnamurthy	2015	18 pages
2.	सामुदायिक भागीदारी द्वारा अकाष्टीय वनोपजों के मानचित्रण एवं आंकलन विधि मार्गदर्शिका बुलेटिन नं. 60, राज्य वन अनुसंधान संस्थान, जबलपुर (म.प्र.)।	Dr. R.K. Pandey	60	
3.	प्राकृतिक वनों में सामुदायिक भागीदारी द्वारा अकाष्टीय वनोपजों के सतत् विदोहन एवं प्रबंधन नियमावली (Community oriented procedure for sustainable harvesting and Management of NTFPs in natural tropical forests) बुलेटिन नं. 61, राज्य वन अनुसंधान संस्थान, जबलपुर	Dr. R.K. Pandey	61	
4.	मध्यप्रदेश के वनों में पायी जाने वाली महत्वपूर्ण दुर्लभ प्रजातियों की उपयुक्त रोपणी तकनीक का विकास – मार्गदर्शिका।	Dr. G. Krishnamurthy Dr. Sachin Dixit Dr. Jyoti Singh		10
5.	खमेर शीर्ष सूखन रोग (Top Drying) एवं प्रबंधन तकनीक मार्गदर्शिका।	Dr. G. Krishnamurthy Dr. Jyoti Singh Dr. Sachin Dixit		10
6.	Volume tables of <i>Tectona grandis</i> (Teak) for various divisions of Madhya Pradesh.	Dr. G. Krishnamurthy Smt. Richa Seth	Under Publication	47
7.	Volume tables of <i>shorea robusta</i> (Sal) for various divisions of Madhya Pradesh.	Dr. G. Krishnamurthy Smt. Richa Seth	Under Publication	25
8.	Growth tables of important coppice origin species for Madhya Pradesh.	Dr. G. Krishnamurthy Smt. Richa Seth	Under Publication	21



S. N.	Name of technical bulletins/ brochures	Authors	Bulletin/ brochure Number	No. of pages
9.	जैविक खाद एवं नीम खली – वानिकी प्रजातियों के पौधों की वृद्धि में लाभ दायक	Dr. Archana Sharma		
10.	सागौन – उपचारण एवं अंकुरण	Dr. Archana Sharma		
11.	भिलवा– बीज एवं रोपणी तकनीक	Dr. Archana Sharma		
12.	कुंभी– बीज एवं रोपणी तकनीक	Dr. Archana Sharma		
13.	माहुल– बीज एवं रोपणी तकनीक	Dr. Archana Sharma		
14.	मुण्डी– बीज एवं रोपणी तकनीक	Dr. Archana Sharma		
15.	Cultivation and uses of Lac	Dr. Pratibha Bhatnagar, Mayank Verma, Ramdeen Bhalavi, Balram Lodhi	-	2
16.	मध्यप्रदेश के वनों में पायी जाने वाली महत्वपूर्ण दुर्लभ प्रजातियों की उपयुक्त रोपणी तकनीक का विकास – मार्गदर्शिका	Sachin Dixit and Jyoti Singh	-	-
17.	खमेर शीर्ष सूखन रोग (Top Drying) एवं प्रबंधन तकनीक मार्गदर्शिका	Jyoti Singh and Sachin Dixit		
18.	गैर-काष्ठीय वनोपज प्रजातियों का वन संसाधन सर्वेक्षण एवं विकास	जी.कृष्णमूर्ति, आर. के.पाण्डे, अंजना राजपूत, एस.के. मसीह	63	
19.	कैमरा ट्रैप मार्गदर्शिका	जी. कृष्णमूर्ति, अंजना राजपूत, अनिरुद्ध मजूमदार, जिशान अली	62	18



Chapter – 9
BUDGET / FINANCE

Funding sources

1. Grant-in-aid under non-plan budget of the Govt. of Madhya Pradesh, Forest Department
2. Project based external funding from govt./semi govt./non- govt. organizations and private donors.
3. Special assistance received from miscellaneous funding agencies.
4. Revenue from various sources of the institute.

Financial support and expenditure (2015-16)

Budget head	Opening balance (Rs.in lakhs)	Budget received during the year (Rs.in lakhs)	Total Amount (Rs. In lakhs)	Expenditure (Rs.in Lakhs)
10-2406 Non-plan (Grant-in aid)	0.00	54000000.00	54000000.00	60554616.00
Deposit Works (Sponsored projects)	65812666.00	186472337.00	252285003.00	147381939.00
Total Rs.	65812666.00	240472337.00	306285003.00	207936555.00

Details of sponsored projects

Various projects have been funded by govt./semi govt./non-govt. and private agencies from time to time. Such on-going projects during the year 2015-16 are given below.

S. N.	Title of the project	Sponsoring agency	Balance available in the beginning of the year	Amount received in the year	Total Amount	Total Exp. (1.4.15 to 31.03.16) (Rs.)
1	Assessment of status and role of sacred groves in conservation of biodiversity at different levels in MP BD/P/E/06-07/04	MP State Biodiversity Board, Bhopal	228767	0	228767	228767
2	Development of nursery techniques of Baibidang (<i>Embellia ribes</i>) Malkagni (<i>Celastrus paniculata</i>) BD/P/E/09-10/11	म.प्र.राज्य लघुवनोपज (व्यापार एवं विकास) सहकारी संघ मर्यादित म. प्र. भोपाल	72395	0	72395	72395
3	Studies on weight loss in stored lac with relation to time. (लाख में समय के साथ सूखत पर प्रतिशत की जांच करने हेतु अनुसंधान परियोजना) BD/P/E/10-11/03	म.प्र.राज्य लघुवनोपज (व्यापार एवं विकास) सहकारी संघ मर्यादित म.प्र.भोपाल	27584	0	27584	27584
4	Development of nursery techniques and models for plantation of rare, endangered and threatened (R.E.T.) species in natural conditions BD/P/E/10-11/08	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	1003511	142000	1145511	540826



S. N.	Title of the project	Sponsoring agency	Balance available in the beginning of the year	Amount received in the year	Total Amount	Total Exp. (1.4.15 to 31.03.16) (Rs.)
5	औषधीय एवं सुगंधीय पौध विकास हेतु मध्यप्रदेश की रणनीति 2009-10 से 2013-14 की गतिविधि के अंतर्गत वैधों के ज्ञान के अभिलेखन हेतु 5 जिलों की परियोजना। BD/P/E/11-12/05	म.प्र.राज्य लघुवनोपज (व्यापार एवं विकास) सहकारी संघ मर्यादित म.प्र.भोपाल	-480	6980	6500	6500
6	म.प्र. में साल बोरर से साल वनों की सुरक्षा हेतु प्रशिक्षण कार्यक्रम। BD/P/E/11-12/22	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	196253	0	196253	54416
7	Mass Multiplication of Medicinal and aromatic plant. BD/P/E/11-12/24	Horticulture and Medicinal Plant Mission Bhopal	-15774	46928	31154	31154
8	Upgradation and renovation of forestry museum at SFRI, Jabalpur BD/P/E/12-13/18	APCCF, (Development) M.P., Bhopal	7738274	0	7738274	2941968
9	Ex-situ conservation of medicinally important wild tuberous/rhizomatic plants and studies on their phenology and growth performance BD/P/E/13-14/05	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	1877716	366946	2244662	441561
10	Development of cultivation techniques of Van Jeera (Black cumine) <i>Centrantherum anthelminiticum</i> (L) Kantze BD/P/E/13-14/16	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	-27915	613000	585085	80010
11	Documentation of ethno-botanical information on natural gum and resin yielding plants of Madhya Pradesh. BD/P/E/13-14/17	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	165594	573000	738594	268746
12	Documentation of traditional knowledge of local tribal & communities of Malwa eco region of M.P. BD/P/E/13-14/19	M.P. Concl of Science and Technology	131873	0	131873	148924
13	औषधीय पौधों के जीन बैंक एवं रोपणी का प्रबंधन एवं विकास। BD/RA/1//01	SFRI Jabalpur	-5126	26186	21060	21060
14	Assessment of the impact of different treatments on rehabilitation of gregariously flowered bamboo forests in	APCCF (Development)	959529	0	959529	959529



S. N.	Title of the project	Sponsoring agency	Balance available in the beginning of the year	Amount received in the year	Total Amount	Total Exp. (1.4.15 to 31.03.16) (Rs.)
	Madhya Pradesh BOT/P/E/06-07/05					
15	Modernization and digitization of existing forest herbarium of State Forest Research Institute Jabalpur (M.P.) (CAMPA) BOT/P/E/11-12/03	अपर प्रधान मुख्य वन संरक्षक (भू-प्रबंध) म.प्र. भोपाल.	473217	0	473217	473217
16	Protection maintenance and growth study of dominant tree species for estimation of biomass and carbon sequestration in preservation plots laid in different forest types of M.P. (CAMPA) BOT/P/E/11-12/07	अपर प्रधान मुख्य वन संरक्षक (भू-प्रबंध) म.प्र. भोपाल.	1710676	0	1710676	510770
17	Preparation of reclamation plan for flagstone mines of Shivpuri District, M.P. BOT/P/E/11-12/18	The M.P. State Mining Corporation Bhopal	303129	0	303129	303129
18	National seminar on "Strategy for Restoration of Forest Bio-diversity of Natural Forests and Plantations in M.P." BOT/P/E/12-13/04	अपर प्रधान मुख्य वन संरक्षक (कक्ष-समन्वय) म.प्र. भोपाल,	80123	0	80123	80123
19	Development and enrichment of existing botanic garden at SFRI, Jabalpur with rare and endemic Angiosperms and Pteridophytes BOT/P/E/12-13/26	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	947903	2870	950773	950773
20	Inventorization and publication of illustrated flora of Achanakmar-Amarkantak Biosphere Reserve (AABR) BOT/P/E/13-14/14	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	229875	0	229875	229875
21	Sustainable livelihood based management plan for Kuno-Palpur Wildlife Sanctuary of Madhya Pradesh BOT/P/E/13-14-15	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	52539	0	52539	283707
22	Studies on photosynthetic efficiency, biomass production and carbon sequestration of bamboo in plantation forests BOT/P/E/14-15/07	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	-16400	1932000	1915600	524837



S. N.	Title of the project	Sponsoring agency	Balance available in the beginning of the year	Amount received in the year	Total Amount	Total Exp. (1.4.15 to 31.03.16) (Rs.)
23	Forest Resources assesment survey of NTFPs in seven PPAs Viz. Betul, Chattarpur, Harda, Narsinghpur, South Sagar, North Panna and East Mandla Forest Divisions of MP. ECO/P/E/06-07/17	MPMFP (Trade & Dev.) Fed.Bhopal	280360	0	280360	280360
24	Impact assesment of proposed relocation of five villages of Panna Tiger Reserve with reference to conservation of tiger and its habitat ECO/P/E/07-08/04	Field Director Panna Tiger Researve, Panna	384341	0	384341	384341
25	Determination of sustainable harvesting limits of commercially important wild plant species in natural forest with active participation of user forest development communities in Chhindwara district of M.P. ECO/P/E/08-09/05	National Medicinal Plants Board New Delhi	386016	0	386016	386016
26	Consultancy for deciding in violate space in Kanha Tiger Reserve. ECO/P/E/09-10/02	Field Director Kanha Tiger Reserve Mandla	14924	0	14924	14924
27	4 नये लोक संरक्षित क्षेत्र में प्रथम रिसोर्स सर्वे हेतु अध्ययन। ECO/P/E/10-11/06	म.प्र.राज्य लघुवनोपज ब्यापार एवं विकास सहकारी संघ मर्यादित म. प्र.भोपाल	1929459	0	1929459	1929459
28	Impact assesment on flora & fauna in Bunder Project in Baxwana forest Range of Chhatarpur forest Division. ECO/P/E/10-11/11	Rio Tinto Exploration India Private Ltd. New Delhi.	176126	264124	440250	440250
29	Impact Assesment of relocation and rehabilitation of forest village Khakrapura of Bori Sanctuaries ECO/P/E/10-11/17	Field Director Satpura Tiger Researve Hashagabad	373459	0	373459	373459
30	UP Forest Management and poverty alleviation Non- Timber Forest Produce Resource Assesment and Development ECO/P/E/11-12/13	Japan International Corporation (JICA)	1757858	13915	1771773	1771773



S. N.	Title of the project	Sponsoring agency	Balance available in the beginning of the year	Amount received in the year	Total Amount	Total Exp. (1.4.15 to 31.03.16) (Rs.)
31	Non- Timber Forest Produce Resource Assessment and Development ECO/P/E/11-12/14	Japan International Corporation (JICA)	2256637	0	2256637	2256637
32	बोर-हौल खनन वनस्पति एवं वन्य प्राणियों पर पड़ने वाले प्रभाव का मूल्यांकन अध्ययन। ECO/P/E/11-12/15	Central Mine Planning & Design Institute Ltd.	424406	0	424406	424406
33	Survey of existing Barahsingha & Blackbuck habitat evaluation for habitat viability assessment for Kanha Tiger Reserve and Satupra Tiger Reserve. ECO/P/E/11-12/26	Field Director Satpura Tiger Reserve Hoshangabad	159832	0	159832	13265
34	Environmental Impact Assessment on aquatic life/water supply and water quality of down stream due to reduced flow especially in lean period in Sanjay Gandhi Thermal Power Plant. ECO/P/E/11-12/27	Sanjay Gandhi Thermal Power Plant, Birsinghpur, Umaria	577086	0	577086	577086
35	Study on soil erosion/soil flow from the over burden areas of Khadia Project with the help of G.I.S. ECO/P/E/11-12/28	Northern Coalfields Ltd.Sonebhadra (U.P.)	692424	0	692424	692424
36	सतपुडा ताप विद्युत गृह सारणी स्थित वर्तमान राखड बांध हेतु रिफ्लेमेशन प्लान एवं वन्य प्राणी प्लान तैयार करना। ECO/P/E/12-13/07	A.E.(Gen) MP.Power Generating Co. Ltd. Shakti Bhawan Rampur Jabalpur	746736	0	746736	746736
37	Study of Evaluation of Impact of Runj Project on wildlife and action to be taken to mitigate the Impacts under Runj irrigation medium Project, (RUNJ PANNA) ECO/P/E/12-13/08	Engineer - in-Chief, Water Resources Department, Tulsi Nagar, Bhopal	3212846	43	3212889	3212889
38	Impact Assessment on Habitat fragmentation and wild life Habitat alongwith floral and faunal studies for the forest to be used for 4-6 laning of National Highway 26-in Jhansi and Lalitpur section in Madhya Pradesh ECO/P/E/12-13/10	National Highway Authority of India (Ministry of Road Transport and Highway	828954	0	828954	828954



S. N.	Title of the project	Sponsoring agency	Balance available in the beginning of the year	Amount received in the year	Total Amount	Total Exp. (1.4.15 to 31.03.16) (Rs.)
39	Ecological studies on grasslands of Bandhavgarh Tiger Reserve with special reference to wildlife management. ECO/P/E/12-13/24	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	2161900	1121000	3282900	344911
40	Impact Assessment of road upgradation of National Highway No.26 (B) on forest wildlife habitat in the affected forest area (48.849 ha) of East Chhindwara Forest Division. ECO/P/E/13-14/01	National Highway Authority of India (Ministry of Road Transport and Highways) Project Implementation Unit Chhindwara	4333390	40	4333430	4333430
41	Development of technology for conservation and sustainable management of wild medicinal plants and NTFPs through community participation in Shahdol Forest Circle of (M.P.) ECO/P/E/14-15/01	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	1793075	2329000	4122075	1009315
42	Impact assessment on flora, fauna wildlife and its habitat in reference to the area being diverted for extension of manganese ore underground mining of M/s JK Minerals District – Balaghat in M.P. ECO/P/E/14-15/06	J.K. Minerals District Balaghat	804194	0	804194	213748
43	म.प्र. खनिज संसाधन विभाग द्वारा विभिन्न जिलों में रेत खनन क्लस्टर के अंतर्गत प्रस्तावित रेत खदानों का पर्यावरणीय मूल्यांकन एवं पर्यावरणीय प्रभाव प्रबंधन। ECO/P/E/15-16/09	M.P. Mining Dev. Cooperation, Bhopal	0	12095926	12095926	1352826
44	Preparation of wildlife conservation plan for Jagannathpur OCM of South Eastern Coal Field Ltd. (SECL) Bhatgaon Area, Dist. Surguja Chhattisgarh ECO/P/E/15-16/10	General Manager (Operation) Bhatgaon Area South Eastern Coalfields Ltd. Bhatgaon Distt. Surguja (C.G.)	0	710494	710494	253897



S. N.	Title of the project	Sponsoring agency	Balance available in the beginning of the year	Amount received in the year	Total Amount	Total Exp. (1.4.15 to 31.03.16) (Rs.)
45	राज्य वन अनुसंधान संस्थान जबलपुर के अनुसंधान परियोजनाओं के निष्कर्षों का प्रचार-प्रसार हेतु कार्यशालाओं का आयोजन। EXT/P/E/11-12/08	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	149173	0	149173	149173
46	Exposure trips to the JFMCs & EDC Members of U.P. Forest Department EXT/P/E/11-12/19	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	133800	0	133800	133800
47	बुंदेलखंड विशेष पैकेज के अंतर्गत हितग्रहियों तथा फील्ड स्टाफ का भू-जल संरक्षण तकनीक एवं प्रबंधन कार्य एवं प्रशिक्षण हेतु कार्यशाला का आयोजन। EXT/P/E/11-12/21	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	511475	0	511475	511475
48	Exposure visit of JFMCs of U.P. PFM P.A.P. EXT/P/E/12-13/22	Chief Project Director PMU UP PFM PAP	1077	423	1500	1500
49	नर्सरी संचालकों के प्रशिक्षण। EXT/P/E/12-13/27	म.प्र. जन अभियान परिषद,	-2203	3703	1500	1500
50	अनुसंधान विस्तार वृत्त, में पदस्थ अधिकारियों कर्मचारियों हेतु नर्सरी प्रबंधन पर दो दिवसीय आवसीय प्रशिक्षण कार्यक्रम। EXT/P/E/13-14/06	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	155570	0	155570	155570
51	राज्य वन अनुसंधान संस्थान जबलपुर के अनुसंधान परियोजनाओं के निष्कर्षों का प्रचार-प्रसार हेतु कार्यशाला 2 का आयोजन। EXT/P/E/13-14/10	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	315402	0	315402	189664
52	National Network on integrated Development of Jatropha. GEN/P/E/2004-05/17	NOVOD Board Gurgaon	183207	0	183207	183207
53	Germplasm evaluation of important medicinal plants through chemo profiling techniques and improved biotechnological tools. GEN/P/E/06-07/15	National Medicinal Plant Board New Delhi (NMPB)	38973	0	38973	38973
54	Standardization of protocols for clonal multiplication of <i>Litsea glutinosa</i> (lour cb, rob and endangered medicinal plant). GEN/P/E/2008-09/07	NMPB, New Delhi	261450	0	261450	261450



S. N.	Title of the project	Sponsoring agency	Balance available in the beginning of the year	Amount received in the year	Total Amount	Total Exp. (1.4.15 to 31.03.16) (Rs.)
55	The establishment of an advanced laboratory for molecular characterization and chemo profiling of <i>Commiphora wightii</i> plant GEN/P/E/10-11/18	M.P. Bio-technology Council Bhopal	58897	0	58897	58897
56	Genetic diversity assessment of <i>Boswellia serrata</i> and standardization of microclonal propagation protocols through biotechnological interventions for the production of elite planting material. GEN/P/E/12-13/05	म.प्र.राज्य लघुवनोपज व्यापार एवं विकास सहकारी संघ मर्यादित म. प्र.भोपाल	-189946	931000	741054	503283
57	Clonal mass multiplication of <i>Commiphora wightii</i> a red-listed medicinal plant. GEN/P/E/12-13/06	म.प्र.राज्य लघुवनोपज व्यापार एवं विकास सहकारी संघ मर्यादित म. प्र. भोपाल	78860	0	78860	78860
58	Standardization and multiplication of clonal propagation protocol for commercially important forestry species <i>Anogeissus pendula</i> . GEN/P/E/12-13/17	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	190712	141000	331712	294862
59	Clonal multiplication of <i>Dendrocalamus asper</i> (Thailand bamboo) through micropropagation technique. GEN/P/E/12-13/23	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	24258	0	24258	24258
60	Development of integrated biotechnological package by genetic diversity assessment using molecular characterization, chemo-profiling, standardization of micro-propagation and cryopreservation protocol of four RET species. GEN/P/E/14-15/02	NMPB, New Delhi	1257945	0	1257945	830934
61	National Seminar on "Recent advances in research and development in medicinal and aromatic plants - A country scenario" Under National Medicinal Plants Board GEN/P/E/14-15/08	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	500000	78250	578250	1265649



S. N.	Title of the project	Sponsoring agency	Balance available in the beginning of the year	Amount received in the year	Total Amount	Total Exp. (1.4.15 to 31.03.16) (Rs.)
62	Quantitative determination of bioactive compounds of highly threatened medicinal plant species through chemoprofiling and standardization of propagation techniques using biotechnological interventions for their conservation. GEN/P/E/15-16/03	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	0	2825000	2825000	598278
63	Preparation of growth tables for coppice origin plants of important species in different regions of M.P. MEN/P/E/08-09/16	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	964170	0	964170	964170
64	Revision of form factors for Teak & Sal in different divisions of M.P. MEN/P/E/09-10/03	वनमण्डल अधिकारी उत्पादन वन मण्डल मण्डला	15526	0	15526	15526
65	Revised- form factor table for important miscellaneous timber tree species of Madhya Pradesh. MEN/P/E/11-12/12	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	279041	0	279041	144945
66	Revision of form factors of Teak For Raisen division of M.P. New Project MEN/P/E/11-12/16	वनमण्डल अधिकारी उत्पादन वन मण्डल रायसेन	7988	0	7988	7988
67	रोपणी मार्गदर्शिका का प्रकाशन MEN/P/E/12-13/25	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	115044	0	115044	21625
68	Germplasm evaluation and standardization of packages of propagation through seeds and vegetative propagation of important tree borne oil seeds of Mahua and Kusum. SD/P/E/08-09/10	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	353579	0	353579	353579
69	Training and demonstration programme for transfer of technology of enhancing flowering and fruiting in Mahua trees through application of fertilizers/chemicals growth retardants. SD/P/E/2008-09/15	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	390584	0	390584	390584



S. N.	Title of the project	Sponsoring agency	Balance available in the beginning of the year	Amount received in the year	Total Amount	Total Exp. (1.4.15 to 31.03.16) (Rs.)
70	Development of packages of seed techniques for important forestry species. SD/P/E/2010-11/13	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	1043074	0	1043074	1043074
71	Strengthening of Infrastructure of collection, testing, certification and storage of forestry seeds. SD/P/E/12-13/01	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	375231	0	375231	375231
72	Strengthening of Infrastructure of collection, testing, certification and storage of forestry species. SD/P/E/12-13/12	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	373233	0	373233	373233
73	Effect of various pretreatment on seed germination of fresh and stored seeds of <i>Tectona grandis</i> (Teak) SD/P/E/12-13/13	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	168708	300	169008	169008
74	Documentation and development & packages of seed and nursery techniques for some important indigenous species. SD/P/E/12-13/14	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	234608	214000	448608	153409
75	Effect of vermicompost and neem cake on plant growth of same forestry species. SD/P/E/12-13/16	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	119626	0	119626	119626
76	Advance and recent development in tree seed technology to enhance forest productivity two day National Seminar. SD/P/E/13-14/09	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	54719	0	54719	54719
77	Training and demonstration programme on seed technology and management of seed production areas for field foresters. SD/P/E/14-15/04	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	772274	73	772347	772347
78	Standardization of seed and nursery techniques for production of quality planting stock of important indigenous species (<i>Terminalia chebula</i> , <i>Terminalia bellirica</i> , <i>Adina Cordifolia</i> , <i>Sapindus</i>)	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	0	1080000	1080000	451422



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	<i>trifoliatus, Adunsonia digitata</i>). SD/P/E/15-16/02					
79	Collection, processing testing, certification and supply of quality seeds of various forestry species. SD/P/E/15-16/06	SFRI Jabalpur	0	56992917	56992917	23716584
80	Digitisation of old records of M.P. Forest Department and Forestry Research. SEM/P/E/09-10/ 05	APCCF Development Bhopal	56275	0	56275	56275
81	Valuation of forest resources and its accounting. A case study of South Balaghat Forest Division. SEM/P/E/09-10/ 06	APCCF Development Bhopal	94503	0	94503	94503
82	Sustainable harvesting and primary processing of gums and gum oleo resin in M.P. SEM/P/E/10-11/04	म.प्र.राज्य लघुवनोपज व्यापार एवं विकास सहकारी संघ मर्यादित म. प्र.भोपाल	26002	199895	225897	225897
83	म.प्र. में निजी एवं राजस्व क्षेत्रों में वानिकी प्रसार हेतु विभिन्न प्रकार के जलवायु एवं मिट्टीयों में प्राप्त हो सकने वाली वनोपज का आर्थिक विश्लेषण। SEM/P/E/10-11/09	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	333661	0	333661	333661
84	Training of sustainable harvesting processing grading and storage of gums. SEM/P/E/10-11/20	MPRLP Bhopal	506247	0	506247	506247
85	Strengthening of MIS cell and establishment of five regional markets data collection and analysis centre in Madhya Pradesh. SEM/P/E/11-12/01	MFP Fedration (Trade and Development) MP, Bhopal	-187241	576000	388759	401826
86	वन विभाग का 150 वर्ष कार्यक्रम मनाते हेतु SEM/P/E/11-12/20	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	165328	0	165328	7500
87	Standardization of primary processing and drying techniques for selected medicinal species and NWFP. SEM/P/E/11-12/25	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	78767	0	78767	13702



S. N.	Title of the project	Sponsoring agency	Balance available in the beginning of the year	Amount received in the year	Total Amount	Total Exp. (1.4.15 to 31.03.16) (Rs.)
88	Compilation of 50 years of forestry research at State Forest Research Institute. Jabalpur SEM/P/E/12-13/03	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	200000	0	200000	1500
89	Preservation and digitization of research records of SFRI SEM/P/E/12-13/15	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	-50605	63000	12395	12395
90	Development of storage system in Archive room of SFRI SEM/P/E/12-13/20	APCCF Development M.P., Bhopal	320065	4160	324225	324225
91	Training on technical know how of gum tapping from <i>Butea monosperma</i> in Umaria and Tikamgarh districts to local people and frontline staff of forest department. SEM/P/E/13-14/13	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	-332864	359612	26748	26748
92	म0प्र0 प्रमुख गौंदो के संग्रहण के आकड़ों का संकलन एवं प्राथमिक संग्राइकों पर सामाजिक आर्थिक प्रभाव। SEM/P/E/13-14/18	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	-60990	254000	193010	422307
93	Network project on conservation of lac insect genetic resources SEM/P/E/14-15/05	Project Indian Institute of Natural Resins and Gums, Namkum, Ranchi	578978	835000	1413978	1294464
94	The scheduled tribes and other traditional forest Dwellers (Recognition of Forest Right Act, 2006) Implementation and its impact in Madhya Pradesh SEM/P/E/15-16/11	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	0	600000	600000	32664
95	Estimation of carrying capacity of grazing in different forest types and canopy density in Jabalpur Forest Division SIL/P/E/2009-10/ 07	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	1241063	0	1241063	396212
96	राष्ट्रीय वनीकरण कार्यक्रम से सम्बंधित कार्यों का मूल्यांकन (FDA Project)	CCF (JFM) FDA	844084	0	844084	844084



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	SIL/P/E/09-10/08					
97	Evaluation of Developmental works of Forest Villages. (वन ग्राम विकास कार्यक्रम से सम्बंधित कार्यों का मूल्यांकन) (वन ग्राम) SIL/P/E/09-10/09	संयुक्त वन प्रबंधन एवं वन विकास अभिकरण सतपुड़ा भवन भोपाल	906784	0	906784	906784
98	Standardization of potting mixtures of if various soil types for optimum growth of <i>Tectona grandis</i> (Teak), <i>Gmelina arborea</i> (Khmer) and <i>Dendrocalamus strictus</i> (Bamboo) species. SIL/P/E/10-11/14	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	262310	0	262310	262310
99	बुंदेलखंड विशेष पैकेज के विकास कार्यों का मूल्यांकन। (New Project) SIL/P/E/11-12/10	अ. प्र. मु. व. सं. संयुक्त वन प्रबंधन/वन विकास अभिकरण सतपुड़ा भवन भोपाल,	1297595	433360	1730955	1730955
100	DNA-based monitoring of tigers and their movement in the Kanha, Pench corridor of (M.P.) SIL/P/E/12-13/09	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	776005	250000	1026005	834518
101	Conference on " Silviculture issues for productivity enhancement and ecological security SIL/P/E/12-13/19	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	32495	0	32495	32495
102	वन विभाग द्वारा वृक्षारोपण की रणनीति पर कार्यशाला। SIL/P/E/13-14/11	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	70072	0	70072	70072
103	म0प्र0 राज्य वन विकास अभिकरण द्वारा विभिन्न वन विकास अभिकरणों में वित्तीय वर्ष 2011-12 में प्रारंभ किए गए वनीकरण कार्यों 2011-12 में किए गए वृक्षारोपण का अनुश्रवण मूल्यांकन किए जाने के संबंध में। SIL/P/E/13-14/12	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	47472	66690	114162	114162



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104	म.प्र. वन विकास अभिकरण द्वारा विभिन्न वन विकास अभिकरणों में वित्तीय वर्ष 2012-13 के वर्षों ऋतु में हुए वृक्षारोपण कार्यो का अनुश्रवण मूल्यांकन। SIL/P/E/15-16/08 (FDA)	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	0	440000	440000	240770
105	To organise trainings for the staff of Forest Department in the maintenance of seed orchards and seed production areas. TI/P/E/08-09/13	APCCF (Production) M.P. Bhopal	153411	0	153411	153411
106	Standardization of pruning techniques for optimum production of quality tendu leaves. TI/P/E/09-10/01	MP State Minor Forest Produce (T&D) Federation, M.P. Bhopal	773220	0	773220	773220
107	Science plan for utilization of automatic weather station (AWS) and agrometeorological station (AMS) data in Madhya Pradesh, India (in collaboration with M.P. Forest Department) TI/P/E/09-10/04	APCCF (Project) M.P. Bhopal	1147330	28778	1176108	1176108
108	Establishment of Bamborium/Bamusetum and Bamboo interpretation centre at SFRI, Jabalpur (बांस वाटिका एवं बैम्बू इंटरप्रिटेशन सेंटर की स्थापना) TI/P/E/10-11/01	वन संरक्षक सामान्य वन मण्डल जबलपुर	543778	0	543778	98914
109	Studies on screening and management of diseases of some selected important medicinal aromatic plants. TI/P/E/10-11/05	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	224191	0	224191	224191
110	Establishment of leaf orchard of Tendu. TI/P/E/10-11/21	MFP Fedration, M.P. Bhopal	202778	0	202778	202778
111	Selection of superior races of Khamer (<i>Gmelina arborea</i> through clonal propagation TI/P/E/12-13/02	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	568590	0	568590	54226



S. N.	Title of the project	Sponsoring agency	Balance available in the beginning of the year	Amount received in the year	Total Amount	Total Exp. (1.4.15 to 31.03.16) (Rs.)
112	Development of suitable nursery techniques of some important rare tree species of (M.P.) TI/P/E/12-13/11	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	789540	0	789540	789540
113	The study on top drying of <i>Gmelina arborea</i> and its management. TI/P/E/13-14/02	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	39975	570884	610859	610859
114	Integrated management of disease of economically important tree species Dhawada, Bija, and Achar occurring in forest of (M.P.) TI/P/E/13-14/03	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	206413	239000	445413	403015
115	Causes and remedial measures of sal mortality <i>Shorea robusta</i> in forest area of (M.P.) TI/P/E/13-14/04	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	204148	396000	600148	305301
116	Monitoring and evaluation of wild life and their habitat for sustainable management and development in the protected areas of Madhya Pradesh WL/P/E/15-16/01	PCCF (Wild Life) M.P. Bhopal	0	88791508	88791508	64539638
117	Evaluation of impact of rehabilitation of pardhi children in Panna district of Madhya Pradesh with reference to the wildlife conservation. WL/P/E/15-16/04	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	0	400000	400000	5000
118	Study on agricultural crop damage by wild animals and its management in Hoshangabad circle of Madhya Pradesh. WL/P/E/15-16/12	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	0	1000000	1000000	8603
119	Impact of tourism on environmental, ecological, and socio-economic dynamics, in and around the Tiger Reserves of Madhya Pradesh WL/P/E/15-16/13	APCCF (Research, Extension & Lok Vaniki) MP, Bhopal	0	1150000	1150000	106993
	Total Project Balance		60422721	179169005	239591726	144067453



S. N.	Title of the project	Sponsoring agency	Balance available in the beginning of the year	Amount received in the year	Total Amount	Total Exp. (1.4.15 to 31.03.16) (Rs.)
1	Project Balance (Miscellaneous)		1714512	0	1714512	65000
2	Inter Bank		-150000	0	-150000	0
3	Interest Under Bank		3618891	6446927	10065818	2922710
4	Internal Project		15794	0	15794	0
5	Misce. Amount		190748	557686	748434	28057
	Grand Total Exp. Rs.		65812666	186173618	251986284	147083220

Income of the A/c SB/3990 Revolving Funds for the year 2015-16

S. No.	HEAD	Income (In Lakh)
1	Gate Entry Fees	553575
2	Guest House Receipts	818775
3	House Rent & Water Charges	947757
4	Misc Receipts	350856
5	Sale of Plants	197706
6	Income from sale of tender form	170460
7	Training fee	89000
8	Income form Vehicle Auction	114023
	Interest Received	
9	Interest on FDR	368206
	Grand Total	3610358

Expenditure of the A/c SB/3990 Revolving Fund for the year 2015-16

S. No.	HEAD	Expenditure (In lakh)
1	Wages	342992
2	Repair & Maintainance	1598147
3	Advertiesment Exp.	123488
4	Bank Charge	32
5	Consultancy Charge	55128
6	Misc. Expenses	162866
7	Nursery Expenses	45740
8	Office Exp.	33345



S. No.	HEAD	Expenditure (In lakh)
9	Seminar & Meeting Expenses	186946
10	Stationary Exp.	131580
11	Travelling Expenses	381482
12	Foreign Tour	865237
	Gross Total	3926983

Income from the Reserve Fund for the year 2015-16 (Sanchit Nidhi) A/c 5007081661

S.No.	Details	Income
1	Books & Magazine Sales	7870
2	Gate Entry Fees	2000
3	Misc. Receipts	629479
4	POL Charge Recovery	8200
5	RTI Receipts	20
6	Sale of seed	45550
7	Soil Testing Income	95725
8	Tender Form	15500
9	Interest on FDR	820620
	Total Rs.	1624964

**Expenditure incurred from the Reserve Fund for the year 2015-16 (Sanchit Nidhi)
A/c 5007081661**

S.No	Details	Income
1	Repair & Maintenance	785689
2	Bank Charges	952
3	Consultancy Charges	19500
4	Misc. Expenses	2883
5	Registration of Vehicle	22382
6	Wages	16176
	Total Rs.	847582.00

Financial Status as on 31st March, 2016

S.No.	Details	Cash in Bank	F.D.R.	Total
1	Revolving Fund A/c SB/3990	9912197	8800000	18712197
2	Grant-In-aid A/c SB/3268	1906544	0	1906544
3	Deposit Work A/c SB/3987	61498064	43405000	104903064
4	Reserve funds A/c Sanchit Nidhi 50070181661	6518352	25999000	32517352



Chapter-10
ESTABLISHMENT
Postings, Transfers, Retirements (2015-2016)

Postings:-

S.No.	Name	Designation	Date of Joining
1	Smt. Indra Jha	Accountant	15-01-2016

Transfers:-

S.No.	Name	Designation	Date of Relieving
1	Shri P.N.Mishra	ACF	30-01-2016
2	Shri Mahesh Prasad Soni	Forester	19-02-2016
3	Shri Rajesh Upadhyay	Forest Guard	01-03-2016
4	Smt. Archana Marscole	Forest Guard	19-02-2016

Retirement:-

S.No.	Name	Designation	Date of Relieving
1	Shri A.K. Sharma	ACF	30-04-2015
2	Shri Jaypat Kol	Dafftari	30-09-2015

Death:-

S.No.	Name	Designation	Date of Death
1	Shri K.V. Diwakar	Dy. Director	05-05-2015



Temporary project staff engaged during the year (April 2015 to March 2016)

S. No	Name	Designation	Project under which appointed	Period	
				From	To
1	Shri Shailendra Nema	JRF	Development of technology for conservation and sustainable management of wild medicinal plants and NTFPs through community participation in Shahdol forest circle of Madhya Pradesh.	2015	cont.
2	Mr. Shivkumar Kaurav	JRF	-do-	2015	cont.
3	Mrs. Snehlata Mishra	Computer Operator	मध्यप्रदेश स्टेट माइनिंग कारपोरेशन लि० द्वारा विभिन्न जिलों में रेत खनन क्लस्टर्स के अन्तर्गत प्रस्तावित रेत खदानों का पर्यावरण प्रभाव मुल्यांकन एवं पर्यावरणीय प्रभाव प्रबंधन।	2015	cont.
4	Mr. Akshay Kumar Jain	Computer Operator	-do-	Dec.2015	Dec.2016
5	Mr. Kundan Sharma	JRF	Preparation of Wildlife Conservation Plan for Jagannathpur OCM of SECL, Bhatgaon Area, Chhattisgarh	2015	cont.
6	Tanvi Telang	JRF	<i>Ex-situ</i> conservation of medicinally important wild tuberous /rhizomatic plants and studies on their phenology and growth.	2015	Cont.
7	Mr. Mukesh Gawane	Field Astd.	The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of forest right Act), 2006. Implementation and its impact in M.P.	2015	Cont.
8	Mr. Rajesh Kumar Berman	Field Astd.	-do-	2015	Cont.
9	Ms. Shubhangi Khatri	Project Astd.	-do-	2015	Cont.
10	Mr. Balram Lodhi	SRF	Network project on conservation of lac insect genetic resources	2015	Cont.
11	Mr. Ramdeen Bhalavi	SRF	-do-	2015	Cont.
12	Shri Jai Prakash George	SRF	Climate Change and its Impact on Forests and The livelihood of People in Damon District.	2015	Cont.
13	Mr. Pradeep Ku. Kanojia	JRF	Estimation of Wood demand and Supply in Madhya Pradesh.	2015	Cont.
14	Mr. Vineet Ku. Mehra	JRF	Development of integrated biotechnological package by genetic diversity assessment using molecular characterization, chemoprofiling, standardization of micropropagation	2015	Cont.



S. No	Name	Designation	Project under which appointed	Period	
				From	To
			and cryopreservation protocol of four RET species		
15	Mr. Shailendra Singh Yadav	Project Astd.	-do-	2015	Cont.
16	Mr. Manish Puri Goswami	SRF	-do-	2015	Cont.
17	Mr. Suresh prasad Charmkar	JRF	Sustainable livelihood based management plan for Kuno-Palpur wildlife sanctuary of Madhya Pradesh	2015	Cont.
18	Mo. Asif Mansoori	Project Astd.	Studies on photosynthetic efficiency, biomass production and carbon sequestration of bamboo in plantation forests	2015	Jan.2017
19	Mr. Abhishek Kumar Gupta	Project Astd.	Standardization of Seed and Nursery Techniques for Production of Quality Planting Stock of Important Indigenous Species	2015	Cont.
20	Sandeep Singh Bhandari	Project Astd.	Phase-IV monitoring and evaluation of wildlife and their habitats for sustainable management and development in the protected areas of Madhya Pradesh	2015	Cont.
21	Ayesha Khan	Project Astd.	-do-	2015	Cont.
22	Mr. Aniruddha Majumder	Research Associate	-do-	2015	Cont.
23	Sk. Zeeshan Ali	Research Associate	-do-	2015	Cont.
24	Mrs. Anju Kathel	JRF	Standardization of Seed and Nursery Techniques for Production of Quality Planting Stock of Important Indigenous Species	2015	Cont.
25	Mr. Shivraj Singh Parmar	Field Astd.	Evaluation of impact of rehabilitation of pardhi children in Pann Dist. Of MP	2015	Cont.
26	Mrs. Ram Kumar Kahar	JRF	Standardization of Seed and Nursery Techniques for Production of Quality Planting Stock of Important Indigenous Species	2015	Cont.
27	Mr. Amardeep Rajak	Computer Operator	म. प्र. राज्य वन विकास अभिकरण द्वारा विभिन्न वन विकास अभिकरणों में वित्तीय वर्ष 2012-13 के वर्षा ऋतु में हुए वृक्षारोपण कार्यो का अनुश्रवण मूल्यांकन किये जाने के संबंध में।	2015	Cont.
28	Mr. Nitin Kumar Verma	Computer Operator	Selection of superior races of Khamer (<i>Gmelina arborea</i>) through clonal propagation	2015	Cont.

