वार्षिक अनुसंधान प्रतिवेदन

ANNUAL RESEARCH REPORT

2014 - 2015

राज्य वन अनुसंधान संस्थान, जबलपुर (म.प्र.)

STATE FOREST RESEARCH INSTITUTE, JABALPUR (M.P.)

FROM THE DIRECTOR'S DESK

In its 52nd year of operation State Forest Research Institute, Jabalpur has entered a new phase in its development. The institute has emerged as one of the leading forest research organization of the state that is generating research results with far flung impact.

It's an honour for me to release the Annual Research Report of State Forest Research Institute, Jabalpur for the year 2014-15. I am delighted to be associated with this institute which has acclaimed itself both in scientific standards with transferable research with societal applications. The institute with an inspiring research environment strives for excellence by taking up research projects of applied nature and is committed to provide technological interventions in the field of conservation and sustainable utilization of forest resources.

The institute was accredited by Quality Control of India (QCI) under National Accreditation Board of Education and Training (NABET) in the field of medium irrigation projects and mining. The institute also have applied for ISO 9001 : 2008 certification. The process of creating wildlife cell was initiated for wildlife research to provide scientific input for wildlife management in the state. The institute has also taken up an ambitious task of providing high quality certified treated seeds with registered trade mark of MP Teak.

This year Dr. R. K. Pandey Senior Scientist of the institute received the best lecture award for his research paper titled "Sustainable harvesting techniques of NTFPs by community participation in Madhya Pradesh", in the World Biodiversity Congress organized from 24th to 27th November, 2014, at Colombo.

The institute achieved the objectives of Annual Action Plan for the year 2014-15 by undertaking 57 research projects. During the year 23 research projects were completed, 29 research projects were continued, 05 new projects were initiated and 14 regular activities were carried out. During this year, 47 papers were published in various journals, 33 papers were presented in various seminars and workshops and 09 papers were published in edited books/souvenirs by the scientists of the institute. The institute also published 03 technical bulletins and brochures based on the findings of completed research projects.

In keeping with objectives of developing skill and expertise awareness and exposure trainings for newly recruited forest rangers, forest guards, farmers, research scholars, school and college students were also organized. To extend research technologies developed by the institute, training cum workshops were organized in various forest divisions.

The institute organized the "5th Kamta Prasad Sagreiya Memorial lecture by Prof. Promode Kant, Director Institute of Green Economy, Noida, New Delhi on "What role can forests play in India's intended nationally determined contributions at the Paris Climate Summit". This event was actively attended by senior forestry professionals, academicians, researchers and ended with fruitful deliberations.

The institute published the Annual Research Report, Quarterly journals 'Vaniki Sandesh' and 'Journal of Tropical Forestry', marketing information newsletter 'Vandhan' and technical bulletins and pamphlets for dissemination of research knowledge.

I gratefully acknowledge and am indebted to the honorable members of the Board of Governors and the Research Advisory Committee of the institute for their support and encouragement to achieve high standards of performance and accomplishments. I am grateful to all my colleagues and staff of SFRI for displaying team spirit and their sustained efforts to propel SFRI towards attaining its objectives

Our sincere thanks and appreciation to the M.P. Forest Department and other esteemed national funding organizations and state funding agencies for having reposed faith and confidence in us, so as to enable us to accomplish our endeavours.

I hope that this Annual Research Report of the institute will provide useful information in the development of the forestry sector and will draw the attention of our stakeholders and well-wishers to give us advice to shoulder greater responsibilities.

Dr. G. Krishnamurthy, 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 namel '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 $23^0$07'.380' latitude and E 079^0 55'.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.

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. Training on techniques of protection of sal forests affected by sal borer attack.
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. Preparation of Wildlife Conservation Plan for the area being diverted for construction of power plants and National highways.
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. Training and extension programmes for transfer of research technologies.
22. Forest resources assessment survey in People's Protected Areas (PPAs).
23. Study on soil erosion/soil flow from the over burden areas with the help of GIS.
24. Habitat evaluation for habitat viability for endangerd wildlife species.
25. Preparation of form factor table for important miscellaneous timber species of M.P.
26. Effect of various pretreatment on seed germination of fresh and stored seed of *Tectona grandis* (Teak)

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. Study to ascertain causes of mortality in teak trees in different regions of M.P.

2. Preparation of volume and yield tables of several species.
3. Revision of form factors of teak and sal in different forest divisions of M.P.
4. Identification and collection of germplasm from plus trees.
5. 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. Maintenance and upgradation of gene bank of medicinal plant species.
12. Cryogenic preservation of germplasm of endangered medicinal plant species.
13. 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.
14. Environmental impact assessment and preparation of environmental management plan of irrigation and power generating projects.
15. Production of vermiculture and vermicompost from various types of organic wastes and extension of its technology to rural population.
16. Standardization of protocols for micro propagation of endangered medicinal plant species of central India and their cryogenic preservation for future multiplication.
17. Development of integrated insect pest and disease control system for major economically important tree species.
18. Lac culture on various host plant species and transfer of adopted technology to rural population for their economic upliftment.
19. Assessment of sal regeneration in borer affected sal forests of Madhya Pradesh.
20. Germplasm evaluation of important medicinal plants through chemo-profiling technique.
21. Enhancing flowering and fruiting in mahua trees through application of various fertilizers and chemicals.
22. Preparation of wildlife conservation plan for the areas being diverted for developmental projects.
23. Protection, maintenance and successional study of growth biomass and carbon sequestration in different forest types of MP.
24. Causes and remedial measures of sal mortality and integrated management of diseases of economically important tree species of M.P.
25. Development of packages of seed techniques for important forest tree species.
26. Development of nursery techniques and models for plantation of rare endangered and threatened (RET) species in natural condition.
27. Estimation of carrying capacity of grazing in different forest types and canopy densities in Jabalpur forest division of Madhya Pradesh.
28. *Ex- situ* conservation of medicinally important wild tuberous /rhizomatic plants and studies on their phenology and growth performance.
29. Modernization and digitalization of existing forest herbarium of State Forest Research Institute, Jabalpur (M.P.)
30. Sustainable harvesting and primary processing of gums and gum oleo resin in Madhya Pradesh.
31. Documentation of ethno-botanical information on natural Gum and resin yielding plants of Madhya Pradesh.
32. Documentation of traditional knowledge of local tribal and communities of Malwa eco region of Madhya Pradesh - Neemach and Ratlam districts.
33. Studies on photosynthetic efficiency, biomass production and carbon sequestration of bamboo in plantation forests.
34. Sustainable livelihood based management plan for Kuno-Palpur wildlife sanctuary of Madhya Pradesh.
35. Development of technology for conservation and sustainable management of wild medicinal plants and NTFPs through community participation in Shahdol forest circle of Madhya Pradesh.

36. 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.
37. 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.	- Chairman
2.	PCCF, Madhya Pradesh	- Vice Chairman
3.	Addl. Chief Secretary, Dept. of Forests, Govt. of M.P.	- Member
4.	Principal Secretary, Dept. of Finance, Govt. of M.P.	- Member
5.	PCCF (Wild Life) M.P.	- Member
6.	Managing Director, M.P. Forest Development l Corporation	- Member
7.	Managing Director, M.P. Minor Forest Produce (Trade and Development) Federation	- Member
8.	Director General, Indian Council of Forestry Research & Education Dehradun	- Member
9.	Director, Wildlife Institute of India, Dehradun	- Member
10.	PCCF, (Working Plan), MP	- Member
11.	APCCF (R/E & Lok Vaniki) M.P.	- 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, M.P.	Chairman
2.	P.C.C.F. (Wildlife), M.P.	Member
3.	PCCF (Working Plan), M.P.	Member
4.	A.P.C.C.F./CCF (Development), M.P.	Member
5.	A.P.C.C.F./CCF (M.P. Forestry Project), M.P.	Member
6.	A.P.C.C.F./CCF (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-D)	1	1
3	Seed Specialist (Scientist-E)	1	1
4	Tree Improvement Specialist (Scientist-E)	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 (Documention) (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	0	1
2	Assistant grade – II	1	1
3	Assistant grade – III	3	3
4	Driver	5	5
5	Daftari	2	4
6	Peon/Orderlies/ Chowkidar/ Mali/ Dak Runner	2	11
7	Sweeper	1	1
	Total	**14**	**26**

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. Extension, Consultancy and Training
11. Library and Documentation
12. 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. Forest resource Assessment survey in 4 newly identified People's Protected Areas (PPAs) i.e. Jabalpur, Satna, East Chhindwara and Anuppur forest divisions of Madhya Pradesh.
7. Exsitu conservation of medicinally important wild tuberous / rhizomatic plants and studies on their phenology and growth performance.

B. Silviculture and Forest Management:

1. म.प्र. राज्य वन विकास अभिकरण द्वारा विभिन्न वन विकास अभिकरणों में वित्तीय वर्ष 2010–11 में प्रारंभ किये गये वनीकरण कार्यों (2011–12 में किये वृक्षारोपण) का अनुश्रवण मूल्यांकन किये जाने के संबंध में।
2. Ecological studies on Grasslands of Bandhavgarh Tiger Reserve with special reference to wildlife management.
3. 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.
4. Network Project on Conservation of Lac insect Genetic Resources.
5. Assessment of sal regeneration in borer affected sal forests of Madhya Pradesh.
6. Evaluation of works of forest development authority and infrastructural developmental works in forest villages of Madhya Pradesh Forest Department.
7. Enhancement of flowering in Mahua using various treatments with hormones and fertilizers.
8. Development of nursery and planting techniques of economically important indigenous species.
9. Development of integrated insect pest and disease control system for major economically important tree species.
10. Resource assessment of NTFPs in People's Protected Areas (PPA's).
11. Study on felling cycles of *Dendrocalamus strictus.*
12. Analysis of soil samples.
13. Estimation of carrying capacity of grazing in different forest types and canopy density in M.P.
14. Identification and documentation of plus trees of important tree species.
15. Digitization of old records of M.P. Forest Department and forestry research.
16. Studies on screening and management of diseases of some selected important medicinal & aromatic plants.

17. DNA based monitoring of presence of tiger and their movements in the Kanha Pench corridor of Madhya Pradesh.
18. Survey of existing Barahsingha & Blackbuck habitat evaluation for habitat viability assessment for Kanha Tiger Reserve and Satpura Tiger Reserve.
19. Documentation of ethno-botanical information on natural gum and resin yielding plants of Madhya Pradesh.
20. Documentation of traditional knowledge of local tribal and communities of Malwa eco-region of Madhya Pradesh - Neemuch and Ratlam districts.
21. Sustainable livelihood based management plan for Kuno-Palpur wildlife sanctuary of Madhya Pradesh.
22. Integrated management of diseases of economically important tree species Dhawada, Bija and Achar occurring in forests of M.P.
23. Causes and remedial measures of sal mortality (*Shorea robusta*) in forest areas of M.P.

C. Seed Technology:

1. Effect of Vermicompost and Neem cake on plant growth of some forestry species.
2. Studies on quality seed production and germination behaviour of teak seeds in relation to age and size.
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 and development of packages of seed and nursery techniques for some important indigenous species.
7. Documentation of developed Seed Technology, Nursery and Planting Techniques of Important Forestry tree Species Particularly of Economic, MFP and Medicinal Value.

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 arbore*a) 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. Preparation of clonal plants of Mahua (*Madhuca latifolia*).
9. Propagation techniques of economically important endangered and rare species.
10. Genetic diversity assessment of *Boswellia serrata* and standardization of mirco clonal propagation protocols through biotechnological interventions for the production of elite planting material.
11. Standardization and multiplication of clonal propagation protocol for commercially important forestry species *Anogeissus pendula.*
12. Clonal multiplication of *Dendrocalamus asper* (Thailand bamboo) through miropropagation 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. Studies on variation in size, weight, quality and maturity period of Aonla fruits in different agro-climatic zones.
2. Sustainable harvesting practices, propagation, tree improvement, wildlife uses, marketing and consumption status of Non-Timber Forest produce and medicinal plants.
3. Determination of sustainable harvesting limits of commercially important wild medicinal plant species in natural forests with active participation of user forest dependent communities.
4. Sustainable harvesting and primary processing of gums and gum oleo resin in 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, Enicostema littorale* (Chhota chirayta).

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.
4. Role of sacred groves in biodiversity conservation.

H. Socio-economic studies and impact assessment:

1. To study the socio-economic condition, income and employment of farmers engaged in cultivation of medicinal and aromatic plants.
2. Valuation of forest resources and its accounting.
3. Collection of data regading important gums of Madhya Pradesh and its impact on the socio-econimic 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. Exposure trips to the JFMCs and EDC members of UP Forest Department.
5. Training on biotechnology, plant propagation and tissue culture.
6. Training-cum-demonstration program in cultivation, processing and marketing of medicinal and aromatic plants.
7. Trainings for the staff of forest department in the maintenance of seed orchards and seed production areas.
8. Training on sustainable harvesting, processing, grading and storage of Salai gum Oleo resin and Dhaora gum in Sheopur district.
9. Lac culture on various host plant species and transfer of adopted technology to rural population.
10. Participation in exhibitions and fairs.

Chapter – 3
RESEARCH ACTIVITIES
Abstract of Research Activities

2014-2015

S. N.	Name of the Research Branch	No. of completed projects (2014-15)		No. of on-going projects (2014-15)		No. of newly initiated projects (2014-15)		No. of regular activities
		External Projects	Internal Projects	External Projects	Internal Projects	External Projects	Internal Projects	
1	Biodiversity and Medicinal Plants	1	-	6	-	-	-	1
2	Forest Botany	2	-	2	-	1	-	1
3	Forest Ecology and Environment	2	-	5	-	1	-	-
4	Forest Genetics, Plant Propagation and Biotechnology	2	-	2	-	1	-	1
5	Forest Mensuration & Statistics	-	-	1	-	-	-	1
6	Seed Technology	3	1	3	1	-	-	1
7	Silviculture	2	-	2	-	-	-	1
8	Social Economics and Marketing	6	-	3	-	2	-	-
9	Tree Improvement	4	-	4	-	-	-	8
	TOTAL	**22**	**1**	**28**	**1**	**5**	**-**	**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. R.K. Pandey	:	Scientist and Head
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: One

1. Mass multiplication of medicinal and aromatic plants.

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: Nil

Externally funded: Nil

Regular Activities:

Newly initiated activities during the year: Nil

Ongoing: One

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

Projects completed during the year
Internally funded: Nil

Externally funded: One

1. Title : Mass multiplication of medicinal and aromatic plants.

I.D. No.	:	BD/P/E/11-12/24
Period	:	Dec. 2011 to Nov. 2013.
Sponsoring agency	:	Director Horticulture and Medicinal Plant Mission, Bhopal (Madhya Pradesh
P.I.	:	Dr. Uday Homkar

Objectives:

- To develop plant production capacity of the medicinal plant nursery.

Activities carried out during the year:

Following facilities are developed in medicinal plant nursery under the project.

- **Development of irrigation facilities:**

New pipe line, water storage tank and sprinkler irrigation system have been procured under the project.

- **Construction of naturally ventilated poly-house and insect proof net house:**

Two shade houses have been constructed under the project to increase the plant production capacity of the nursery. These structures are constructed as per the specifications provided by the horticulture board. The poly-shade net is used for seed germination/ storage of mother stock plants in adverse field conditions.

(i) Naturally ventilated poly-house: One naturally ventilated poly-house of 20 X28 m. is constructed under the project for seed germination, vegetative propagation and storage of mother plants for mass multiplication. Technical specifications of the structure is given as below:

Technical Specification:-

(a) Area : 560 sq.m.
(b) Size : 28 m. x 20 m.

200 micron thick film with anti-dust, antivirus and anti drip properties is used for covering the structure. 40 mesh net is used for side ventilation which is covered with manually openable window. The fogger system of irrigation has been installed inside the structure.

(ii) Insect proof net house:

One insect proof net-house of 40 X 30 m. is constructed under the project for storage of new plantlets during mass multiplication. Technical specifications of the structure is given as follows:

Technical Specification:-

(a) Area : 1200 sq.m.
(b) Size : 40 m. x 30 m.

All structure is covered by double layer viz. UV stabilized nylon net 40 mesh inner side and 75% agro shade net UV stabilized HDPE outer side .This structure also equipped with fogger system of irrigation.

- **Meteorological equipments:**

Equipments like rain guage, wind velocity meter and temperature humidity meter were procured to record daily weather data.

- **Plantlets developed in medicinal plant nursery:**

Large scale plantlets of medicinally important species have been prepared under the project. Prepared plants were sold to farmers, herbal manufacturing companies and visitors of the nursery. Similarly, large scale plants were prepared on demand for Dabur India Limited, Gaziabad, U.P.

The institute is now capable to produce 5 to 10 lakh plants as per requirement.

Current status of the project: Completed

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) Bhopal., (M.P.)
P.I.	:	Dr. R.K. Pandey
Project fellow	:	Miss Tanvi Telang
	:	Shri Imrat Sen

Objectives:

- To develop nursery techniques for important RET species namely *Bauhini vahlii* (Mahul), *Barbaris aristata* (Daru Haldi), *Oroxulum indicum* (Sheonak), *Dillania pentagyna* (Kalla), *Semecarpus anacardium* (Bhilwa), *Randia dumentorum* (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:

- Trials for multiplication by seed for *Barbaris aristata* (Daru Haldi) and *Dillania pentagyna* were tried.
- Maintenance of plantation of *Oroxulum indicum* (Sheonak), *Dillania pentagyna* (Kalla), *Semecarpus anacardium* (Bhilwa) and *Radermachera xylocarpa* (Garudphal) were raised at Katara of West Mandla Forest Division (T) under the project.

Following experiments were laid.

(A) Experiment 1: Standardization of mass multiplication technique of targeted species viz. *Berberis aristata* and *Dillenia pentagyna.* through seeds.

Methodology:

- Healthy seeds were collected from the field.
- 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

50 seeds in each replicates	
Treatments	**Replicates**
H_2SO_4 10%	3
H_2SO_4 20%	3
H_2SO_4 30%	3
H_2SO_4 40%	3
GA3 200ppm	3
GA3 500ppm	3
GA3 100ppm	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 controled condition was recorded to be 15.7% and 0.0% in the case of *Berberis aristata* and *Dillenia pentagyna* respectively.
- Observation envisaged that the maximum seed germination *in Berberis aristata.* (68%) in 10% H_2So_4 solution against the control and other treatments.
- In case of *Dillenia pentagyna* the solution of H_2So_4 solution of 40 % and GA3 300ppm were found suitable treatment against the control and other treatments. The maximum seed germination (28%) was recorded with the treatment of 40% H_2So_4 solution.

(B) Experiment 2: To find out suitable media for seed germination of *Berberis aristata* and *Dillenia pentagyna.*

Methodology:

- Healthy seeds were collected from the field.
- Experiments were laid in seed germination tray, inside the green net house.
- Kapu soil (River bank soil) was used.
- 3 replicates were taken.

Interim findings:

It was observed that the maximum seed germination percent was found in pure sand media in case of *Berberis aristata*.

In case of of *Dillenia pentagyna* no seed germination was observed in any of media treatment.

It is evident from the observation from the experiments, that the seed germination media of sand is suitable for maximum seed germination in *Berberis aristata*. However, in

case of *Dillenia pentagyna* no germination was recorded in any media. In normal condition seed germination is very difficult.

(C) Experiment 3: To find out proper month for seed germination.

Methodology:

- Healthy seeds were collected from the field.
- Experiments were laid in seed germination tray, inside the green net house.

Interim findings:

The variation of seed germination percent in different periods from May to December were observed in *Barberis aristrata* while in *Dillenia pentagyna* seeds were collected in the month of June, therefore, experiments were laid June onwards. Observation envisaged that *Barberis aristrata* maximum seed germination (66%) was observed in the month of July. After the month of August the seed germination was recorded to decrease remarkably. Moreover, October onwards no seed germination was recorded. In case of *Dillenia pentagyna,* seed germination was seen only during month of June. After June, no seed germination was recorded.

Month wise seed germination

Daru Haldi ***Barberis aristrata***			**Karkat** ***Dillenia pentagyna***		
Date of seed sowing	**First germination was observed**	**Maximum Germination %**	**Date of seed sowing**	**First germination**	**Maximum Germination %**
19-05-14	18 days	5	05-06-14	28 days	16
19-06-14	14 days	16	19-06-14	26 days	28
18-07-14	15 days	66	18-07-14	-	Nil
16-08-14	19 days	16	23-08-14	-	Nil
16-09-14	22 days	5	16-09-14	-	Nil
17-10-14	-	Nil	17-10-14		

(D) Experiment 4: To find rooting response in stem cuttings of the selected species.

Observations: It was observed that the cuttings treated with IBA 250 ppm gives good rooting response in compare to control. Detailed experiment with different rooting hormone is laid out. Results of which are awaited.

(E) Development of plantation model of RET species:

- Plantation of four species viz. sheonak, Kalla, Bhilawa and Garudphal have been raised in Paryavaran Park, Katara of West Mandla Forest Division (T). Casualty replacement was made during second year.
- A small plantation of *Berberis aristata* has also been raised in SFRI nursery.

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

Sp. Code	Species	Local Name	Available plants
1	*Oroxylum indicum*	Sheonak	500
2	*Dillania indica*	Kalla	310
3	*Dillania pentaphylla*	Karkat	50
4	*Grevia asiatica*	Falasa	15
6	*Stereospermum suaveolens*	Garudphal	198
7	*Berberis aristrata*	Daru Haldi	500

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

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 R. K. Pandey

Objectives:

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

Progress:

- As per direction of BOG, work is retendered.
- Work agreement signed by both the parties i.e. Successful tenderer and Institute.
- First installment released to successful tenderer.
- Renovation work is in progress.

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.

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:

- 70 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.
Sponsoring agency	:	MPMFD, (Research/Extension & Lok Vaniki) Bhopal., (M.P.)
P.I.	:	Dr. Uday Homkar

Objectives:

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

Progress:

(A) EXPERIMENT-1: Effect of spacing and manure on seed production of Van jeera (*Centrantherum anthelminiticum (L) Kantze)*

Interim findings:

Per plant seed production: According to the data, the estimated seed production/ ha. is shown in the following table.

Spacing	Plants to be planted in one lines X No. of lines.	Number of plants per ha.	Mean value of per plant seed produced in gms	Seed production per ha. in kg
30cmX30 cms	333 X 333	1,10,889	3.1	343.8
30cmX45 cms	333 X 222	73,926	3.3	244.0
45cmX45 cms	222 X 222	49,284	2.6	128.1
45cmX60 cms	222 X 166	36,852	2.2	81.1
60cmX60 cms	166 X 166	27,556	2.5	68.9

Among all the treatments, per plant seed production was found maximum at the spacing of 30cmX45 cms but number of plant increases in 30X30 cms spacing and seed production per plant was about similar to 30X 45 spacing, therefore, estimated production of Van Jeera seed per ha. was more in 30 X30 cms spacing.

Study on effect of spacing on seed production of Van jeera (*Centrantherum anthelminiticum (L) Kantze)* envisaged that the spacing of 30 X30 cms. was found effective for cultivation of Van jeera.

(B) **EXPERIMENT- 2: To study the impact of manure on seed production of Van jeera (Centrantherum anthelminiticum (L) Kantze).**

Interim findings:

As data recorded and analysed, it is observed that the use of farm yard manure (FYM) increases the production in compairigen to the plants treated with vermicompost and control (without any manure). The growth performace of the plants treated with FYM is also comparatively better than plants treated with vermicompost and untreated plants (control).

Average of per plant seed production is given in following table.

S.No.	Treatment	Mean value of seed production /plant (in gms)	Maximum seed production /plant (in gms)
1	FYM	3.7	4.8
2	Vermicompost	2.1	2.4
3	Control	1.8	1.9

All experiments will be repeated in consequent project 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	:	R&D, MPFD, 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 321 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.
- On the basis of selected 4 reference books given below identification and scrutiny of gum and resin yielding plants of India were done :-

S. No.	Reference book	Approximate No. of plant species reported
1	CSIR (1986). The Useful Plants of India. ICAR, New Delhi Pp. 981	5000
2	Khare, C. P. (2007). Indian Medicinal Plant – An Illustrated Dictionary. Springs Science- Business Media LLe. Pp.812	1650

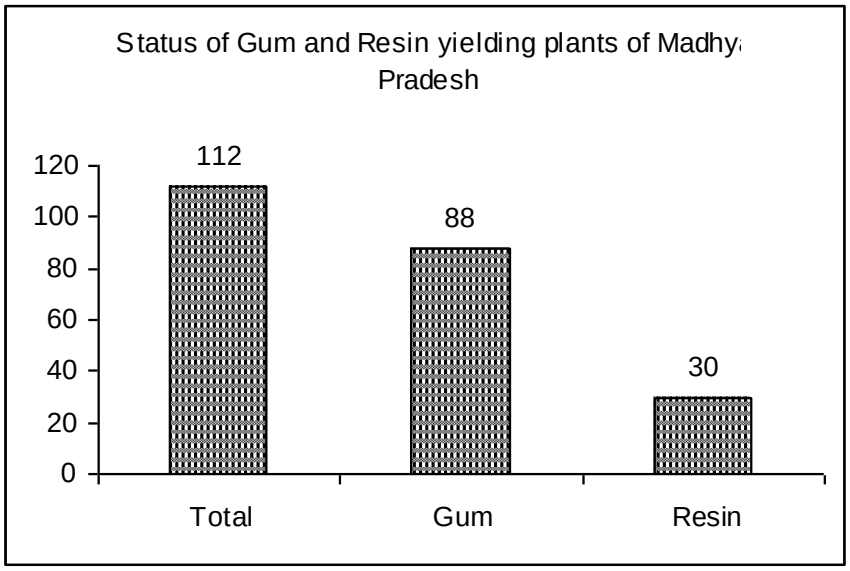
S. No.	Reference book	Approximate No. of plant species reported
3	Shiva, M. P. (1998). Inventory of Forest Resources for Sustainable management and Biodiversity Conservation. Indias Publishing Co. New Delhi Pp.704 (MFP-Database)	2500
4	WOI (1952-1992). The Wealth of India: A Dictionary of Indus Raw Materials and Industrial Products. Vol. I-XI, P&IV, CSIR, New Delhi.	8000

- On the basis of such scrutiny a total 425 plant species of gum and resin yielding plant are scrutinized from India.
- The list of gum and resin yielding plants of India (i.e. 425 plant species) is further considered for re-scrutiny with consultation of published floras of Madhya Pradesh.

S. No.	Flora of Madhya Pradesh	Identified floral elements		
		Family	Genera	Species
1	Verma, D. M.; N. P. Balakrishan & R. D. Dixit (1993). Flora of Madhya Pradesh Vol. – 1. BSI, Calcutta. pp.181	83	407	874
2	Mudgal, V.; K. K. Khanna & P. K. Hajra (1997). Flora of Madhya Pradesh Vol. – 2. BSI, Calcutta. pp. 681	51	320	792
3	Singh, N. P.; K. K. Khanna; V. Mudgal & R. D. Dixit (2001). Flora of Madhya Pradesh Vol. – 3. BSI, Calcutta. pp.590.	37	241	706
4	Khanna, K. K.; A. Kumar; R. D. Dixit & N. P. Singh (2001). Supplement to the Flora of Madhya Pradesh. BSI, Calcutta. pp. 181.	7	233	379

- As a result with re-scrutiny, a total 112 plant species of gum and resin yielding plant belonging to 48 families are scrutinized from Madhya Pradesh.
- Out of total 112 plant species 88 and 30 plant species respectively of gum and resin yielding plant species were identified (Figure – 1)

Figure – 1: Gum and resin yielding plant species scrutinized from Madhya Pradesh



- Total 88 plant species of gum yielding plant belonging to 36 families. (Table – 1)

Table – 1: Gum yielding plant species scrutinized from Madhya Pradesh

S. No.	Botanical name	Family	Trade name	Part used	Habit
1	*Abelmoschus esculentus (Linn) Moench*	Malvaceae	Bhindi, Bhinditori.	Bark	Shrub
2	*Acacia catechu Willd.*	Mimosaceae	Khair, Katha	Stem, Bark	Tree
3	*Acacia chundra (Roxb ex Rottle) Willd. Rottl*	Mimosaceae	Lal khair	Stem	Tree
4	*Acacia farnesiana (Linn) Willd.*	Mimosaceae	Cassie flower, bilayati babool	Bark	Shrub
5	*Acacia ferruginea D.C.*	Mimosaceae	Sonkhair	Stem	Tree
6	*Acacia lenticularis Buch-Ham. Ex Baker.*	Mimosaceae	Khin	Stem	Tree
7	*Acacia leucophloea Roxb. Willd.*	Mimosaceae	Safed Kikar	Bark	Tree
8	*Acacia nilotica (Linn) Willd.*	Mimosaceae	Babool	Stem, Bark	Tree
9	*Acacia senegal (Linn) Willd.*	Mimosaceae	Kumpta	Bark	Tree
10	*Acacia sinuata (Lour) Merr.*	Mimosaceae	Shikakai	Bark	Shrub
11	*Adansonia digitata Linn.*	Bombacaceae	Gorakh imali	Fruit, Seed	Tree
12	*Aegle marmelos (Linn) Correa.*	Rutaceae	Bael	Seeds, Stem	Tree
13	*Ailanthus excelsa Roxb.*	Simaroubaceae	Maharukh	Bark	Tree
14	*Albizia amara Roxb. Boivin.*	Mimosaceae	kaunyhia seljhari	Bark	Tree
15	*Albizia lebbeck (Linn) Benth.*	Mimosaceae	Kokko kala siris,siris	Stem, Bark	Tree
16	*Albizia procera (Roxb) Benth.*	Mimosaceae	Safed Siris	Bark	Tree
17	*Anacardium occidentale Linn.*	Anacardiaceae	Cashew Nut Tree,Caju	Bark	Tree
18	*Anogeissus lalifolia (Roxb Ex DC) Wall. Ex Guill & Perr.*	Combretaceae	Axelwood, Button tree, Dhar, Dhurandhar, Dharada, Dhamoda, Dhaora, Dhav.	Stem, Bark	Tree
19	*Anogeissus pendula Edgew.*	Combretaceae	Dhauhkura,kadai Kardari	Stem	Tree
20	*Asclepias curassavica Linn.*	Asclepiadaceae	Kaakatundi	Bark	Herb
21	*Azadirachta indica A. Juss.*	Meliaceae	Neem	Bark	Tree
22	*Baliospermum montanum (Willd) Muell Arg.*	Euphorbiaceae	Jamal Ghota	Bark	Shrub
23	*Bamobusa arundinacea (Retz) Willd.*	Bombacaceae	Thorry bamboo, Wansh, Bans, Bambu	Stem, Bark	Tree

S. No.	Botanical name	Family	Trade name	Part used	Habit
24	*Berberis asiatica Roxb Ex DC.*	Berberidaceae	Berberry tree, Daruharidra, Daruhalad, Daruhaldi, Chitra	Stem, Bark	Shrub
25	*Bombax ceiba Linn.*	Bombacaceae	Red Silk Cotton Tree, Semal	Bark	Tree
26	*Bombax insigne Willd.*	Bombacaceae	Semul	Stem	Tree
27	*Borassus flabellifer Linn.*	Arecaceae	Palmyra Palm	Stem	Shrub
28	*Boswellia serrata Roxb Ex Colber.*	Burseraceae	Salai,Saliha	Bark	Tree
29	*Buchanania lanzan Spreng.*	Anacardiaceae	Chironji, char	Bark	Tree
30	*Butea monosperma (Lamk) Taub*	Fabaceae	Flam of the forest, Palash, Brahma-vruksha, Palas, Dhak	Stem, Bark	Tree
31	*Butea monosperma (Lamk) Taub var. lutea (Witt) Maheshwari*	Fabaceae	Bastard Tree	Stem, Bark	Tree
32	*Butea parviflora Roxb.*	Fabaceae	Maula, Bando,Murdh abel	Bark	Tree
33	*Butea superba Roxb.*	Fabaceae	Lata Palash, Palashbel, Palash lata.	Stem, Bark	Tree
34	*Calotropis procera (Aiton) Roxb Br.*	Asclepiadaceae	Aak, Akawan,Akoh wa	Stem	Shrub
35	*Carica papaya Linn.*	Caricaceae	Papita	Bark	Tree
36	*Cassia javanica Linn.*	Caesalpiniaceae	Apple blossomsenn a	Seeds	Tree
37	*Chloroxylon swietenia DC.*	Rutaceae	Indian satin Wood	Stem	Tree
38	*Cochlospermum religiosum*	Cochlospermac eae	Katira gum, White silk cotton	Bark	Tree
39	*Commiphora wightii*	Burseraceae	Guggul	Stem	Tree
40	*Cyamopsis tetragonoloba (Linn) Taub.*	Fabaceae	Gowar, Guar	Seeds	Herb
41	*Cycas circinalis Linn.*	Cycadaceae	Jangli Mastaka Phool, Jangal madan phool	Bark	Tree
42	*Dillenia aurea Sm.*	Dilleniaceae	Kalle	Bark	Tree
43	*Eucalyptus umbellata Dum.*	Myrtaceae	Red gum	Bark	Tree
44	*Euphorbia nivulia Buch-Ham.*	Euphorbiaceae	Katathohar ,kaitha	Stem	Shrub
45	*Feronia limonia Linn Swingle.*	Rutaceae	Elephant Apple	Stem	Tree

S. No.	Botanical name	Family	Trade name	Part used	Habit
46	*Ficus cerica Linn.*	Moraceae	Anjeer, Dhalgu, Teen	Fruits	Tree
47	*Gardenia gummifera (Linn) F.*	Rubiaceae	Pindawa, Chhote Kurra, Dikamoli	Shoots	Shrub
48	*Gardenia resinifera Roth.*	Sapindoceae	Dikamoli	Bark	Shrub
49	*Gardenia turgida Roxb.*	Rubiaceae	Ghurgia, Safed Phetra	Stem	Tree
50	*Garuga pinnata Roxb.*	Burseraceae	Ghogar, Toon,Kaked	Bark	Tree
51	*Heliotropium indicum Linn.*	Boraginaceae	Scorpion tail, Hat6hisunda	Stem	Herb
52	*Lagerstroemia parviflora Roxb.*	Lythraceae	Dhaura,bakli, Lendia Sanehi	Stem	Shrub
53	*Lannea coromandelica (Houtt) Merr.*	Anacardiaceae	Jhingan.Gunja Moyen	Bark	Tree
54	*Lepidium sativum Linn.*	Brassicaceae	Halim, Hurf.	Seeds	Herb
55	*Macaranga dinticulata (Muell-Arg) Blume.*	Euphorbiaceae		Bark	Tree
56	*Macaranga indica Wigst.*	Euphorbiaceae	Ramalo	Bark	Tree
57	*Madhuca indica J. F. Crmel koenig.*	Sapotaceae	Maanuka, Mahuaa	Bark	Tree
58	*Mangifera indica Linn.*	Anacardiaceae	Mango	Stem	Tree
59	*Manikara hexandra Roxb Dubard.*	Sapotaceae	khirni	Stem	Tree
60	*Melia azedorach Linn.*	Meliaceae	Drek, Bakain.	Bark	Tree
61	*Miliusa velutina Dunal Hook F & Thoms.*	Annonaceae	Gandha-palaasa; Kaari gum	Bark	Tree
62	*Mitragyna parviflora Roxb Karth.*	Rubiaceae	Kaim	Whole Plant	Tree
63	*Moringa oleifera Lank.*	Moringaceae	Horse Radish Tree	Bark, Seed	Tree
64	*Phoenix dactylifera Linn.*	Arecaceae	Date Palm	Stem	Shrub
65	*Phoenix sylvestris Linn Roxb.*	Arecaceae	Wild date	Stem	Shrub
66	*Pithecellobium dulce Roxb Benth.*	Mimosaceae	Manila Tamarind,Jangli jalebi	Bark	Shrub
67	*Prosopis cineraria Druce.*	Mimosaceae	Jand	Stem	Tree
68	*Pterocarpus marsupium Roxb.*	Fabaceae	Indian Kino Tree	Bark	Tree
69	*Salvia aegyptiica Linn.*	Lamiaceae	Tukhm-Malangaa	Seeds	Shrub
70	*Samanea saman Jacq Merr.*	Mimosaceae	Rain Tree,Vilaiti siris	Stem	Tree
71	*Schrebera swietenioides Roxb.*	Oleaceae	Moka, Banapalas, Ghant,Bhat	Bark	Tree

S. No.	Botanical name	Family	Trade name	Part used	Habit
72	*Securinega virosa Roxb Ex Willd Baill.*	Euphorbiaceae	Dalme,chirigodi,Patala	Stem	Shrub
73	*Semecarpus anacardium Linn.*	Anacardiaceae	Bhela, Bilawa.	Bark	Tree
74	*Sesbania bispinosa (Jacq) W. F. Wight.*	Fabaceae		Seeds	Herb
75	*Sesbenia granidiflera (Linn) Poir in lamk.*	Fabaceae	Agastya, Agasti, Agust	Bark	Tree
76	*Sonchus oleraceus Linn.*	Asteraceae	Dudhi, Dodak	Stem, Bark	Herb
77	*Sorghum bicolor Mionch.*	Poaceae		Stem	Tree
78	*Soymida febrifuga Roxb A. Juss.*	Meliaceae	Indian Red Wood, Rohan	Bark	Tree
79	*Spondias pinnata L F Kurtz.*	Anacardiaceae	Jangli-Aam,Amera	Bark	Tree
80	*Sterculia urene Roxb.*	Sterculiaceae	Gular	Bark	Tree
81	*Symplocos racemosa Roxb.*	Symplocaceae	Lodh	Bark	Shrub
82	*Tecomella undulata Sm. Seem.*	Bignoniaceae	Rohida Tree	Stem	Tree
83	*Terminalia alata Heyne Ex Roth.*	Combretaceae	Laurel	Stem	Tree
84	*Terminalia bellirica (Gaerth) Roxb.*	Combretaceae	Belliric Myrobalan,Bahera	Stem, Bark	Tree
85	*Terminalia catappa Linn.*	Combretaceae	Indian Almond, Jangali Badam	Bark	Tree
86	*Terminalia chebula Retz.*	Combretaceae	Chebulic Myrobalan,Harra	Bark	Tree
87	*Terminalia crenulata Roth.*	Combretaceae	Saj	Bark	Tree
88	*Thespesia populnea Linn Saland Ex Correa.*	Malvaceae	Portia Tree,Paras Pipal	Stem	Tree

- The name of family and number of their representative plant species is reported in **(Table – 2)**

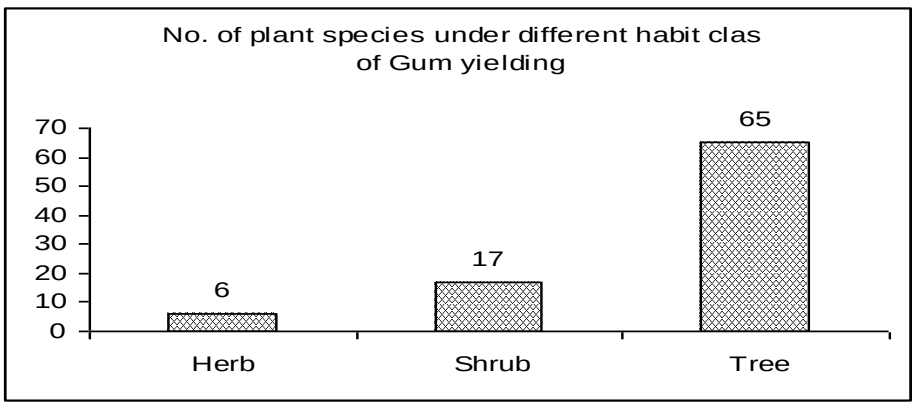
Table – 2: Name of family and number of plant species of Gum yielding plant species

S. No.	Name of family	No. of species
1	Anacardiaceae	6
2	Annonaceae	1
3	Arecaceae	3
4	Asclepiadaceae	2
5	Asteraceae	1
6	Berberidaceae	1
7	Bignoniaceae	1
8	Bombacaceae	4
9	Boraginaceae	1
10	Brassicaceae	1

S. No.	Name of family	No. of species
11	Burseraceae	3
12	Caesalpiniaceae	1
13	Caricaceae	1
14	Cochlospermaceae	1
15	Combretaceae	7
16	Cycadaceae	1
17	Dilleniaceae	1
18	Euphorbiaceae	5
19	Fabaceae	8
20	Lamiaceae	1
21	Lythraceae	1
22	Malvaceae	2
23	Meliaceae	3
24	Mimosaceae	15
25	Moraceae	1
26	Moringaceae	1
27	Myrtaceae	1
28	Oleaceae	1
29	Poaceae	1
30	Rubiaceae	3
31	Rutaceae	3
32	Sapindoceae	1
33	Sapotaceae	2
34	Simaroubaceae	1
35	Sterculiaceae	1
36	Symplocaceae	1
	Total	**88**

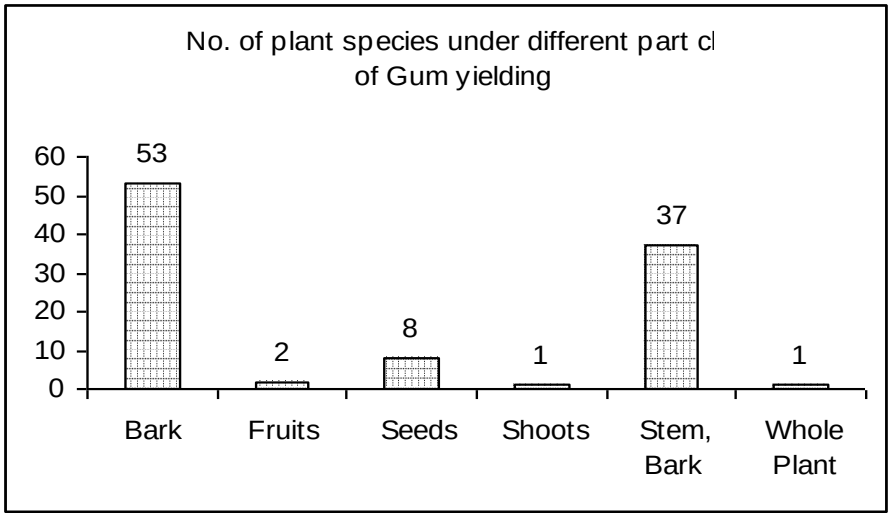
- The habit wise status of these gum yielding plants resulted as tree (65), shrubs (17) and herb (6). (Figure – 2)

Figure – 2: Habit wise status of gum yielding plant species



- The part wise utilization of these gum yielding plant species represented such as Bark (53), Fruits (2), Seeds (8), Shoots (1), Stem (37) and Whole plant (1) respectively from Madhya Pradesh. (Figure – 3)

Figure – 3: Part wise utilization of gum yielding plant species



- Total 30 plant species of resin yielding plant belonging to 22 families. (Table – 3)

Table – 3: Resin yielding plant species scrutinized from Madhya Pradesh

S. No.	*Botanical name*	Family	Trade name	Part used	Habit
1	*Adhatoda zeylanica Medik.*	Acanthaceae	Malabar Nut,Vasaka, Arusha	Leaf	Shrub
2	*Annona squarmosa Linn.*	Annonaceae	Custard apple,Sharifa	Seeds	Tree
3	*Asclepias curassavica Linn.*	Asclepiadaceae	Kaakatundi	Root	Herb
4	*Calotropis gigantea Linn (Roxb) Br.*	Asclepiadaceae	Bowstring Hemp,Aak Safed	Flowers	Shrub
5	*Cannabis sativa Linn.*	Cannabinaceae	Bhang	Flowers	Herb
6	*Casuarina equisetifolia Linn.*	Casuarinaceae	Jangli saru.	Root	Tree
7	*Catharanthes roseus (Linn) G. Don.*	Apocynaceae	Madagascar Periwinkle	Root, Bark, Leaf	Herb
8	*Centella asiatica Linn Urban.*	Apiaceae	Brahmi	Root, Bark	Herb
9	*Clerodendrum indicum Kantz Linn.*	Verbenaceae	Vaamana-haati, Bharangi	Root	Herb
10	*Commiphora wightii*	Burseraceae	Guggul	Stem	Tree
11	*Erythrina variegata Linn.*	Sterculiaceae	Indian Coral Tree	Bark	Tree
12	*Euphorbia nivulia Buch-Ham.*	Euphorbiaceae	Katathohar ,kaitha	Stem	Shrub
13	*Gardenia gummifera (Linn) F.*	Rubiaceae	Pindawa, Chhote Kurra, Dikamoli	Shoots	Shrub
14	*Garuga pinnata Roxb.*	Burseraceae	Ghogar, Toon,Kaked	Bark	Tree
15	*Haldina cordifolia Roxb Ridsd.*	Rubiaceae	Haldu	Stem	Tree

S. No.	*Botanical name*	Family	Trade name	Part used	Habit
16	*Ipomea alba Linn.*	Convolvulaceae	Dudhiakalmi	Root, Bark	Herb
17	*Ipomoea eriocarpa R. Br.*	Convolvulaceae	Paninoi	Seeds	Herb
18	*Ipomoea muricata Jacb.*	Convolvulaceae	Mirchaai	Seeds	Herb
19	*Ipomoea nil (Linn) Roth.*	Convolvulaceae	Kaalaadaana	Seeds	Herb
20	*Ipomoea purpurea (Linn) Roth.*	Convolvulaceae	Karakatiyaa	Seeds	Herb
21	*Lagerstroemia speciosa Auct.*	Lythraceae	Jarul,Queen Crope Myrtle	Bark	Tree
22	*Leonotis nepetaefolia (Linn) Roxb Br.*	Lamiaceae	Hejurchei,Badbhodra	Leaf	Herb
23	*Mirabilis jalapa Linn.*	Nyctaginaceae	Four O'clock plant,Gulabhas	Root	Herb
24	*Operculina turpethum (Linn) Manso.*	Convolvulaceae	Nisoth, Nisotar, Pitohari.	Bark	Climber
25	*Psoralea corylifolia Linn.*	Fabaceae	Babchi	Seeds	Herb
26	*Radermachera xylocarpa Roxb K Schum.*	Bignoniaceae	Jaimangal, Katori ,Paral	Stem	Tree
27	*Sansevieria hyacinthoides Linn Druce.*	Liliaceae	Ceylon Bowstring Hemp	Rhizome	Herb
28	*Semecarpus anacardium Linn.*	Anacardiaceae	Bhela, Bilawa.	Bark	Tree
29	*Shorea robusta Gaerten F.*	Dipterocarpaceae	Sal,Pinjal	Stem	Tree
30	*Withania somnifera Linn Dunal.*	Solanaceae	Aswagandha	Bark, Stem	Shrub

- The name of family and number of their representative plant species is reported in (Table –4).

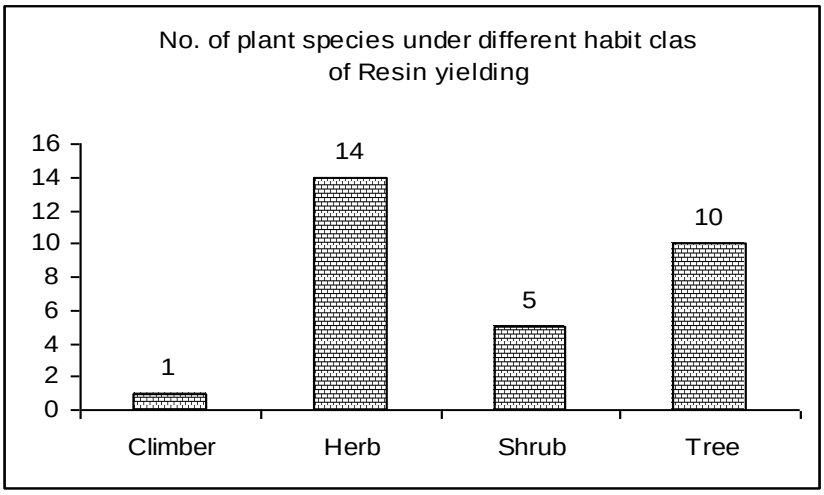
Table – 4: Name of family and number of plant species of resin yielding plant species

S. No.	Name of family	No. of species
1	Acanthaceae	1
2	Anacardiaceae	1
3	Annonaceae	1
4	Apiaceae	1
5	Apocynaceae	1
6	Asclepiadaceae	2
7	Bignoniaceae	1
8	Burseraceae	2
9	Cannabinaceae	1
10	Casuarinaceae	1
11	Convolvulaceae	6
12	Dipterocarpaceae	1

S. No.	Name of family	No. of species
13	Euphorbiaceae	1
14	Fabaceae	1
15	Lamiaceae	1
16	Liliaceae	1
17	Lythraceae	1
18	Nyctaginaceae	1
19	Rubiaceae	2
20	Solanaceae	1
21	Sterculiaceae	1
22	Verbenaceae	1
		30

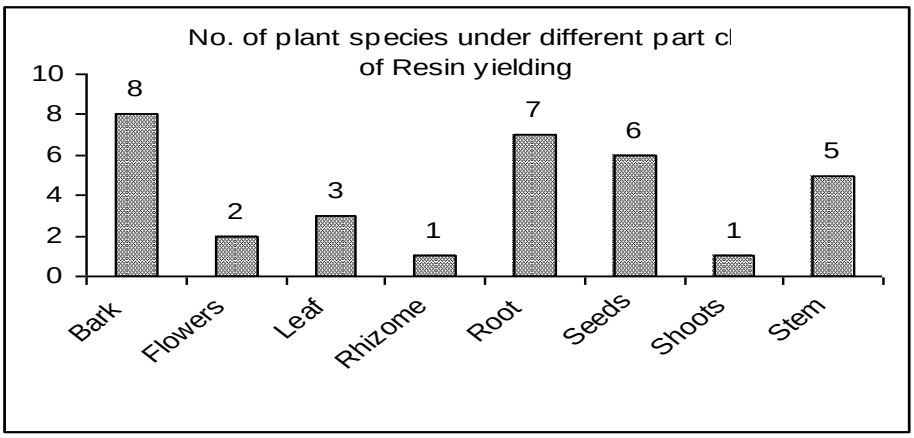
- The habit wise status of these resin yielding plants resulted as tree (10), shrubs (5), herb (14) and climber (1). (Figure – 4)

Figure – 4: Habit wise status of resin yielding plant species



- The part wise utilization of these gum yielding plant species represented such as Bark (8), Flowers (2), Leaves (3), Rhizomes (1), Roots (7), Seeds (6), Shoots (1) and Stem (5) respectively from Madhya Pradesh. (Figure – 5)

Figure – 5: Part wise utilization of Resin yielding plant species



- Finally the preparation database of all 112 gum and resin yielding plant species is under progress.

Important findings / interim findings, if any.

- More than 321 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.
- On the basis of scrutiny a total 425 plant species of gum and resin yielding plant are scrutinized from India.
- As a result with re-scrutiny, a total 112 plant species of gum and resin yielding plant belonging to 48 families are scrutinized from Madhya Pradesh.
- Out of total 112 plant species gum and resin yielding plant species identified as 88 and 30 plant species respectively.
- Total 88 plant species of gum yielding plant belonging to 36 families.
- Total 30 plant species of resin yielding plant belonging to 22 families.
- Finally the preparation database of all 112 gums and resin yielding plant species is 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/2013-14/19
Period	:	April 2014-March 2016
Sponsoring agency	:	MPCOST, Bhopal
P.I.	:	Dr. S. K. Masih
Project staff	:	Ms. Smita Rajput - Field Assistant

Objectives:

- To carryout ethnobotanical survey of local tribe, villagers, communities in Neemach and Ratlam disricts 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.).
- Information regarding JFMCs in each forest ranges of the division has been collected from forest records.
- More than 150 research papers have been reviewed till date.
- 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 personel and local villagers have been interviewed personaly and in focused group discussion through PRA exercise.

- On the basis of above field exercises the traditional knowledge of more than 119 plant species were recorded with botanical name, family name, vernacular and local names, part(s) used and folk / traditional used.
- The 119 plant species belonged to 57 families.
- Out of 119 plant species the habit wise composition represents Climber (10), Grass (2), Herb (43), Shrub (27) and Tree (37). **(Figure – 1)**
- Various plant parts and product such as Buds, Culm, Flowers, Fruits, Gum, Husk, Latex, Leaves, Rhizomes, Root, Seeds, Stem bark, Tuber and Whole Plant representing 1, 1, 13, 30, 7, 1, 5, 51, 2, 27, 28, 23, 3 and 7 plant species respectively. **(Figure – 2)**
- Simultaneously local existing primary markets of the study sites are also visited during field survey. An inventory of all the available medicinal plant species, NTFPs and their parts and products, etc. sold for their household income in these markets is made.
- The field survey work in other ranges and tehsils of Neemach and Ratlam districts is in ongoing.

Figure – 1: Habit wise composition plant species

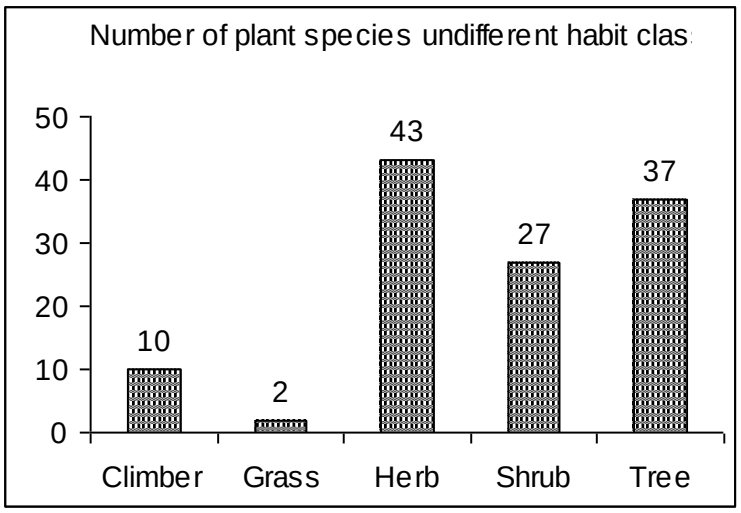
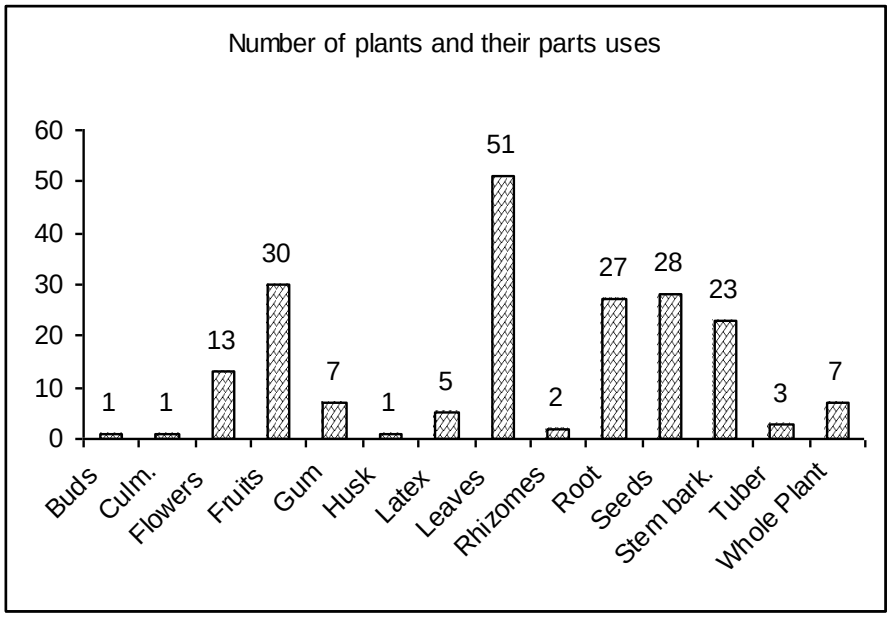


Figure – 2: Part and product wise composition plant species



Important findings / interim findings, if any.

- On the basis of above field exercises the traditional knowledge of more than 119 plant species were recorded with botanical name, family name, vernacular and local names, part(s) used and folk / traditional used.
- The 119 plant species is belonging to 57 families.
- Out of 119 plant species the habit wise composition represents as Climber (10), Grass (2), Herb (43), Shrub (27) and Tree (37).
- Various plant parts and product such as Buds, Culm, Flowers, Fruits, Gum, Husk, Latex, Leaves, Rhizomes, Root, Seeds, Stem bark, Tuber and Whole Plant representing 1, 1, 13, 30, 7, 1, 5, 51, 2, 27, 28, 23, 3 and 7 plant species respectively.

Current status of the project - On-going

Regular Activities

Ongoing: Two

1. Title: - औषधीय पौधों के जींन बैंक एवं रोपणी का प्रबंधन एवं विकास।

ID. No.	:	BD/RA/I/01
Period	:	One year
Sponsoring agency	:	SFRI
P.I.	:	Dr. R. K. Pandey

उद्देश्यः

- जींन बैंक एवं औषधीय पौध रोपणी/उत्पादन क्षेत्र का प्रबंधन एवं विकास।
- औषधीय प्रजातियों की मातृ पौध तैयार करना।
- औषधीय प्रजातियों का संरक्षण एवं जींन बैंक का सुदृढ़ीकरण 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।

प्रगतिः

- जींन बैंक में संरक्षित औषधीय पौधों की प्रजातियॉ : 413
- औषधीय प्रजातियों का संरक्षण एवं जींन बैंक क्षेत्र का सुदृढ़ीकरण एवं विस्तार किया गया।
- मसाला वाटिका, नक्षत्र वाटिका, नवग्रह वाटिका, सर्पगंधा, काली हल्दी, तीखुर एवं केवकंद का मातृ पौध क्षेत्र तैयार किये गये।
- पौध विक्रय से रू.4,43,745/—. प्राप्त हुए।

2. Title : Renovation and maintenance of SFRI's Museum Jabalpur.

I.D.	:	BD/RA/I/22
P.I.	:	Dr.Uday Homkar
Sponsoring agency	:	SFRI

Objectives:

- Renovation of old display boards.
- Maintenance of Museum.

Activities carried out during the year:

- Maintenance of museum was done.
- More than 500 visitors visited in the museum.
- The present museum is dismantled and civil renovation work is in progress.

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 and Branch Head
Dr. Awadhesh Sharma	:	Sr. Research Officer
Shri Jatashanker	:	Technical Assistant

Project Staff:

Mohd Asif Mansoori	:	Computer Operator
Ravindra Gupta	:	Project Assistant
Poonam Mishra	:	Junior Research Fellow
Suresh Prasad Charmkar	:	Junior Research Fellow

Completed project

Internal : Nil

Externally funded : Two

1. Modernization and digitalization of existing forest herbarium of State Forest Research Institute, Jabalpur (M.P.).
2. Development and enrichment of existing botanic garden of S.F.R.I., Jabalpur with rare and endemic angiosperm and pteridophytes.

Ongoing projects continued during the year:

Internal Funded : Nil

Externally Funded : Two

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

Newly initiated project during the year

Internally funded : Nil

External funded : One

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

Regular Activities

Internally funded : One

1. Development and maintenance of botanic garden of SFRI.

Externally funded : Nil

Completed project : Two

1. Title : Modernization and digitalization of existing forest herbarium of State Forest Research Institute, Jabalpur (M.P.)

Project ID	:	BOT/P/I/11-12/03
Project period	:	3 years (May 2011 – April 2014) - Extended for March, 2015
Sponsoring Agency	:	M.P. Forest department (Land Management)
Principal investigator	:	Dr. O.P. Chaubey
Project Associates	:	Mohd Asif Mansoori
	:	Ravindra Gupta

Objectives:

- Modernization of existing forest herbarium by extending temperature and humidity controller, computer facilities/lighting/power points/ fittings and fixtures for e-herbarium.
- Preparation of electronic herbarium database.

Activities carried out during this year:

- Procurement of one computer and one scanner EPSON GT 20000.
- Renovation of main storage unit completed through PWD.
- Scanning of 100% herbarium sheets completed.
- Data entry/ artificial key for Identification software completed.
- Images of live specimens completed.
- Data entry of herbarium sheets completed.
- Software developed by tender agency completed.
- Visited National herbarium of CSIR-NBRI, Lucknow.
- Final report and education materials prepared, and submitted.

Important findings / interim findings, if any

Herbarium plays a central role in authentic identification of plant material, biodiversity conservation, habitat identification of rare, endangered, threatened and endemic plants, documentation of traditional knowledge, study of molecular taxonomy, to check bio-piracy of intellectual property, environmental management etc. It is of vital importance for educationalist, foresters, taxonomist, ecologist, medicinal practioners, environmentalist and other user communities related with the subject. The State Forest Research Institute, Jabalpur as a part of conservation program, has a rich forest herbarium since its inception i.e. 1963. Over 20,000 plant specimens of 206 families, 1183 genera and 3456 species are harbored in the existing herbarium of SFRI. The development of virtual and searchable herbarium database will provide taxonomic information for authentic identification and important data with regards to different species including rare plants, their conservation and rehabilitation. The main objectives of the project are (1) Modernization of existing forest herbarium by extending temperature and humidity controller, computer facilities/lighting/power points/ fittings and fixtures for e-herbarium (2) Preparation of electronic herbarium database. The main storage unit of the herbarium with modern and scientific techniques was developed through PWD department including flooring with ceramic tiles, aluminum partition of the room, dismantling wall plaster and providing with tiles up to 1 feet height. The software developed for digital herbarium database and plant identification. The software available information including label information of herbarium sheets as well as secondary information pertaining to collection number, habit, habitat, local name, botanical name, family, distribution, taxonomical features, flowering and fruiting period, uses were installed in the software. The Software development for digital herbarium database and plant identification has following features viz., Stand along with front end, back end and external tool. Software must be password protected. Main menu: the key characters for identification of trees,

shrubs, climbers, herbs, etc had arranged in the main menu under different icons such as Bole (Buttressed, aerial/still roots, prickled, thorny), Stem character, (stem type, stem surface, stem modification, such as above ground and underground, modification type), Bark features (color, texture, Blaze color, exudation and its color), Leaf type, Leaf form, Leaf size, Leaf margin, Leaf base, Leaf Apex, Petiole, Petiole length, Leaf arrangement, Stipules, Nerves, Position of the glands, Phenology (flower, fruit characters and seeding periods), Inflorescence character (type and color of inflorescence), flower character such as epicalyx (type, number, colour, arrangement). Flower characters - Calyx (calyx forms, calyx type, calyx surface, color, number of sepals and special characters, if any), corolla (Corolla forms, corolla surface, corolla color, number of petals and special characters if any), perianth (shape, type, color, number of lobes), stamen (number of stamens, stamen forms, stamen arrangement, stamen dehiscence, stamen color and any special character), staminodes, stigma (stigma,style present/absent, placentation, ovary position, number of ovules, number of locules), fruit characters (type , color etc), seeds characters (type, color etc), stipules (type, number, color, special character, if any), gland (type, color, position, special characters, if any), bracts (type and no of bracts, special new bract option) and bracteoles (present/absent, number of bracteoles), spine (type, modification), tendril (type, modification) etc, phonological characters (flowering, fruiting and seeding period). The herbarium sheet icon covers Location, Habit, Habitat, Distribution, English name, Local name, Genus Name, Species and Synonymous name, Sub species/ variety, Family, Collection number, Collector's name, Collection date, Uses/ethno-medicinal value, Images of herbarium sheets: Minimum five photographs of each species of one locality, Images of live specimens. The identification of plants/flora has inbuilt taxonomical data.

Current status of the project: Project completed and final report submitted.

2. Title : Development and enrichment of existing botanic garden of S.F.R.I., Jabalpur with rare and endemic Angiosperm and Pteridophytes.

Project ID	:	BOT/P/E/12-13/26
Project period	:	One year (April 2013– March 2014)- Extended upto Dec.,2014
Sponsoring Agency	:	APCCF (Research, Extension & Lok Vaniki), Satpura Bhawan, Bhopal (M.P.)
Principal investigator	:	Dr. O.P. Chaubey
Project Associate	:	Poonam Mishra

Objectives:

- Strengthening the infrastructure of the garden.
- Enrichment and multiplication of the garden with fern and fern allies and rare /endemic tree species.
- Extension programme for biodiversity conservation.
- Preparation of education materials.

Activities carried out during this year:

- Fencing material procured and erected in the garden.
- Micro irrigation material procured.
- Flex and iron boards prepared and erected.
- Lable plates prepared and erected in the garden.
- Beautification and cleaning of the garden.
- Erection of lighting poles and stone boards is under process through Administrative Officer. .
- Following plants viz; *Pteris vittata, Microsorium punctatum, Nephrolepis tuberose, Adiantum capilus vneris, Diplazium esculentum, Cyclosorus dentatus, Colysis elliptica, Nephrolepis*

cordifolia, Microsorium alternifolium, Microlepia strigose, Hymenodictyon excelsum, Ougeinia oojeinensis were collected, conserved and multiplied in the garden.

- Final report and education materials prepared and submitted.

Important findings / interim findings, if any

The database for pteridophytes and fern allies have also been created pertaining to scientific name, family and medicinal uses for different localities belonging to different agro climatic zones of Madhya Pradesh.

The pteridophytes are an important, ancient and diverse group of plants that includes ferns, horse tail and club mosses distributed all over the world. The hilly and undulating topography of the area with several large and small rivers, ponds, lakes and swamps harbors rich population of pteridophytic plant diversity. The Gond, Baiga and Panika tribes of Madhya Pradesh have the traditional knowledge about utility of various pteridophytic species for treatment of various diseases. An ethnobotanical survey will be undertaken to document traditional knowledge of major pteridophytes of M.P. and these species will be collected, conserved and multiplied in the garden to save the diversity of pteridophytes and fern allies. For the purpose information will be collected from aboriginal pockets of M.P. using questionerie method. The vailidity of recorded medicinal uses of ferns will be verified by repeated queries from various informants.The plants will be collected under the guidance of traditional medicinal practitoners. The specimens will be identified with the help of available literature on pteridophytes. The twenty five pteridophytic and fern allies were conserved and multiplied in the garden.

The conserved plants were multiplied adopting macro-proliferation methods after developing planting stock of fern and fern allies on mass scale. The tillers were separated and multiplied. The collected plants were conserved in polythene bags by mixing potting mixture viz; sawdust and FYM in the ratio of 2:1. The multiplied plants of fern and fern allies would be planted in the garden under tree canopy.

An arboretum section was expanded with indigenous tree species particularly rare, endangered, and endemic viz; *Hymenodictyon exclesum, Ixora arborea, Albizzia odaratissima*, *Ougeinia oojeinensis*, *Stereospermum chelonoides* and prone to extinction in a scientific manner. This will reflect a typical forests vegetation of Madhya Pradesh. It is very purposeful for education and awareness development of people. The arboretum is useful for identification of plants generating academic interest. Four seedlings of each tree species were planted in pits of size 45 cm^3 at the spacing of 4 m X 4m. These pits were filled up with good loamy soil or silt brought from outside. Soil working was done to retain adequate soil moisture. Before filing up the pits the earth was also mixed with suitable mixture of FYM/ mulches. Watering of planted seedlings was done as and when required.

Education Material on conservation, multiplication and utilization of rare, endemic angiosperms and pteridophytes was completed and printed for field foresters and other stake holders.

Current status of the project: Project completed and final report submitted.

Ongoing external projects : Two

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 40 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:

- Physical Target -39 preservation plots (Each plot 10 ha).
- In protected areas barbed wire fencing was not allowed by the PCCF Wild Life in 07 preservation plots.
- Fencing completed in all the preservation plots excepted in Alirajpur and Narsinghpur forest division.
- Boards erected in all the 38 preservation plots except Bandhavgarh Tiger reserve.
- Survey, demarcation and numbering of trees in all preservation plots were completed.
- Monitoring/recording of growth data and data base computerization was completed.

Important findings / interim findings, if any

Data entry for volume and biomass production completed as per IPCC guidelines.

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), Satpura Bhawan, Bhopal (M.P.)
Principal investigator	:	Dr. O.P. Chaubey

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: Nil

- 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., (1) 0-1 km, (2) 1-3 km, (3) 3-5 km, (4) 5-7 km, (5) 7-10 km were collected. Survey and collection of information work completed.
- The Proforma prepared for collection of data.

Important findings / interim findings, if any:

Kuno-palpur Wild Life Sanctuary is situated in the Sheopur District of Madhya Pradesh and has been established in 1981. It is spread over an area of 345 sq. km. It has many tourist spots surrounding the sanctuary. The principal fauna of this sanctuary are Tiger, Leopard, Blue bull, Sambhar, Chital, Chinkara, Bear Birds of many species etc. The dominant flora of the area include Kardhai, Gurjan, Bher, Ghont, Raonja, Palas, Kher, Salai, Dhawa, Tendu, Mahua, Kasai etc. The sanctuary is the good habitat for tiger conservation. Very little information is available on the subject particularly for Sustainable livelihood based approach to prepare management plan of Wildlife Sanctuaries of Madhya Pradesh. The purpose of this study is to prepare sustainable management plan for Kuno-Palpur wild life sanctuary (WLS) by assessing ecological and conservation value and by understanding the complexities involve in wild life conservation. The data base on various aspects

would be in accordance with the targets addressed in UN Convention on Biological Diversity, CITES and IUCN. The databases would be of vital importance for habitat management of wildlife of protected areas selected for study.

Current status of the project: Ongoing

Newly initiated projects: One

1. 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 (R/E & Lok Vaniki), Satpura Bhawan, Bhopal (M.P.)
Principal investigator	:	Dr. O.P. Chaubey
Project Associates	:	Mohd Asif Mansoori

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

- The project is newly sanctioned and would be started in the financial year 2015-16.

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, socioeconomic and livelihood benefits of various stack-holders, and finally to improve the ecological balance and to enhance the national economy.

Current status of the project: Newly initiated

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:

- Nakshatra Vatika raised and under maintenance.

- New species like *Pterocarpus santalinus*, *Strychnos nuxvomica, Eucalyptus* hybrid*, Sterculia urens, Ehretia laevis, Prosopis spicigera, Pinus roxburghii, Mesua nagassarium, Ficus virens, Grewia asiatica* were introduced in the garden.
- Ethno- medicinal plants and Pteridophytes were multiplied in the green house and their enrichment in different thematic beds was undertaken.
- One flex board showing details of conserved tree species was prepared.
- Lable plates were prepared and erected in the green house and fixed on the standing trees conserved in the garden.
- The bricks of the garden were painted.
- Cleaning, weeding, watering and soil working of plants completed.
- Protection and maintenance of the garden is in continuation.

Important findings / interim findings, if any

1. Botanic garden has become more educative after conservation and development.
2. Awareness regarding conservation of indigenous and threatened plants generated among the field foresters, academicians, researchers, stake holders and students.

Current status of the project: On going

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.Anjana Rajput	**:**	Research Officer
Shri Rakesh Jain	**:**	Research Officer
Mr. Vijay Haldkar	**:**	Forester
Mrs.Madhuri Shrivastava	**:**	Technical Assistant

Project Staff

Dr. (Mrs) Satvant Kaur Saini	:	Scientist Fellow (From Apr. 2014-Sept., 14)
Mr. Shailendra Nema	:	Junior Research Fellow
Mr. Vikas Jain	:	Junior Research Fellow
Mr. Shiv Kumar Kaurav	:	Research Associate (From March 2015 onwards)
Mr. Sandeep Bhandari		Data Entry Operator (Till March 2015)

Completed Projects

Internally funded: Nil

Externally funded: Two

1. UP Participatory Forest Management and Poverty Alleviation Project on Non timber Forest Produce (NTFP) Resource Assessment and Development (UP-PFMPAP) under Japan International Corporation Agency.
2. UP Participatory Forest Management and Poverty Alleviation Project on Harvesting and post harvesting Technology of Non timber Forest Produce (NTFP) (UP-PFMPAP) under Japan International Corporation Agency.

On–going projects

Internally funded: Nil

Externally funded: Five

1. 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
2. Survey of existing Barahsingha & Blackbuck habitat evaluation for habitat viability assessment for Kanha Tiger Reserve and Satpura Tiger Reserve.
3. Ecological Studies on Grasslands of Bandhawgarh Tiger Reserve with special reference to wildlife management.
4. Impact Assessment of road up-gradation 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*)
5. Development of technology for conservation and sustainable management of wild medicinal plants and NTFPs through community participation in Shahdol forest circle of Madhya Pradesh

Newly Initiated Projects

Internally funded: Nil

Externally Funded: One

1. . Impact assessment on flora fauna 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

Regular activities

On-going: Nil

New initiated during the year: Nil

Completed Projects during the year

Externally funded: Four

1. Title : UP Forest management and poverty alleviation project Non-timber Forest Produce (NTFP) Resource Assessment and Development (UP-PFMPAP) under Japan International Corporation Agency.

Project ID	:	ECO/P/E/11-12/13
Project period	:	Eighteen months (Jan. 2012 – June 2013) extended upto Sept.,2014
Sponsoring Agency	:	U.P. Participatory Forest Management and Poverty Alleviation Project (UP-PFMPAP
Team Leader	:	Dr.R. K. Pandey
Key Professionals	:	Dr. P. Bhatnagar
	:	Dr Anjana Rajput
	:	Dr. S. K. Masih
Support Experts	:	Mr. Rakesh Jain

Objectives:

- To carry out situational analysis in three regions viz; (i) Vindhayachal (ii) Bundelkhand (iii) Terai
- To develop community based participatory mapping and appropriate assessment methodologies.
- To evolve a package of i*n-situ/ex-situ* conservation, enrichment and propagation practices.
- To provide technical guidance for cultivation on private lands as pure crops/Agro forestry/farm forestry.

- To develop training materials/modules to be used for training the DMU/FMU/JFMC/ NSO/PNGO staffs and SHG /SHG consortium for the above topics.
- To give field guidance to DMU/FMU/NSO/PNGO staffs.

Activities carried out during the year:

- Preparation of following two training manuals.
  1. गैर–काष्ठीय वनोपज प्रजातियों का वन संसाधन सर्वेक्षण एवं विकास
  2. सामुदायिक भागीदारी द्वारा अकाष्ठीय वनोपजों के मानचित्र एवं उपयुक्त आंकलन विधियों का विकास ।
- Report preparation and submission.

Important Findings:

- The situational analysis of selected JFMCs in (i) Vindhayachal (ii) Bundelkhand and (iii) Terai region covering three divisions viz; Renukoot, Baharaich and Lalitpur of U.P. forest division.
- Developed community based participatory mapping and assessment methodologies.
- Assessed bio prospecting of all the selected NTFP species of all three regions
- Prepared Field manual covering all tasks for *in situ/ ex situ* conservation, enrichment and propagation practice for user stake holders. Models of agricrop/agro forestry, farm forestry were developed under the project as per site specific requirement. Field training and workshop were organized for JFMC members, NGOs, PNGOs, PMU and front line staff of forest department in all the regions during the study period. Training was imparted on various tasks as per schedule of the project. Final report of the project and field manual of NTFP, participatory mapping and assessment methodologies has been prepared and submitted to funding agency.
- Manual consisting of *in situ/ ex situ* conservation, enrichment and propagation practices, and technical guidance for cultivation of selected 33 NTFP species was prepared and submitted to provide training material for various stake holders under the project.

Current status of the project: Completed

2. Title : Harvesting and post harvesting Technology of Non- timber Forest Produce (NTFP) (UP-PFMPAP) under Japan International Corporation Agency.

Project ID	:	ECO/P/E/11-12/14
Project period	:	Fifteen months (Jan. 2012 – March 2013) extended upto Sept 2014
Sponsoring Agency	:	U.P. Participatory Forest Management and Poverty Alleviation Project (UP-PFMPAP)
Team Leader	:	Dr. R. K. Pandey
Key Professionals	:	Dr. (Mrs) Satvant Kaur Saini
	:	Dr. Uday Homkar
Support Experts	:	Mr. Rakesh Jain
	:	Mr. Shailendra Nema
	:	Mr. Vijay Haldkar

Objectives:

- Development of skill and capabilities of forest dependent communities for sustainable harvesting of NTFPs and MAPs through field training and awareness campaign.
- Secure sustainable forest management by improving harvesting practices especially implementing sustainable harvesting limits through community organizations and other stakeholders.

Activities carried out during the year:

- Preparation of training manual on NTFP Harvesting Code.
  अकाष्ठीय वनोपज सतत् विदोहन एवं प्रबंधन नियमावली
- Report preparation and submission.

Important Findings:

- The situational analysis of selected JFMCs in (i) Vindhayachal (ii) Bundelkhand and (iii) Terai region covering three divisions viz; Renukoot, Baharaich and Lalitpur of U.P. forest division.
- Community based participatory methodology for non destructive harvesting of NTFPs.
- Improved tools and technologies for the harvesting for selected 33 NTFP species of all the three regions.
- Developed technique for management and regulation for the collection of NTFP species.
- Developed package of harvesting code for *in situ/ ex situ* harvesting technique, post harvesting technique (processing), grading, packaging, storing etc. of 33 NTFPs for user stake holders.
- Field manual covering all six tasks was prepared and submitted to sponsored agency.
- Organized field training and workshop for JFMC members, NGOs, PNGOs, PMU and front line staff of forest department in all the regions covering 54 JFMCs during the study period. Training was imparted on various tasks as per schedule of the project.
- Prepared final report of the project and field manual of NTFP, harvesting code and its processing and submitted to funding agency. Manual consisting of in situ/ ex situ harvesting technology, post harvesting technology of selected 33 NTFP species was also provide training material to various stake holders of the project.

Current status of the project: Completed

On-Going Projects

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 following methods were adopted in each PPA.

- IIIrd 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 and preparation of third draft report is in progress.

Important Findings:

- Third and final forest resource assessment survey i.e. qualitative & quantitative for all the four selected PPAs (Jabalpur, Anuppur, Satna and Chhindwara) site have been completed. NTFP and medicinally important plants encountered listed in all the 4 PPAs are as under:
- Anuppur division- Under tree category 6 species viz; (i)Buchanania lanzan (ii) *Phyllanthus embelica (iii) Schlrichera oleosa (iv)Terminalia chebula, (v) Terminalia bellirica, (vi) Diospyros melanoxylon,* were encountered to have NTFP values. In shrub and ground categories 14 and 18 species were enlistedrespectively. Some important species of this category were *Rubia cordifolia, Swertia angustifolia, Thalactrum javaonicum, Scoparia dulces, Asparagus racemosus, Chlorophytum tuberosum, Pueraria tuberose etc.*

  The selected PPA site was observed to be influenced by biotic impact of local domestic cattle for grazing and need strict management intervention for protection from prevailing biotic factors.
- Jabalpur division- 9 species of tree viz; (i)Buchanania lanzan (ii) *Phyllanthus embelica (iii) Aegle marmelos (iv)Diospyros melanoxylon (v)Pterocarpus marsupium (vi) Schlrichera oleosa(vii)Terminalia arjuna (viii) Madhuca longifolia (ix)Semicarpus anacardium* were encountered to have NTFP values. In shrub and ground categories 13 and 23 species of NTFP/medicinal importance were recorded in this site. Some important species of this category were *Gymnema sylvestris, Chlorophytum tuberosum, Helicterus isora, Van Singhada* (orchid*), Mucuna pruriens, Abrus precatorius, Andrographis paniculata,* etc. werecommonly found in the area. This PPA has thepotential as hub of wild edible mushroom in the division.

  PPA was observed also to be influenced by biotic impact of local domestic cattle and forest dwellers, need strict management intervention for protection from prevailing biotic factors.
- Chhindwara division- Some NTFP and medicinally important species under tree category recorded wereviz; (i)*Madhuca indica, (ii)Aegle marmelos, (iii)Buchanania lanzan* In shrub and ground categories some important species of NTFP/medicinal importance recorded in this site were *Nyctanthus arbortris-tis, Andrographis paniculata, Phyllanthus amara, Hemidesmus indicus, Evolvulus alsinoides, Helicterus isora, Asparagus racemosus, Embelia basal, Celastrus paniculata etc.*

  This PPA have the potential to have diverse NTFP species. However strict management interventions are required for grazing and illicit felling of trees from local inhabitants.
- Satna Divsion- This PPA includes part areas of 6 ranges i.e. Maihar, Uchehara, Chitrakoot, Mukundpur, Majhgawan, and Barondha. Some NTFP and medicinally important species under tree category were recorded in this PPA e.g. (i)*Madhuca indica, (ii)Azadirachta indica, (iii)Acacia catechu, (iv)Diopspyros melanoxylon (v)Emblica officinalis,(vi) Pterocarpus marsupium,(vii) Aegle marmelos.* In shrub and ground categories some important species of NTFP/medicinal importance recorded in this site were *Evolvulus alsinoides, Phyllanthus amarus etc. but their density /ha is quite meager.* In this site, most of thePPA area was found degraded, damaged and under impact of high biotic pressure.

Current status of the project: Ongoing

2. Title : Survey of existing Barahsingha & Blackbuck habitat evaluation for habitat viability assessment for Kanha Tiger Reserve and Satpura Tiger Reserve.

Project ID	:	ECO/P/E/11-12/26
Project period	:	Dec 2011-March 2013 (Proposed extension upto Sept 2015)
Sponsoring Agency	:	PCCF (Wild Life),M.P., Bhopal
Principal investigator	:	Dr.R.K.Pandey
Associates	:	Dr. (Mrs) Satvant Kaur Saini
	:	Mr. Shailendra Nema
	:	Mr. Vijay Haldkar

Objectives:

- Compare various habitat parameters of the barasingha in existing *in-situ* enclosure of Kanha and the proposed Bori *in-situ* enclosure in the Bori Wildlife Sanctuary of Satpuda Tiger Reserve (STR), Pachmarhi.
- Compare basic habitat parameters of the barasingha in Sonph meadow of Kanha Tiger Reserve (KTR) existing habitat, with proposed reintroduction site of Bori grasslands of STR for establishment of barasingha population.
- Explore the possibility of expansion of free-ranging barasingha population and suggest measures for habitat connectivity improvement in proposed reintroduction site.
- Prepare monitoring protocol for successful reintroduction.

Activities carried out during the year:

- Survey of Blackbuck habitats of Seoni forest Division.
- Data analysis for the Habitat Viability Assessment (HVA) for blackbuck is in progress.
- Draft report is under preparation

Progress:

- Habitat viability assessments (HVA) in various forest localities in Seoni forest division have been completed and data were recorded.
- Habitat Viability Assessment (HVA) of KTR and data analysis is in progress.

Current status of the project: preparation of draft report is in progress.

3. 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)
Sponsoring Agency	:	APCCF, (R/E & Lokvaniki), M.P. Bhopal
Principal Investigator	:	Dr. R.K.Pandey
SRA	:	Dr. (Mrs) Satvant Kaur Saini(till Oct. 2014)
		Mr. Shailendra Nema
		Mr. Vijay Haldkar
		Mr. Shivkumar 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 siteviz; Bathan of Tala range and Kudrakherwa in Kalwah range.
- 2nd year data of various treatments in open and protected plots were collected as per the project design.
- Inventory and ecological study of the grasses encountered during survey in various grasslands of Bandhawgarh National Park were made.
- Phyto-sociological study to understand the prevailing community structure in selected grasslands were 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 were made.
- Photographs and plant specimens of grass species of various grasslands were collected and processed for preparation of herbarium.

Progress:

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

Current status of the project: Ongoing

4. 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:

- Field work on assessment of floral and faunal components of the study area, evaluation of wildlife habitat and preparation of report.

Important Findings

Extensive study on biological components was made along the 15 km length 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. 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. The project site was also represented to a potential habitat for regenerating tree species, perennial shrubs and climbers, and provides congenial habitat 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 of* near threatened.
- According to wildlife (Protection) act 1972, the major wildlife species of schedule 1 category were observed viz. Sloth bear (*Melursus ursinus*), Leopard (*Panthera pardus*), Python *(Python molurus),* Chinkara / Indian gazella *(Gazella gazella)* in the study area.
- During present study 21 forest compartments were directly affected and each compartment was fragmented into 44 small isolated patches. Forest habitat in term of area of 0.4615 sq. km was estimated to be diverted, through passing the road at affected forest area.

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	:	PCCF, Bhopal. Govt. of M.P. (R & E Lokvaniki), Bhopal, Forest deptt. M.P.
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.
- Status survey of wild medicinal plants and NTFPs in the selected sites.
- Determination of SHL of the selected commercially important medicinal plants & NTFPs on priority basis with community participation.
- Awareness and training programme for the user's communities for sustainable harvesting and *in-situ* management.

Activities carried out during the year:

- Ecological studies and inventory of wild medicinal and NTFPs plant in the potentially rich forest areas of Shahdol circle were made with the help of concerned forest officers in Umariya Shahdol forest division.

- Detailed survey of the inventory of commercially important wild medicinal plants and NTFP's which are being collected by the local peoples and their traditional methods of harvesting have been studied.
- Potentially rich habitat of wild medicinal and NTFP species have been selected through reconnaissance survey of the area and discussed with local users communities, enlisted the commercially important medicinal plant growing *in-situ* conditions.
- Status survey of the the selected commercially important medicinal plants in selected site have been made by adopting standard ecological method.
- On the basis of status of commercially viable NTFPs in natural forest; 6 commercially important NTFP and medicinal plant species were identified in North Shahdol Forest Division and Umaria Forest Division of Shahdol circle. Out of 6 species 3 species i.e. *Gloriosa superba*(Kalihari), *Terminalia chebula* (Harra) and *Buchanania lanzan* (Achar) were indentified for experiment in Amjhor range of North Shahdol Forest Division and remaining 3 species i.e. *Andrographis paniculata* (Kalmegh), *Evolvulus alsinoides* (Shankhpushpi) and *Phyllanthus maderaspatensis* (Bhuin aonla) were selected in Gunghuti range of Umaria Forest Division.
- Experimental plots were made in both selected divisions for experimentation on determination of species specific sustainable harvesting limit.
- Five treatment groups in 4 replication were made for each species in *in situ* conditions.
- Experimental plots were made for *Gloriosa superb* (Kalihari), *Terminalia chebula* (Harra), and *Buchanania lanzan* (Achar) were laid out in compartment no. 256 , 258, and 527 respectively in Chandura beat of Amjhor range of North Shahdol Forest Division and *Andrographis paniculata*, *Evolvulus alsinoides* and *Phyllanthus maderaspatensis* in Comportment no. 309 of Bijora beat of Ghunghuti range in Umaria Forest Division. Species specific treatment and replications for determination of sustainable harvesting limit at all the sites were given as under.

S. No.	Selected species	Treatment (Harvesting limits)	Replications	Plot size
1	*Gloriosa superba*(Kalihari) Compartment no: 526,528 Samiti:Lapri and Navatola Beat: Chandaur Range: Amjhor Division : North Shahdol Forest Division (T)	T0 Control (No Harvsting)	4	10x10
		T1 (20% harvesting)	4	10x10
		T2 (40% harvesting)	4	10x10
		T3 (60% harvesting)	4	10x10
		T4 (80% harvesting)	4	10x10
	Total	**5**	**20**	
2	*Buchanania lanzan* (Achar) Compartment no: 527 Samiti:Mithi Beat: Chandaur Range: Amjhor Division : North Shahdol Forest Division	T0 Control (No Harvesting)	4	25x25
		T1 (60% harvesting)	4	25x25
		T2 (70% harvesting)	4	25x25
		T3 (80% harvesting)	4	25x25
		T4 (90% harvesting)	4	25x25
	Total	**5**	**20**	
3	*Terminalia chebula* (Harra) Compartment no: 526 Samiti:Lapri Beat: Chandaur Range: Amjhor Division : North Shahdol Forest Division (T)	T0 Control (No Harvsting)	4	25x25
		T1 (60% harvesting)	4	25x25
		T2 (70% harvesting)	4	25x25
		T3 (80% harvesting)	4	25x25
		T4 (90% harvesting)	4	25x25
	Total	**5**	**20**	

S. No.	Selected species	Treatment (Harvesting limits)	Replications	Plot size
4	*Andrographis paniculata* (Kalmegh) Compartment no: 309 Samiti:Ghunghuti Beat: Bijoura Range: Ghunghuti Division : Umaria Forest Division (T)	T0 Control (No Harvsting)	4	10x10
		T1 (20% harvesting)	4	10x10
		T2 (40% harvesting)	4	10x10
		T3 (60% harvesting)	4	10x10
		T4 (80% harvesting)	4	10x10
	Total	**5**	**20**	
5	*Evolvulus alsinoides* (Shankhpushpi) Compartment no: 309 Samiti:Ghunghuti Beat: Bijoura Range: Ghunghuti Division : Umaria Forest Division (T)	T0 Control (No Harvsting)	4	10x10
		T1 (20% harvesting)	4	10x10
		T2 (40% harvesting)	4	10x10
		T3 (60% harvesting)	4	10x10
		T4 (80% harvesting)	4	10x10
	Total	**5**	**20**	
6	*Phyllanthus maderaspatensis* (Bhuinaonla) Compartment no: 309 Samiti:Ghunghuti Beat: Bijoura Range: Ghunghuti Division : Umaria Forest Division(T)	T0 Control (No Harvsting)	4	10x10
		T1 (20% harvesting)	4	10x10
		T2 (40% harvesting)	4	10x10
		T3 (60% harvesting)	4	10x10
		T4 (80% harvesting)	4	10x10
	Total	**5**	**20**	

Important Findings:

Preliminary workshop has been conducted in each selected study site. Field training were imparted to members of FPC's /VFC in selected sites during field experimentation. Harvesting of the selected species viz; *Andrographis paniculata*, *Evolvulus alsinoides*, *Phyllanthus maderaspatensis* and *Terminalia chebula* as per the experimentation design was made for first year of project. Periodical observation as per the project design on various parameters are being made. Data of first year were collected and analyzed.

Current status of the project: Ongoing

Newly Initiated

Internally funded: Nil

Externally funded: One

1. Title: 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 J.K. Minerals Dist. Balaghat in Madhya Pradesh.

ID No.	:	ECO/P/E/14-15/06
Project period	:	Jan. 2015 – Aug 2015
Sponsoring Agency	:	M/s J.K. Minerals Dist. Balaghat
Principal Investigator	:	Dr. R.K.Pandey
Associate	:	Mr. Vijay Haldkar
	:	Mr. Vikas Jain

Objectives:

- To assess the impact on flora, fauna and wild life habitat fragmentation, avifauna habitat etc. in respect to proposed diversion of 10.00 ha of forestland.
- To assess the impact on corridor value of forest for sustained wildlife due to proposed diversion of forestland.
- To suggest comprehensive mitigation measures for overcoming impacts of underground mining within 10 km radius.

Activities carried out during the year:

- Reconnaissance survey of the project site and the area coming under 10 km radius has been made for delineations of sub impact zones.
- The project site and 0-1 km sub impact zones have been assessed to collect data on flora, fauna and wildlife habitat. Data are being collected through field survey and collected data are being analyzed. The field survey works are in progress.

Progress:

- Site specific information, maps and project related data were collected covering 10 km radius from project site.
- Map of forest area, habitation sites Govt. land etc. coming under 10 km radius from project site was prepared for delineation of 0-1 km, 1-3 km, 3-5km, 5-7 km, 7-10 km was prepared for detail survey.
- Field survey for vegetational and wildlife habitat assessment in 0-1 km sub impact zone have been completed and data were collected and analyzed.

Current status of the project: Ongoing

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. Sachin Dhamamgaonkar	:	Senior Research Fellow
Mr. Pankaj Saini	:	Field Assistant
Mr. Vineet Mehra	:	Field Assistant

Projects completed during the year:

Internally funded : Nil

Externally funded : Two

1. Clonal multiplication of *Dendrocalamus asper* (Thailand bamboo) through miropropagation technique.
2. Establishment of an advanced laboratory for molecular characterization and chemoprofiling of *Commiphora wightii* plant

On-Going Projects during the year:

Internally funded : Nil

Externally funded : Two

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

Newly Initiated project during the year:

Internally funded : Nil

Eexternally funded : One

1. Development of integrated biotechnological package by genetic diversity assessment using molecular characterization, chemoprofiling, standardization of micropropagation and cryopreservation protocol of four RET species.

Regular Activities

On-going: One

1. Training on plant biotechnology and plant tissue culture.

Plants raised /disposed off during the year

Dendrocalmus asper, Anogeisus pendula, Boswellia serrata

New protocols/clone/varities developed:

Macropropagation: *Anogeisus pendula, Boswellia serrata*

Other scientific achievements:

Genetic diversity of *Commiphora wightii* has been assessed through molecular markers for the identification of quality germplasm

Standardization of micropropagation protocol has been done for *Dendrocalamus asper.*

Completed projects during the year :

1 Title : Clonal multiplication of *Dendrocalamus asper* (Thailand bamboo) through miropropagation technique.

Project ID	:	GEN/P/E/2012-13/23
Project period	:	January 2013 to Dec.2014
Sponsoring Agency	:	APCCF (R/E & Lokvaniki) M.P., Bhopal
Principal Investigator	:	Dr. S. K. Tiwari,
Co-PI	:	Amit Pandey
Filed Assistant	:	Vinit Mehra

Objectives:

- To multiply & produce *Dendrocalamus asper* plants using micropropagation technique.
- To produce 3000 plants per year.

Findings:

Dendrocalamus asper is a commercially important bamboo species, however due its prolonged seeding cycle its propagation through seed is difficult therefore an alternate propagation

technique such as micropropagation helps for its propagation. In the present findings this species is propagated by using micropropagation technique through nodal explants. When MS culture medium was supplemented with combination of 3.0mg/lt. BAP & IAA 0.1mg /lt, excellent morphogenetic response in terms of shoot induction and shoot multiplication were observed. Other combination and concentration of BAP & IAA showed moderate to poor morphogenetic response. On MS control medium no morphogenetic response were observed.

In vitro raised shoots were harvested and separated for root induction, profuse root induction were observed when the MS culture medium was supplemented with NAA 3.0mg/lt and IAA 1.0mg/lt. In this combination NAA helped for induction of roots from shoots while IAA helped for more elongation of healthy shoots. 6500 *In vitro* regenerated plantlets were shifted in 1:1:1 FYM for acclimatization and hardening and after hardening 70% plants survived. 250 Tissue culture plants of this species have been sold @Rs. 25/ which earned revenue of Rs. 6250.

Induction of roots from *in vitro* grown plant

Hardened plants of *D. asper*

Current status of the project: Completed

1. Title : Establishment of an advanced laboratory for molecular characterization and chemoprofiling of *Commiphora wightii* plant.

Project ID	:	GEN/P/E/10-11/18
Project period	:	Oct. 2010 to Sept.2013. (extension up to Oct. 2014)
Sponsoring Agency	:	M.P. Biotechnology Council, Bhopal
Principal Investigator	:	Dr. S. K. Tiwari
Co-PI	:	Amit Pandey

Objectives:

- Collection of germplasm.
- Standardization of chemoprofiling techniques through HPLC for active ingredients.
- Assessment of genetic diversity of the designated species through molecular characterization

Findings:

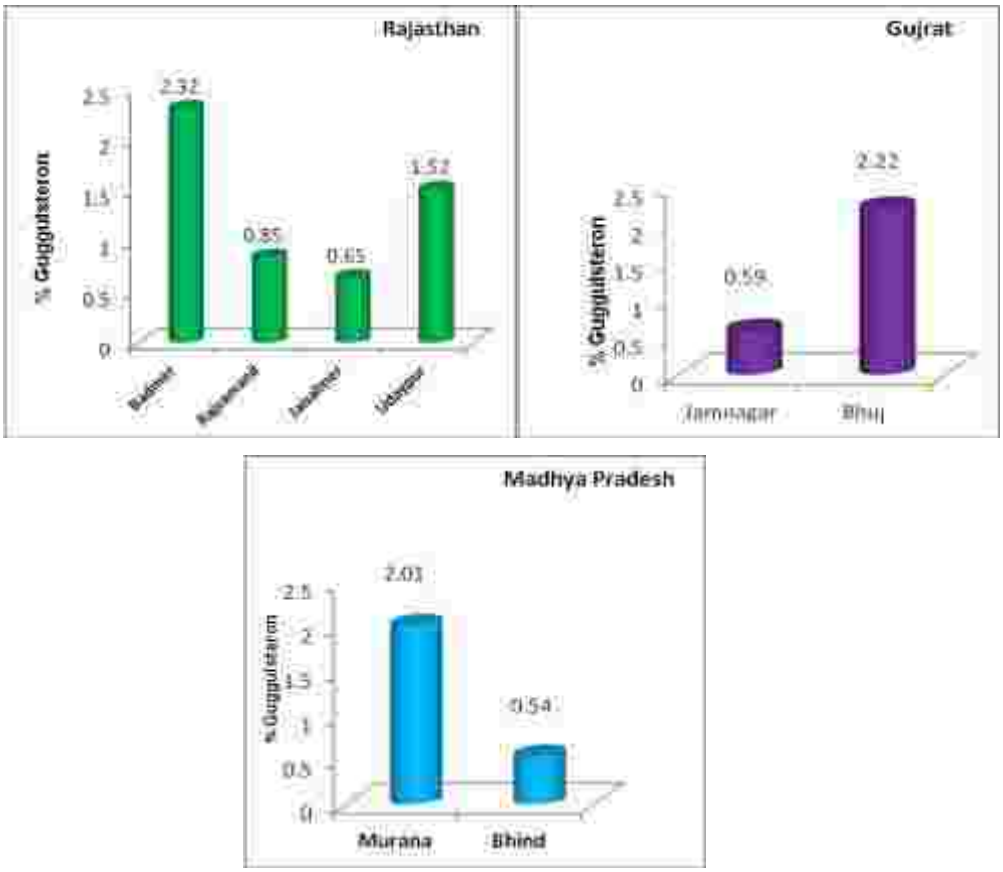
A. Chemoprofiling: The percent concentration of Guggulsterone in the accessions collected from different geographical locations of Rajasthan, Gujrat and MP are presented below:

a. Rajasthan: ranges from 0.65 % to 2.32%.

b. Gujarat: ranges from 0.59 % to 2.22%.

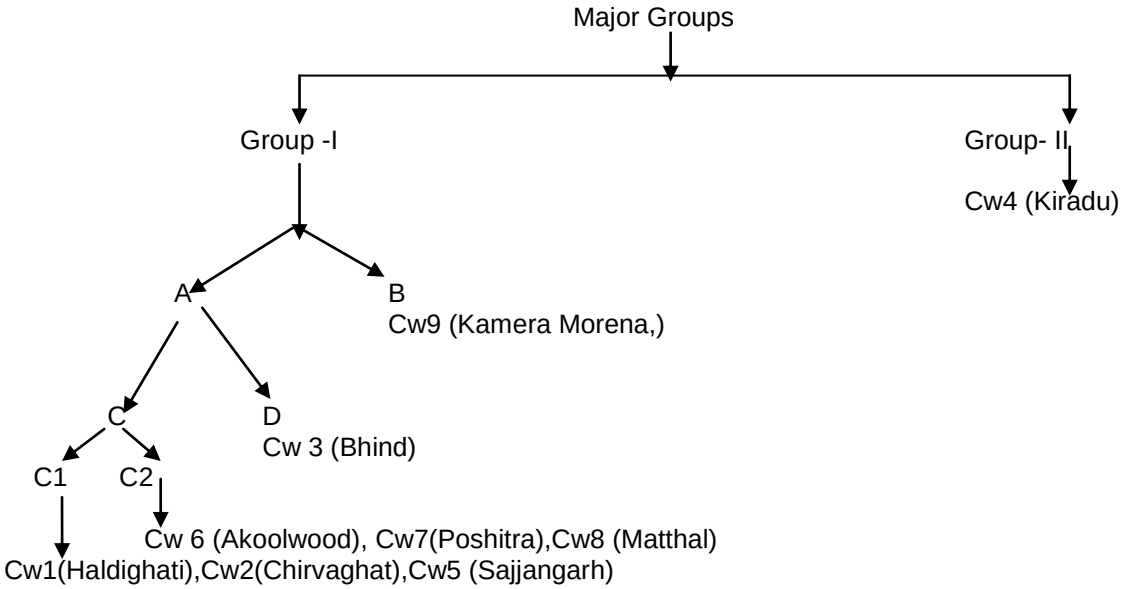
c. MP: ranges from 0.54 % to 2.01%.

From the HPLC analysis it is summarized that the population which were collected from Kiradu (historical guggle in India) and surrounding areas of Badmer District (Rajasthan) showed highest alkaloid concentration followed by Gujrat and Madhya Pradesh.



B. Genetic Diversity Assessment: The genetic diversity assessment was assessed within and between the populations of three states which is summarized below:

A dendrogram (Fig) was generated based on RAPD marker analysis among 13 populations collected from three states, which showed genetic diversity within and between the states. Out of these 13 populations only the 9 populations showed genetic diversity and rest 4 populations could not responded with applied primers (Table-2). According to the dendrogram analysis, all the populations were divided into two major clusters which were further sub divided as:



Genetic diversity Assessment within the states: From the grouping/dendrogram (Fig-3,4 &5) and according to Jaccard's coefficient and cluster analysis it is summarized that as per the similarity index all the populations are placed in the range of 0.64 to 0.94. From this findings the population which were collected from Rajasthan, Cw1 (Haldighati) and Cw2 (Chirvaghat) showed highest genetic similarity index 0.92 and lowest genetic similarity was seen between Cw1 (Haldighati) Cw4 (Kiradu) (Table-6) that means these population are highly diversify with each other. While Cw4 (Kiradu) showed highly genetic diversify population (0.64) among the populations of Cw1(Haldighati), Cw2 (Chirvaghat) ,Cw5 (Sajjangarh) and Cw6(Akkalwood) . In case of Gujarat Cw8 (Matthal) population showed more diversify index (0.81) as compared Cw7(Poshitra) (0.87).The populations which were collected from MP. Cw9 (Murana, Kamera) showed highly diversify index (0.69) as compared to Cw3 (Bhind) (0.80).

Genetic diversity Assessment between the states: From the genetic analysis it is concluded that the populations of Cw4 (Kiradu) showed high genetic diversify (0.64) among the populations of Gujarat and MP. No such populations were found having closer genetic affinity from these three states except Rajasthan. According to Jaccard's coefficient and cluster analysis five RAPD markers were found to be more polymorphic. According to RAPD Marker assay it was found that 42 % bands showed polymorphism while 35% bands showed monomorphism. All the primers showed 54.54% polymorphism (Table -1).

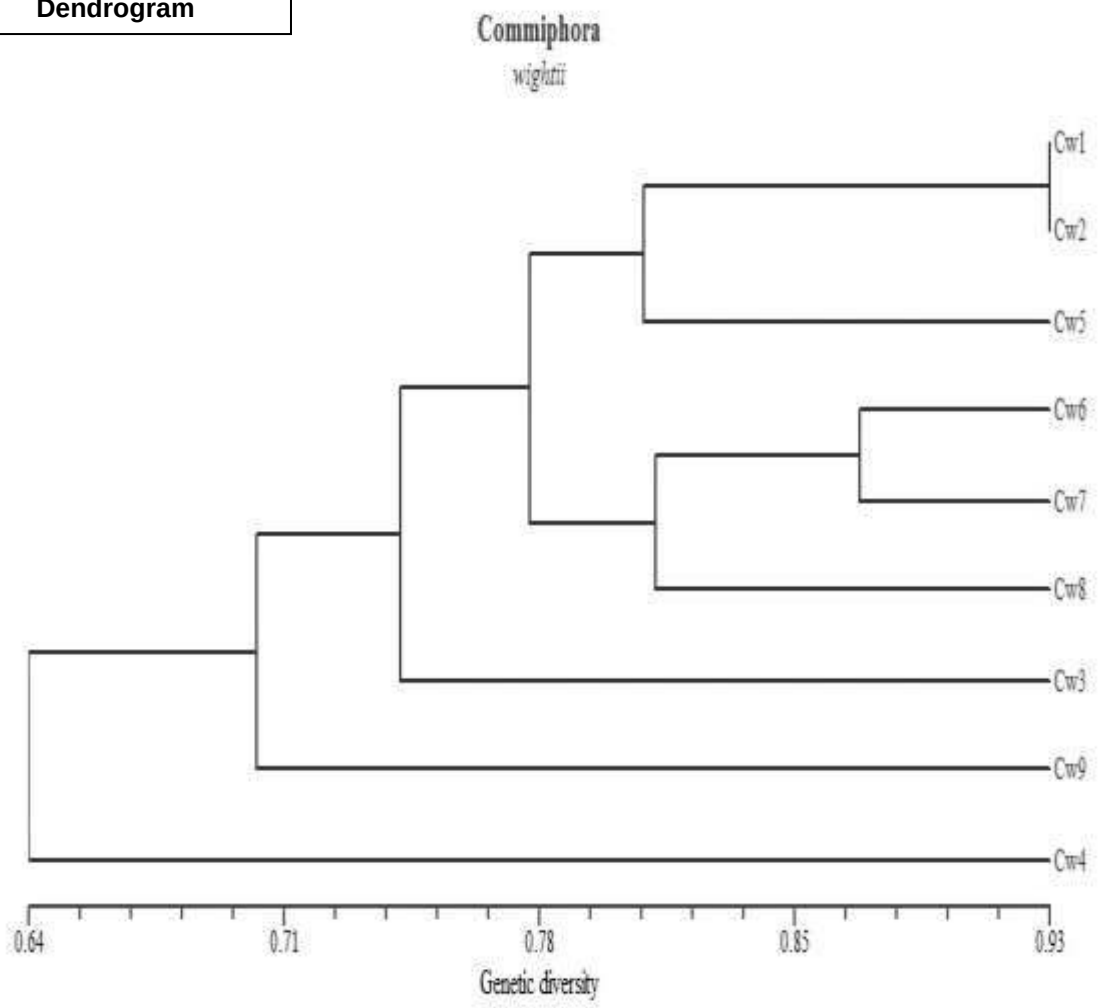
Table-1 RAPD Markers Assay

S.<	Code	Total bands	Monomorphic bands	Polymorphic bands	Percentage of Polymorphism
1	OPA-08	3	1	2	66.60
2	OPC 10	4	2	2	50.00
3	OPA-07	8	3	5	75.00
4	OPC-15	8	2	6	50.00
5	OPA-05	6	3	3	50.00
6	OPA-20	8	5	3	63.00
7	OPA-11	8	4	4	50.00
8	OPA-06	6	3	3	40.00
9	OPA-09	3	2	1	25.00
10	OPA-04	5	1	4	80.00
11	OPN-16	5	3	2	40.00
12	MAP-08	7	2	5	71.00
13	MAP-13	6	4	2	33.00
	Total	77	35	42	54.54

Table-2 List of RAPD primers and sequences

S.№	Primer	Sequences 5'-3'	GC content
1	OPA-08	5'-GTGACGTAGG-3'	60
2	OPC 10	5'-GACGGATCAG-3'	60
3	OPA -07	5'-GAAACGGGTG-3'	60
4	OPC-15	5'-GACGGATCAG-3'	60
5	OPA-05	5'-AGGGGTCTTG-3'	60
6	OPA-20	5'-GTTGCGATCC-3'	60
7	OPA-11	5'-CAATCGCCGT-3'	60
8	OPA-06	5'-GGTCCCTGAC-3'	70
9	OPA-09	5'-GGGTAACGCC-3'	70
10	OPA-04	5'-AATCGGGCTG-3'	60
11	OPN-16	5'-AAGCGACCTG-3'	60
12	MAP-08	5'-CTATCGCCGC-3'	70
13	MAP-13	5'-GTGCAATGAG-3'	50

Dendrogram



As per the above findings it is concluded that the population which were collected from Kiradu (historical guggle in India) and surrounding areas of Badmer District (Rajasthan) showed highest alkaloid concentration as well as in terms of genetic diversity is concerned. This information can be used for its genetic improvement programmes either through breeding or through propagation of elite material for *Commiphora wightii*.

Current status of the project: Completed

Ongoing Projects : Two

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 June 2015)
Sponsoring Agency	:	M.P. Minor Forest Produce Federation Ltd. Bhopal
Principal Investigator	:	Dr. S. K. Tiwari
Co-PI	:	Amit Pandey

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.

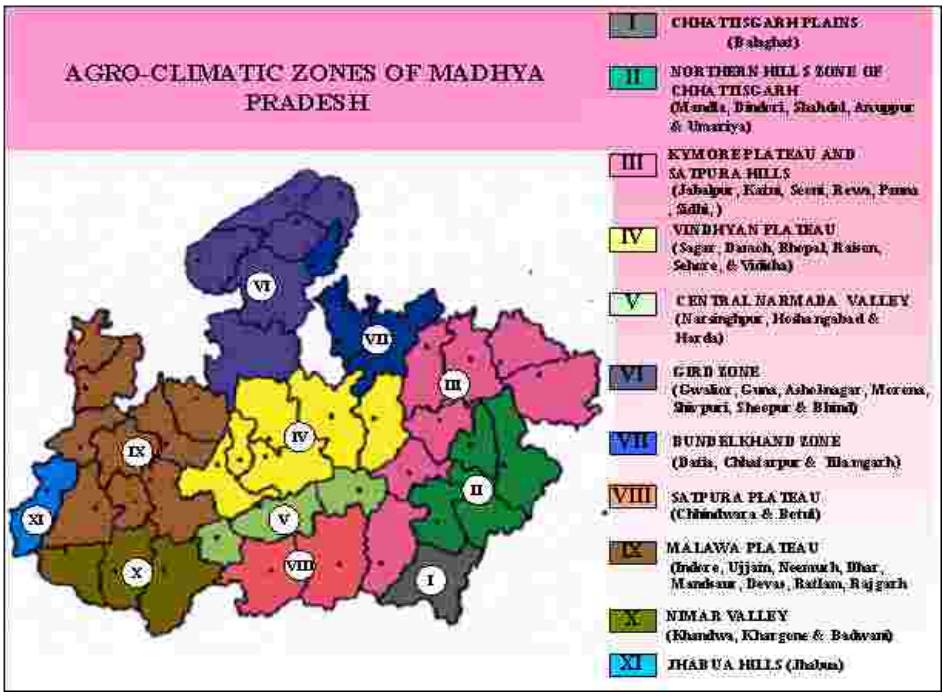
Activities carried out during the year:

- Identification of potential pockets of *Boswellia serrata* from different agroclimatic zones of Madhya Pradesh.
- Maintenance of collected germplasm in mist chamber.
- Assessment of genetic diversity work is in progress.
- Standardization of propagation protocol after elite material selection.

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. These differences include inseration, deletion, translocations, duplications and point mutation. Random Amplified Polymorphic DNA marker (RAPD) was the first PCR-based molecular marker to employ in genetic variation analyses. In this studies Random amplified polymorphic DNA marker has been used for study regarding polymorphism within and between the populations.

DNA Isolation protocol

Young leaves (1g wt.) grinded in *Pestle & Mortar* using liquid nitrogen (LN_2) 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 ^{0}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^{0}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).

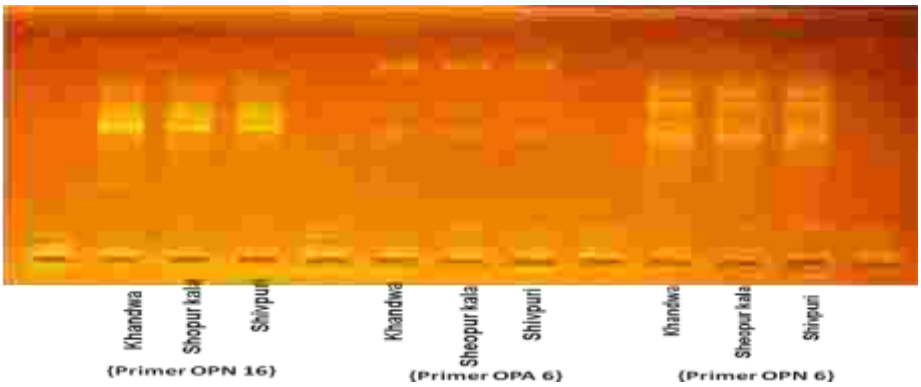
DNA Verification: The isolated genomic DNA was verified using 0.8% Agarose gel (Promega) through electrophoresis (Genetix).

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 $MgCl_2$ and 0.1% gelatin (Promega), 2.5 mM $MgCl_2$, 0.2 µl dNTPs (Promega), 20 pmols Oligonucleotide primers (IDT Avantor),1U Taq DNA polymerase (Promega) and 20 ng template DNA.

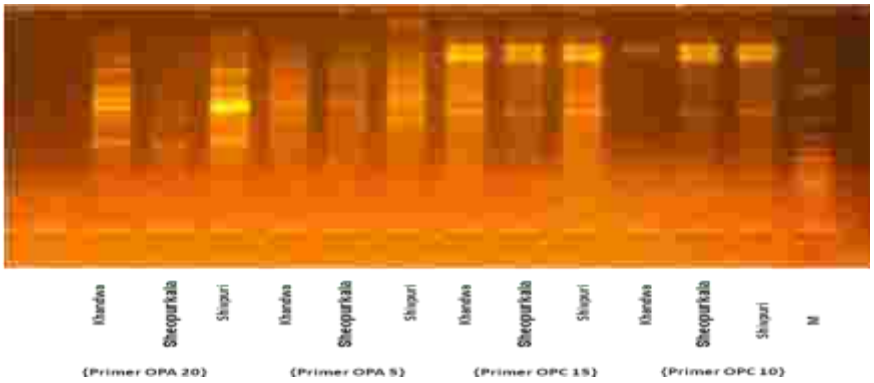
This reaction mixture was subjected to the three final PCR steps through (denaturation, annealing and extension) as initial denaturation at 94^{0}C for 5 minutes. followed by 45 amplification cycles, each consisting of 30seconds at 94^{0}C (denaturation step), 1 min at 37^{0}C (annealing step) and 2min at 72^{0}C (extension step) with final extension of 10 min. at 72^{0}C. The amplification products were separated on 1.5% w/v agarose gel (Promega) and stained with 0.7 µg/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.

Scoring of amplified DNA fragments: Initially the DNA fragments, obtained from different populations using RAPD marker were manually scored for their presence and absence. For the amplification of DNA, Seven primers were used and initially three populations responded as shown below :

Gel image- 1



Gel image- 2



Initially from the above gel images it is found that primers OPN 6, OPA 6 & OPN 16 showed monomorphism between the populations (Gel image- 1), while primers OPC10, OPC15, OPA5 & OPA 20 showed polymorphism between the populations. However primer OPA20 and OPA 5 showed more polymorphism. (Gel image- 2)

Out of these seven primers other primers will also apply for assessing genetic diversity within and between the populations of different agroclimatic zones of MP for assessing genetic diversity as well as identification for the elite planting metrial.

III. Standardization of micropropgation protocol: Since genetic diversity assessment work is in progress for the identification of genetically diversified population to identify elite source for standardizing clonal micropropagation protocol. Since then an attempt has been made for standardizing micrpropagation protocol from nodal explant of an unidentified source as shown in below mentioned figures. Further work is under progress.

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.
Sponsoring Agency	:	Addl. PCCF, Research Extension & Lokvaniki 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:

I. 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

Shivpuri

Orcha

II. Maintenance of collected germaplsm in mist Chamber/ polypropagators. The collected germpalsm 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 40^0C) 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:

a. Temperature: 35^0 to 45^0C.

b. Humidity: 80 to 90% with intermittent spraying of water.

c. Spraying frequency 3 to 4 times in summer and 2 to 3 times in other seasons.

Table - 3 Experimental designs for Macropropagation:

Hormonal 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 responses from the cuttings were recorded at an 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 shifted 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 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
T2	T2a	60-70	Nil	Nil	Nil	Nil	Nil	Nil
	T2b	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	
	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%

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/lt + IAA 2.0mg/lt .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

Newly initiated project during the year: One

1. Title: Development of integrated biotechnological package by genetic diversity assessment using molecular characterization, chemoprofiling, standardization of micropropagation and cryopreservation protocol of four RET species

I. D. No.	:	GEN/P/E/2014-15/2
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	:	Sachin Dhamangaonkar
	:	Pankaj Saini

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 evolve technologies.

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

Activities carried out during the year:

Germplasm of the targeted species were collected and maintained in mist chamber for further research work as below-

Species	Collected areas
Barberis aristrata	Pachmarhi
Embelia tsjerium cottom	Amarkantak
Saraca asoka	Amarkantak
Swertia aungustifolia	Amarkantak

The works of other objectives are 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	1
30 days	3
3 months	2
4-6 months (PG, Dissertation)	7
Revenue generated	2.00 Lakhs

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

Smt. Richa Seth	:	Sr. Research Officer
Shri Shishupal Singh Mehta	:	Forester
Shri Mahesh Prasad Soni	:	Forester
Shri Rajesh Updhayaya	:	Forest guard

Project Staff

Smt. Snehlata Mishra	:	Computer Operator

Projects completed during the year:

Internally funded : Nil

Externally funded : Nil

Ongoing projects

Internally funded : Nil

Externally funded : One

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

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: Nil

Ongoing Project : 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.

Activities carried out during the year:

- Data of Betul, North Balaghat, South Balaghat, West Balaghat, Dewas, Harda, South Seoni, West Chhindwara, Dindori & Sehore were entered in the computer.
- Data of Betul, North Balaghat, South Balaght, West Balaght, Dewas, Harda, South Seoni, West Chhindwara & Sehore was rearranged as per requirement of the project and analysis in SPSS.
- Final repots for Raisen and Chhindwara districts have been prepared and sent to the concerned DFO.

Interim Findings:

- Revised form factors were calculated for Raisen and Chhindwara district.

Current status of the project: Ongoing

Newly initiated projects: Nil

Regular activity:

On-going: One

1. Title : Measurement of sample plots due for measurement in the year 2013-14.

I. D. No.	**:**	ID.No. MEN/RA/1/08
Period	**:**	April 2013 - March 2014
Sponsoring agency	**:**	Internal
PI	**:**	Shri S.K. Jain
Co-PI	**:**	Smt. Richa Seth

Objectives:

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

Activities carried out during the year:

- As per schedule for 2014-15 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

Shri Pradeep Kori	:	Project Assistant
Shri Abhishek Kumar Gupta	:	Project Assistant

Completed Projects

Internally funded : Nil

Externally funded : Three

1. Effect of various pretreatment on seed germination of fresh and stored seeds of *Tectona grandis* (Teak).
2. Strengthening of infrastructure of collection, testing, certification and storage of forestry seeds.
3. Effect of vermicompost and neem cake on plant growth of some forestry species.

Ongoing Projects :

Internally funded : Nil

Externally funded : Three

1. Documentation and development of packages of seed and nursery techniques for some important indigenous species.
2. Training and demonstration programme on seed technology and management of seed production areas for field foresters.
3. Documentation of developed seed technology, nursery and planting techniques of important forestry tree species.

Internally funded : Nil

Regular Activities : One

1. Seed testing and certification

Completed projects during the year

Externally funded : Three

1. Title : Effect of various pretreatment on seed germination of fresh and stored seeds of *Tectona grandis* (Teak)

Project ID	:	SD/P/E/ 12-13/13
Project period	:	July, 2012- July, 2014 (Extended upto December, 2014)
Sponsoring Agency	:	APCCF, (R/E & Lokvaniki) M.P. Bhopal
Principal Investigator	:	Dr. Archana Sharma

Objectives:

- Find out an appropriate seed collection period for better germination.
- Find out an appropriate time of sowing for better seed germination.
- Find out the best sowing media for quick and higher germination.
- Find out the best pretreatment technique for hastening seed germination of teak seeds.
- Preparation of field manual.

Findings:

Parameter of interest	Findings
Collection period	February 3rd week to March 2nd week
Sowing media	Pure Sand
Sowing month	March
Seed size	Medium (12–13mm)
Best pre treatment	Seed soaking in 20% Conc. of ($CaOCl_2$) for One hour

Current status of the project : Completed

2. Title : Strengthening of infrastructure of collection, testing, certification and storage of forestry seeds

Project ID	:	SD/P/E/ 12-13/12
Project period	:	June, 2012- June, 2014 (Extended upto December, 2014)
Sponsoring Agency	:	APCCF, (R/E & Lokvaniki) M.P., Bhopal
Principal Investigator	:	Dr. Archana Sharma

Objective:

- To improve the capability of the institute to develop a systematic and scientific approach of collection, testing, grading, certification, storage and distribution of quality seeds.

Findings:

- Scientific instrument and other materials procured.
- Strengthened the structure of seed certification and seed storage capacity for systematic and scientific approach of seed collection, testing, storage and certification of quality seeds.

Current status of the project : Completed

3. 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 upto December, 2014)
Sponsoring Agency	:	APCCF, (R&E) Bhopal
Principal Investigator	:	Dr. Archana Sharma

Objectives:

- 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.
- To determine the optimum doses of these fertilizers and neem cake.

Targeted Species-

- *Tectona grandis* (Teak)
- *Gmelina arborea* (Khamer)
- *Emblica officinalis* (Aonla)

Findings:

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

Ongoing projects :

Externally funded : Three

1. 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
Sponsoring Agency	:	APCCF, (R/E & 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

- Literature search from other state.
- Seed collection of targeted species
- Testing repeated of collected seeds of various species for viability, moisture and germination percent.
- Preparation of nursery bed.
- Preparation of sowing media.
- Seed sowing in nursery bed/ germination tray.
- Various pretreatment for standardization to hasten seed germination.
- Seed Stored in various conditions.
- Observation on seed germination.
- Planting of seedlings in root trainers and polythene bags for standardization of size of root trainer and polythene bags.
- Various potting mixture were applied for standardization of potting mixture for better seedling growth.
- Various doses of organic/ inorganic fertilizers in potting mixture were used for standardization of doses for better plant growth under nursery stages.
- Various doses of insecticides and pesticide were applied to prevent of pests and diseases in nursery stock.

Interim findings

- Seeds of *Careya arborea*, *Mitragyna parviflora, Bauhinia vahlii* and *Semicarpus anacardium* have been collected and tested for moisture, viability and germination potential for verified the observations and findings of previous year.
- In *Bauhinia vahlii* the highest germination 90% was found in 200ppm GA3 for 10 minutes seed soaking against 58% in control under storage at 4°C temperature after 3 month of storage. After one year storage the highest germination 72% was found with 200 ppm GA3 for 10 minutes seed soaking under Storage of 4°C temp against 40% in control.
- In *Careya arborea* the viability of seeds has been maintained at 4°C temperature for 45 days against two days as reported by C. Anil Kumar.
- 95-100% germination was found in the treatment of 10% H_2SO_4 or 500ppm IBA for 10 minutes seed soaking against 60-70% in control.
- In *Semicarpus anacardium* the highest germination 40% was found with concentration of 5% H_2SO_4 for 10 minutes seed soaking against 15% in control after 12 month of storage at 4°C temperature.

- In *Mitragyna parviflora*, germination in fresh seeds was found to be 0%. After 3 month of storage the highest germination (70%) was found with seed soaking in cold water for 96 hours against 5% in control.

Current status of the project : On-going

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, (R&E) Bhopal
P.I.	:	Dr. Archana Sharma

Objective :

- The objective of this training course is 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.

Interim Findings

- 03 training and demonstration programme covering 45 divisions and 09 R & E and Lokvaniki centers has been completed. Total 235 field foresters have been trained.

Current status of the project : On-going

3. 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 July, 2015)
Sponsoring Agency	:	APCCF, (R/E & Lokvaniki) M.P., Bhopal
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

Interim Findings

- 35 species documented and documentation updated**.**

Current status of the project : On-going

Regular Activities :

1. Seed testing and certification

- 07 Seed samples of Teak and Khamer were received from identified sources and were certified with tested standards.

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

S.K. Palash	:	Dy. Director
S.K. Jain	:	Asst. Director
Raghvendra Bisen	:	Asst. Director
Dr. Pratiksha Chaturvedi	:	Sr. Research Officer
Mayank Verma	:	S.R.A
Vinay Kori	:	Forest Guard

Project Staff:

Akshay Kumar Jain	:	Computer Operator
Surya Kant Choubey	:	Field Assistant

Completed Projects

Internally funded: One

1. Biomass production capacity of *Gliricidia sepium.*

Externally funded: Two

1. मध्यप्रदेश राज्य वन विकास अभिकरण द्वारा विभिन्न वन विकास अभिकरणों में वित्तीय वर्श 2010–2011 में प्रारंभ किये गये वनीकरण कार्यो (2011–12 में किए गए वृक्षरोपण) का अनुश्रवण मूल्यांकन एवं प्रोजेक्ट इम्पेक्ट एसेसमेंट किये जाने के संबंध में।
2. Standardization of potting mixture of various soil types for optimum growth of teak, Khamar and *Dendrocalamus strictus* species.

On-going projects

Internally funded: One

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

Externally funded: Two

1. Estimation of carrying capacity of grazing in different forest types and canopy densities in Jabalpur forest division of M.P.
2. DNA based monitoring of presence of Tiger and their movements in the Kanha Pench corridor of Madhya Pradesh.

Newly initiated projects during the year: Nil

Regular activities

On-going: One

1. Analysis of soil samples

Projects completed during the year:

Internally funded: One

1. Title: **Biomass production capacity of *Gliricidia sepium*.**

Project ID	:	SIL/P/I/13-14/07
Project period	:	03 Month (May 2013 – Aug 2013) (Extended up to Dec 2014)
Sponsoring Agency	:	SFRI
Principal Investigator	:	Dr. Pratiksha Chaturvedi

Objective:

- To know the potential of biomass production of *G. sepium.*

Activities carried out during the year: Draft report submitted.

Important/ interim findings:

- This study thus proves that *Gliricidia sepium* is an extremely valuable plant in tropical farming system and can be an alternative to subabul. The tree can be harvested at around 6 years but if it is retained then it shows an increase in biomass at 1.547 tonnes per year per hectare. Thus it can be used as a combination crop successfully in agroforestry models.

Current status of the project: Completed

Externally funded: Two

1. Title: मध्यप्रदेश राज्य वन विकास अभिकरण द्वारा विभिन्न वन विकास अभिकरणों में वित्तीय वर्ष 2010 – 2011 में प्रारंभ किये गये वनीकरण कार्यों (2011–12 में किए गए वृक्षारोपण) का अनुश्रवण मूल्यांकन एवं प्रोजेक्ट इम्पेक्ट एसेसमेंट किये जाने के संबंध में।

Project ID	:	SIL/P/E/13-14/12
Project period	:	6 Month (Sept 2013 to Feb 2014) (Extended up to Dec 2014)
Sponsoring Agency	:	APCCF (FDA/JFM), MP Bhopal
Principal Investigator	:	S.K. Palash, Dy. Director
Co-PI	:	S.K. Jain, Asst. Director

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:

- Final reports of 17 (Ujjain, Indore, Dhar, Dewas, Jhabua, Barwaha, Rewa, Singrouli, West Sidhi, East Chhindwara, West Chhindwara, South Chhindwara, East Mandla, West Mandla, Dindori, Katni & Jabalpur) divisions completed and submitted to funding agency .

Important findings:

The major impacts observed are as follows - (Year 2010-11 & 2011-12)

- People are aware of environment, conservation of natural resources and importance of forests to an extent.
- People got employment from the implementation of FDA activities.
- Decrease in soil erosion and increase in soil moisture humidity.
- The water level in the project area has increased slightly due to implementation of FDA works.
- Siltation of soil was observed in those FDAs where SMC works were carried out after soil and water conservation measures.
- Agriculture crop production was also increased.
- In most of the FDAs grass production was found to be increased significantly resulting in increase in domestic milk production.
- Regeneration of miscellaneous species was found to improve a little bit.
- Employment opportunities were created.

Overall grading of the project

S.N.	Name of FDAs	Overall Project Grade
1	Jabalpur	8.4 Outstanding
2	Ujjain	8.3 Outstanding
3	West Chhindwara	7.7 Very Good
4	Dhar	7.7 Very Good
5	East Mandla	7.7 Very Good
6	West Sidhi	7.7 Very Good
7	East Chhindwara	7.6 Very Good
8	Singrouli	7.6 Very Good
9	Katni	7.5 Very Good
10	Dindori	7.5 Very Good
11	Jhabua	7.2 Very Good
12	Dewas	7.0 Very Good
13	Indore	7.0 Very Good
14	South Chhindwara	6.6 Very Good
15	Barwaha	6.6 very Good
16	Rewa	4.5 Good
17	West Mandla	4.3 Good

Current status of the project: Completed

2. Title : Standardization of potting mixture of various soil types for optimum growth of *Tectona grandis, Gmelina arborea* and *Dendrocalamus strictus* species.

Project ID	:	SIL/P/E/ 10-11/14
Project period	:	Jan 2011 - Jan 2013 (Extension granted up to Dec., 2014)
Sponsoring Agency	:	APCCF (R/E & Lokvaniki) M.P. Bhopal
Principal Investigator	:	Mayank Makrand Verma

Objective:

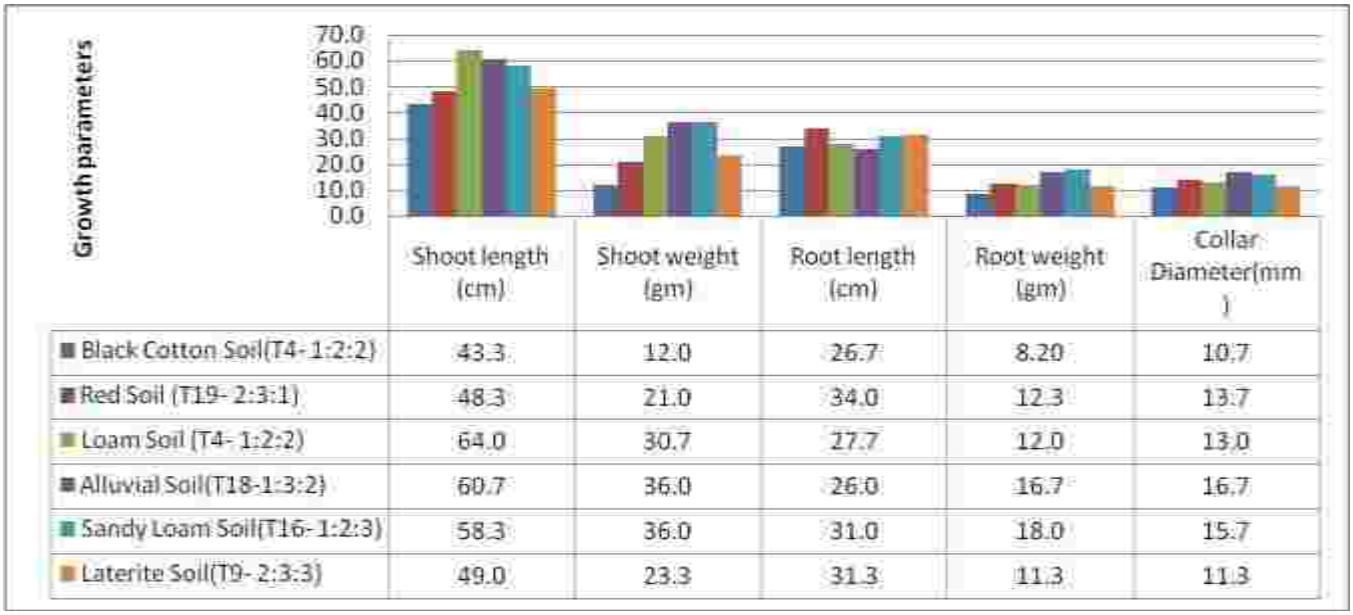
- To standardize proportion of ingredients of potting mixture for production of healthy planting stock of *Tectona grandis, Gmelina arborea* and *Dendrocalamus strictus* in major soil types of M.P.

Important findings:

1. *Tectona grandis* performance on Black Soil, Red Soil, Loam Soil, Alluvial Soil, Sandy Loamy Soil and Laterite Soil was found most suitable in 1:1:3, 3:3:2, 1:1:2, 3:2:2, 2:2:1, 2:2:3 ratio of Soil: Sand: Compost respectively after one year seed sowing.
2. *Gmelina arborea* performance on Black Soil, Red Soil, Loam Soil, Alluvial Soil, Sandy Loamy Soil and Laterite Soil was found most suitable in 1:2:2, 2:3:1, 1:2:2, 1:3:2, 1:2:3, 2:3:3 ratio of Soil: Sand: Compost respectively after one year seed sowing.

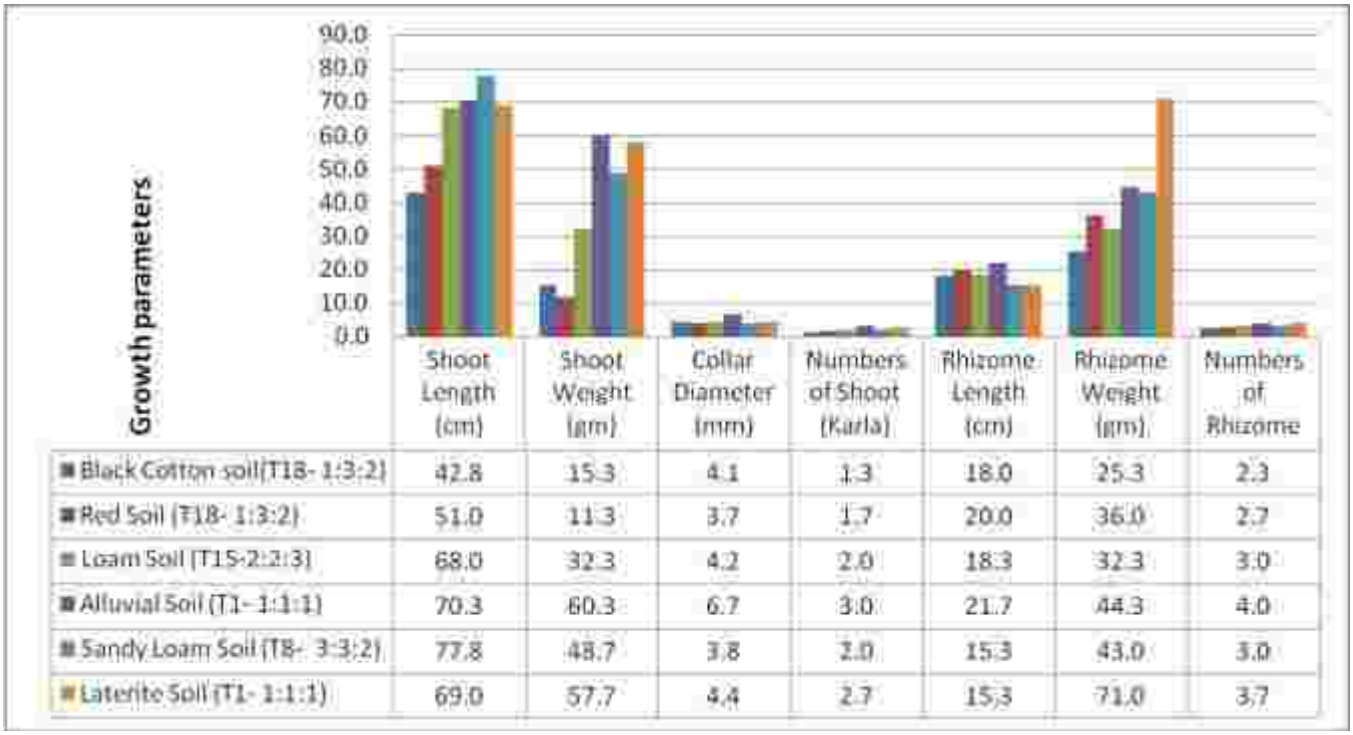
3. *Dendrocalamus strictus* performance on Black Soil, Red Soil, Loam Soil, Alluvial Soil, Sandy Loamy Soil and Laterite Soil was found most suitable in 1:3:2, 1:3:2, 2:2:3, 1:1:1, 3:3:2, 1:1:1 ratio of Soil: Sand: Compost respectively after one year seed sowing.

Table No.1- Growth parameters comparison performed by best suitable potting mixture (soil: sand: compost) ratio of six different soil types for *Tectona grandis.*



	Shoot length (cm)	Shoot weight (gm)	Root length (cm)	Root weight (gm)	Collar Diameter(mm)
Black Cotton Soil(T4- 1:2:2)	43.3	12.0	26.7	8.20	10.7
Red Soil (T19- 2:3:1)	48.3	21.0	34.0	12.3	13.7
Loam Soil (T4- 1:2:2)	64.0	30.7	27.7	12.0	13.0
Alluvial Soil(T18-1:3:2)	60.7	36.0	26.0	16.7	16.7
Sandy Loam Soil(T16- 1:2:3)	58.3	36.0	31.0	18.0	15.7
Laterite Soil(T9- 2:3:3)	49.0	23.3	31.3	11.3	11.3

Table No.2 Growth parameters comparison performed by best suitable potting mixture (soil: sand: compost) ratio of six different soil types for *Gmelina arborea*



	Shoot Length (cm)	Shoot Weight (gm)	Collar Diameter (mm)	Numbers of Shoot (Karla)	Rhizome Length (cm)	Rhizome Weight (gm)	Numbers of Rhizome
Black Cotton soil(T18- 1:3:2)	42.8	15.3	4.1	1.3	18.0	25.3	2.3
Red Soil (T18- 1:3:2)	51.0	11.3	3.7	1.7	20.0	36.0	2.7
Loam Soil (T15-2:2:3)	68.0	32.3	4.2	2.0	18.3	32.3	3.0
Alluvial Soil (T1- 1:1:1)	70.3	60.3	6.7	3.0	21.7	44.3	4.0
Sandy Loam Soil (T8- 3:3:2)	77.8	48.7	3.8	2.0	15.3	43.0	3.0
Laterite Soil (T1- 1:1:1)	69.0	57.7	4.4	2.7	15.3	71.0	3.7

Table No.3 - Growth parameters comparison performed by best suitable potting mixture (soil: sand: compost) ratio of six different soil types for *Dendrocalamus strictus*

SPECIES	SOIL TYPE	POTTING MIXTURE RECOMMENDED (SOIL:SAND:COMPOST)
Teak	Black Cotton	1:1:3
Teak	Red	3:3:2
Teak	Loamy	1:1:2
Teak	Alluvial	3:2:2
Teak	Sandy Loam	2:2:1
Teak	Laterite	2:2:3
Khamer	Black Cotton	1:2:2
Khamer	Red	2:3:1
Khamer	Loamy	1:2:2
Khamer	Alluvial	1:3:2
Khamer	Sandy Loam	1:2:3
Khamer	Laterite	2:3:3
Bamboo	Black Cotton	1:3:2
Bamboo	Red	1:3:2
Bamboo	Loamy	2:2:3
Bamboo	Alluvial	1:1:1
Bamboo	Sandy Loam	3:3:2
Bamboo	Laterite	1:1:1

Current status of the project: Completed

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	:	S.K. Palash
	:	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 two year intervals in T_1, and T_2 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: Two

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 - 2015
Sponsoring Agency	:	Madhya Pradesh Forest Department (Development Wing)
Principal Investigator	:	Mayank Makrand Verma

Objectives:

- To estimate the carrying capacity of grazing.
- To prepare an inventory of palatable and non palatable grass species.occurring in the forest areas.
- To study the effect of grazing & browsing on the regeneration.

Activities carried out during the year:

- Regeneration data collection
- Phyto-sociological study
- Socio-economic survey.

Important findings:-

- Statistical analysis is in progress but some general observations noticed during the field visit are shown below.
- Palatable grasses namely *Dichanthium anullatum, Isaelima laxum, Apluda mutica, Hetropogan contortus, Themeda quadrivalvis* have been found in majority in sample plot areas.
- Preferences for grazing observed in decending order namly Isaelima laxum, *Dichanthium annulatum, Themeda quadrivalvis, Apluda mutica, Chloris truncata, Hetropogan contortus, Dimeria ornithopoda, eragrostris* sp., *erthraxon sp*.
- *Dichanthium annulatum* is most preferable grass for grazing and survives easily under stress condition.
- Protection along with weed eradication is essential to increase yield of palatable *grasses. Isaelima laxum* is observed to dominant on unwanted weeds like *Ocimum hyptis* weed and cassia tora so it should be introduced as biological control of aforesaid weeds.

Current status of the project: On-going

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

Project ID	:	SIL/P/E/ 12-13/09
Project Period	:	2012 - 2015
Sponsoring Agency	:	APCCF (R/E & Lokvaniki) M.P. Bhopal
Principal Investigator	:	Mayank Makrand Verma
Project associate	:	Surya Kant Choubey.

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:

- Collection of tigers scat with their geo reference locations.
- Identification & documentation of sign marks of tiger presence.
- Grid wise survey through questionnaire based on presence of tigers and their habitat.
- Molecular characterization of individual tigers Through DNA profiling.

Interim findings:

- Tiger habitat identified on the basis of tiger presence , water availability, shelter and 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

- South Seoni Forest Division - Rhukad Range-408, 411,410,413, 415,422,425,431, Kurai Range 215216,217,219,223,222,228,233Ari Range168, 182,184, Barghat range-106, 107, 108, 113, Kanhiwada range- 62, 73, 75,
- South Balaghat Forest Division - Katangi Range- 474,475,487, Lalburra range- 427,446,447, Lougoor range- 1, 2, 3, 9,10, 22,23, 24 ,25, 51,57,58, 76,77,84,85, 89, 102,
- North Balaghat Forest Division-North Lamta Range- 1192, 1292, 1209,1257,1277, South Lamta 1389,1349
- West Mandla Forest Division- Bamhni Range- 364,369,372
- Barghat project division- Bahrai Range-765,775,776, Keolari range-721,718
- Lamta project division – Lalburra Range- 401,402,405, 408, 409,410, Lamta Padriganj Range,346,351
- Mohgaon project division- Nainpur range- 91,92,93, Chirai dongri range- 68,69,70,75,78
- Pugmark of Tiger cub identified in Logur Range, Kurai Range, Skata beat, Lalburra Range, Sonewani beat, Lamta Padrigang 340 Compt, Rukhad Range 410 Compt.

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:

1326 samples for biomass determination of leaf litter and herbacious material and 324 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

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

Ms. Radhika Urmalia	:	Research Associate
Ms. Kiran Kawade	:	Research Associate
Mr. Rajesh Barman	:	Sales Promotion Representative
Mr. Mukesh Gawane	:	Sales Promotion Representative
Mr. Nitin Jaiswal	:	Sales Promotion Representative

Completed projects during the year

Internally funded: Nil

Externally funded : Six

1. Valuation of forest resources and its accounting: a casestudy of South Balaghat Forest Division.

2. Sustainable harvesting and primary processing of gums and gum oleo resin in Madhya Pradesh.
3. Preservation and digitization of research records of SFRI.
4. Development of storage system in archive record rooms of State Forest Research Institute.
5. 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.
6. मध्यप्रदेश में निजी एवं राजस्व क्षेत्रों में वानिकी प्रसार हेतु विभिन्न प्रकार के कृषि जलवायु एवं मिट्टियों में प्राप्त हो सकने वाली वनोपज का आर्थिक विश्लेषण।

Ongoing projects

Internally funded : Nil

Externally funded : Three

1. Strengthening of MIS Cell at SFRI and establishments of five regional marketing analysis centres.
2. Standardization of primary processing and drying techniques of NWFPs including medicinal plants.
3. Compilation of 50 years of forestry research in SFRI (1963-2013).

Newly initiated projects during the year

Internally funded: Nil

Externally funded: Two

1. Network project on conservation of lac insect genetic resources.
2. मध्यप्रदेश में प्रमुख गोंदों के संग्रहण के ऑकड़ों का संकलन एवं प्राथमिक संग्राहकों पर सामाजिक आर्थिक प्रभाव।

Projects completed during the year
Externally funded: Six

1. Title : Valuation of forest resources and its accounting: a casestudy of South Balaghat Forest Division.

Project ID	:	SEM/P/E/09-10/06
Project Period	:	Jan.2010 to Dec 2012
Sponsoring Agency	:	APCCF (Dev.) M.P.Bhopal
Principal Investigator	:	Dr. Pratibha Bhatnagar
Project associate	:	Ms. Kiran Kawde

Objectives :

- To undertake a specific study for forest valuation and resource accounting of contribution of forests at division level.
- To suggest a method and framework for adopting an improved Forest Resource Accounting (FRA) system.

Interim Findings:

Estimates of value of all recorded and unrecorded benefits and costs

Particulars	Benefits	Costs	Net benefit (Rs. Lakh)
Recorded	4358	4304	54
Unrecorded	13059	6824	6235
All	17417.31	11128	6289

Extent of unrecorded

Estimates based on the study			Unrecorded (Rs. crore)
Recorded (Rs. crore)	Unrecorded (Rs. crore)	Total (Rs. crore)	
1.	2.	3.(1+2)	4.(2-1)
0.54	62.35	62.89	61.81

The extent of unrecorded for the division was Rs. 61.81 crores. The study undertook accounting of recorded and unrecorded removals from the Forest Division which revealed a distortion to the extent of Rs. 61.81 crores

Current status of the project: Completed

2. Title : Sustainable harvesting and primary processing of gums and gum oleo resin in Madhya Pradesh.

Project ID	:	SEM/P/E/10-11/04
Project Period	:	Dec 2010 –Dec 2012, extended upto June, 2013
Sponsoring Agency	:	MP MFP (Trade & Dev.) Co-operative Federation, Bhopal
Principal Investigator	:	Dr. Pratibha Bhatnagar
Project associates	:	Ms. Radhika Urmalia
	:	Ms. Sonam Jain

Objectives:

- To study and document the present status of sustainable harvesting, processing, utilization and marketing of important gums and gum oleo-resin viz *Sterculia urens* (gum karaya), *Anogeissus latifolia* (Dhaora gum), *Butea monosperma* (Kamarkas gum) and *Boswellia serrata* (Salai oleo resin) in the state.
- To standardize methods of sustainable harvesting and primary processing of Dhaora, kullu, kamarkas gum and salai oleo-resin
- To evolve proper methods of storage to maintain its properties.
- Extension of improved harvesting, processing, value addition and storage technologies to model villages through training.

Activities carried out during the year:

Interim findings:

A) To assess current status of harvesting gums, field survey were done in seven districts by laying sample plots of 50 X 50 m, 10 X 10 m and 1 X 1 m for tree enumeration and estimating regenerating status. Criteria for estimating harvesting intensity of *Sterculia urens* and *Boswellia serrata* are as follows:

Low	< 1 feet
Moderate	>1 feet < 2 feet
High or severe	> 2 feet

and for *Butea monosperma:*

Low	0-50 incisions
Moderate	50-100 incisions
High or severe	>100 incisions

The field survey revealed that intensity of *Sterculia urens* and *Boswellia serrata* was high in Sheopur district whereas, on *Butea monosperma* it was reported high in Tikamgarh district, as shown in figs. 1-3 respectively.

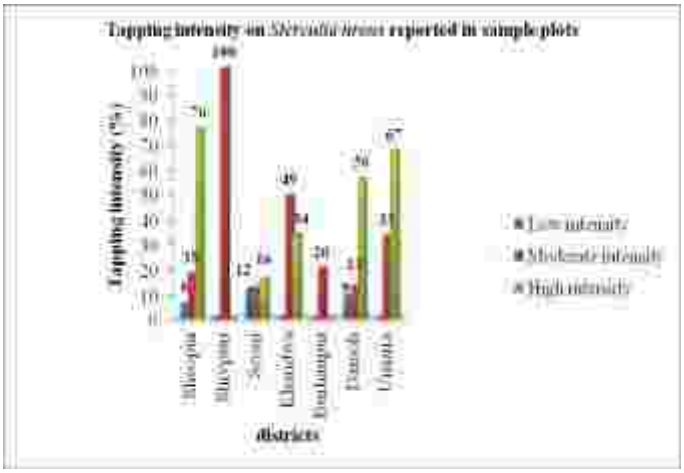


Fig. 1: Status of tapping intensity on *Sterculia urens* in different surveyed districts.

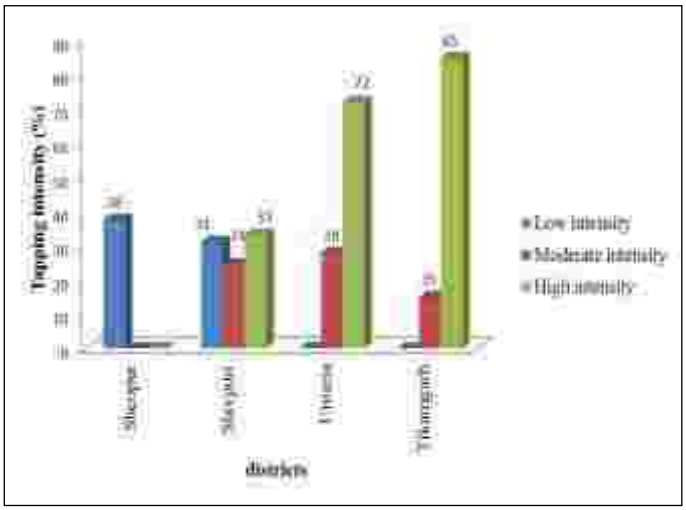


Fig. 2: Status of tapping intensity on *Butea monosperma* in different surveyed districts

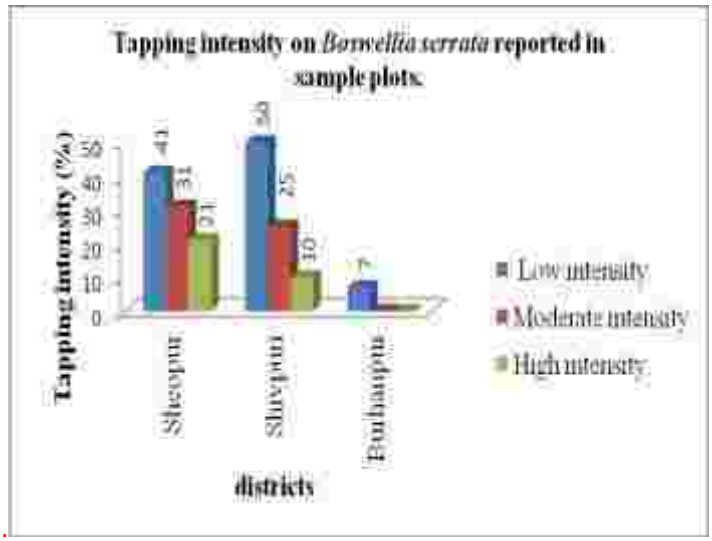


Fig. 3: Status of tapping intensity on *Boswellia serrata* in different surveyed districts

The methods adopted by gum collectors are of serious concern. In case of *S. urens*, daily freshening was reported in Taradehi range, Damoh which harms gum yielding tissues i.e. ducts or canals.

To find seasonal collection and income from gum karaya a survey was carried out in six villages of Damoh district which revealed that households collected gum for four months and an average income ranging between Rs. 5000-6600 approx. for collection of 31-41 kgs. Whereas, in some households collection was continued for seven months earning an income between Rs. 9500-11500 per season.

In Sheopur, tribal population have tenurial rights on Salai trees for gum collection. Survey revealed that maximum annual income of Rs. 47232 was earned by 5 percent of households, who tap 301 to 500 trees per season. Whereas, 20.0 percent households without tenural rights collect gums from other trees and earning an average income of about Rs.11718 per season. Survey conducted in nine villages of Shivpuri district revealed that average seasonal collection was 1.37 quintals and average seasonal income Rs. 12345.

Survey carried out to assess the current status of processing and storage of gums revealed that gums are not cleaned, graded or processed.

B) To evolve sustainable harvesting techniques of Karaya, Kamarkas and Salai gum different experiment were done; details are given in Table 1.

Table No.1: Experiments to evolve sustainable harvesting techniques

S. No.	Tapping experiments	Treatments and Replicates	Girth class (in cm)
1	*Sterculia urens*	T0- Traditional method T1- 1 blaze T2- 2 blaze opposite side 5 replicates in each girth class	90-140 141-190 191-240
2	*Butea monosperma*	T1- 10 incisions T2- 20 incisions T3- 30 incisions 5 replicates in each girth class	80-110 111-150 151-200
3	*Boswellia serrata*	T0- Traditional method T1- ½ Circular band T2- ½ Circular opposite alternate side 10 replicates in each girth class	90-120 121-160 161-200

The result of the experiment has shown that, maximum *Karaya gum* production of 1697.9 gm/tree was found in girth class 191-240 cm under treatment T_2 with 2 blazes on opposite sides of the tree. Details are given in Table No. 2.

Table No.2 : Yield of *Karaya gum* under different treatment of girth class.

S. No	Month	90-140 cm			141-190 cm			191-240 cm		
		T0	T1	T2	T0	T1	T2	T0	T1	T2
1	March	179.5	194.6	215.9	203.1	158.1	231.1	197.3	208.8	325.7
2	April	341.8	356.6	434.6	364.4	366.8	459.8	422.8	458.2	631.2
3	May	336.4	395.8	477.0	389.0	449.8	509.6	457.2	494.2	741.0
Total yield/tree		857.7	947.0	1127.5	956.5	974.7	1200.5	1077.3	1161.2	1697.9

Maximum *Kamarkas* gum production of 709 gm /tree was observed in girth class 151-200 cm under treatment T_3 with 30 incisions. Details are shown in Table No. 3.

Table No.3: Yield of *Kamarkas* gum under different treatments and girth classes

S. No.	Month	80-110 cm			111-150 cm			151-200 cm		
		T1	T2	T3	T1	T2	T3	T1	T2	T3
1	Feb	28.0	27.0	12.1	59.5	74.5	99.0	115.0	173.6	137.5
2	March	51.0	100.0	222.0	58.0	162.5	371.0	93.0	413.0	571.5
Total yield/tree		79.0	127.0	234.1	117.5	237.0	470.0	208.0	586.6	709.0

Maximum Salai gum production of 406.5 gms/tree was found in 161-200 cms girth class under treatment T_2 following ½ circular band on opposite alternate side. Details are given in Table No. 4

Table No. 4: Yield of *Salai* gum under different treatment and girth classes.

S. No.	Month	80-120 cm			121-160 cm			161-200 cm		
		T0	T1	T2	T0	T1	T2	T0	T1	T2
1	Nov	1.1	5.8	3.3	8.3	3.8	6.0	10.8	14.8	13.1
2	Dec	24.5	15.2	26.8	20.1	18.5	23.4	41.4	62.9	57.9
3	Jan	32.6	36.9	38.2	31.3	34.4	26.3	89.8	78.3	84.5
4	Feb	6.6	11.3	25.7	15.6	6.0	20.8	55.9	37.4	53.0
5	March	27.1	35.1	47.0	25.4	33.5	50.6	80.3	40.2	94.1
6	April	34.7	41.2	38.3	32.2	26.9	53.2	69.7	52.3	85.4
7	May	20.4	10.2	10.5	13.6	13.2	17.2	17.3	6.0	18.5
Total yield/tree		147	155.7	189.8	146.5	136.3	197.5	365.2	291.9	406.5

Experiments to evolve proper driage method

Experiments were laid out to estimate the driage percentage of gums and gum oleo resin following two treatments T1 (room temperature) and T2 (solar drier) for *S. urens* (April and May months) whereas, only room temperature for *B. monosperma* (April month) and *B. serrata* (whole year) results that maximum driage percentage of 24.7 was recorded for gum karaya under solar dryer whereas, 45.0 percent for kamarkas gum and 9.23 for salai oleo resin under room temperature.

Experiments to evolve proper method of storage

Five different treatments (T1- polythene bag, T2- Plastic container, T3-Alluminium foil, T4-cloth bag, T5- Jute bag) were laid out to determine the best method for gum storage and result has revealed that practice of using plastic containers for storage can give maximum driage, reduced moisture content and contamination to *Butea* and *Salai* gum. However, cloth bags were found better in case of *Karaya* gum.

A. National Workshop on Sustainable management of natural gums and resins was organised in which 31 research papers were presented.

Extension of improved harvesting, processing, value addition and storage technologies to model village through training.

Two trainings were given to the gum collectors on sustainable harvesting, primary processing, storage, grading and marketing techniques of *Boswellia serrata*, *Sterculia urens* and *Anogeissus latifolia* in Satanwara and Patara villages of Shivpuri district in April-May 2012. 38 trainees participated in Satanwara village and 52 traines in Patara village.

A. Training on sustainable harvesting, primary processing, value addition and marketing was given in Shivpuri district on 3th -5th July, 2014. 101 trainees were invited from Dadol, Madkheda, Survaya, Sirsaup and Patoda villages participated in the training.

Current status of the project: Completed

3. Title : Preservation and Digitization of research records of SFRI.

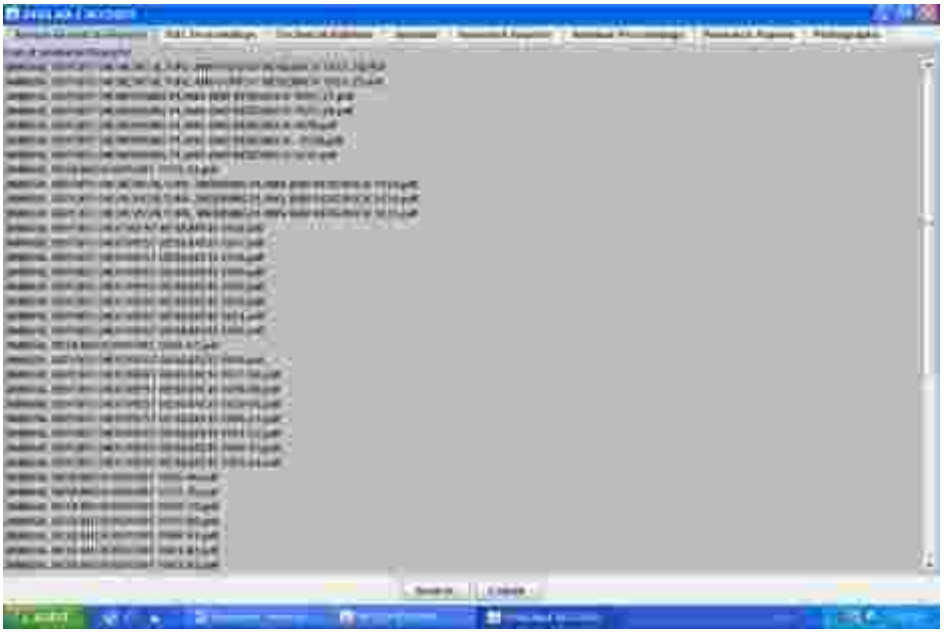
Project ID	:	SEM/P/E / 12-13/15
Project Period	:	June 2012 to June 2014.
Sponsoring Agency	:	APCCF (R/E & Lok Vaniki), MP Bhopal
Principal Investigator	:	Dr. Pratibha Bhatnagar
Project staff	:	Ajay Tiwari
	:	Bhoopendra Banraj

Objective:

- To digitize old research records of SFRI.

Activities carried out during the year:

SFRI has old research records and grey literature which needed to be preserved and digitized, for easy availability. The following works were done in the project.



Software was designed and all digitized records were appended under different sub heads for use. Thereafter collection of old SFRI reports/bulletins/RAC proceedings/old research papers in Journals was done. These records were then listed, cleaned, repaired and digitized.

Digitization work done

- Total 33 Annual Reasearch reports and 27 Annual Silviculturists report from 1923 to 2013.
- 45 Technical Bulletins
- 307 Research Reports since year 2000-2013.
- Vol 1-37 of Vaniki Sandesh
- 1-42 RAC Proceedings
- 48 Research papers published in Journals pertaining to Central Provinces from 1900 onwards.
- 500 photographs.

Current status of the project: Completed

4. Title: Development of storage systems in archive record rooms of State Forest Research Institute.

Project ID	:	SEM/P/E12-13/20
Project Period	:	June 2012 to May 2013
Sponsoring Agency	:	APCCF, (Research and Extension & Lok Vaniki)
Principal Investigator	:	Dr. G. Krishnamurthy
Co-PI	:	Dr. Pratibha Bhatnagar

Objective:

- Installation of storage systems in archive record rooms of State Forest Research Institute.

Activities carried out during the year:

- Storage systems installed in two Archive record rooms and one lab.
- Archive rooms been upgraded.
- Listing of old records of Forests Dept and SFRI completed.

S. No.	Product	No. of items	Room No.	Archive Records
1. (a)	Compact storage unit 16 bodies	1 Set	76 (Archive record room)	Old records of MP Forest Dept. & SFRI
(b)	Open plain office system	Plain office work system		
2 (a)	Compact storage unit 40 bodies	In two sets	75 (SFRI record room)	SFRI records
(b)	Open plain office system	Plain office work System		
3	Compact storage unit 08 bodies	1 set	70 (Archive Lab)	Old ledger files of C.P. & Berar
4.	Compact storage unit 08 bodies	2 sets	67 (Documentation room)	Project report 1997 to till date, SFRI Publication 1967 to till date, Old (Miscellaneous file) Documents, ARR 1923 to till date, RAC proceeding. Silviculture reports.
5.	Book cases	13 Nos.	Room No. 75	Indian Foresters 1875 onwards and other old Journals for Archive
6.	Civil Works	Renovation work (Putty, distemper)	No.75 & 76. (SFRI Record room & Archive record room	
7.	Electrical Works	Electrical works & Repairs Installation of inverter	Room No. 74,75 & 76	

S. No.	Product	No. of items	Room No.	Archive Records
8.	Window Shade	Window shade and repairing work of 12 windows,	Room No. 75 & 76	
9.	Preservative Chemicals	Repairing of old Books/journals with preservative chemicals		All old records/ Books/ Journals/ Files preserved
10.	Split ACs	2 Nos.	Room No. 75 & 76	

Records maintained in storage units

- The following records have been kept in the record rooms.
- SFRI old records
- Maps
- Working Plans
- Annual Administration Reports
- Research Files
    - Annual Research reports
    - Bulletins
    - General Ledger Files
    - Old Reports
    - Old Books
    - Tour & inspection Notes
    - Old Correspondence files+
- Library old records, old Journals and reports

Current status of the project: Completed

5. Title : 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.

Project ID	:	SEM/P/E/13-14/13
Project Period	:	Feb 2014 to Feb 2015
Sponsoring Agency	:	APCCF, (R/E & Lok Vaniki), MP Bhopal
Principal Investigator	:	Dr. Pratibha Bhatnagar
Project Staff	:	Ms. Kiran Kawde

Objective:

- To impart training on sustainable harvesting, processing and marketing of *Butea monosperma*
- After studying the current harvesting intensity and methods review of literature done
- A training manual was prepared and published.

Six trainings were given in Umaria and Tikamgarh districts as given below:

S. No.	Name of the programme	District	Date	Organized for	Participants
1.	Training on technical know how of gum tapping from *Butea*	Umaria	9.1.15 to 10.1.15	Bilaspur	94
			11.1.15 to 12.1.15	Ghunghuli	81

S. No.	Name of the programme	District	Date	Organized for	Participants
	monosperma in Umaria and Tikamgarh districts to local people and frontline staff of forest department		13.1.15 and 15.1.15	Nigahri	51
		Tikamgarh	03.03.2015 to 04.03.2015	Sinoni	114
			16.03.2015 to 17.03.2015	Satankhera	69
Total					**409**

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Current status of the project: Completed

6. Title: मध्यप्रदेश में निजी एवं राजस्व क्षेत्रों में वानिकी प्रसार हेतु विभिन्न प्रकार के कृषि जलवायु एवं मिट्टियों में प्राप्त हो सकने वाली वनोउपज का आर्थिक विश्लेषण।

Project ID	:	SEM/P/E/10-11/09
Project Period	:	2010-2014
Sponsoring Agency	:	अपर प्रधान मुख्य वन संरक्षक (अनुसंधान, विस्तार एवं लोक वानिकी) मध्यप्रदेश, भोपाल
Principal Investigator	:	डॉ. जी. एस. मिश्रा, वरिष्ठ अनुसंधान अधिकारी
Project Staff	:	दिनेश कुमार कुशवाहा
	:	शेखर सक्सेना

Objectives:

- वानिकी प्रसार हेतु जलवायु एवं मिट्टी के अनुसार कृषकों के सफल वृक्षारोपणों का अध्ययन।
- कृषकों की पड़ती तथा कृषि के लिए अनुपयुक्त भूमि में उगाई जा सकने वाली वृक्ष एवं औषधीय प्रजातियों का अध्ययन।

Activities carried out during the year:

मध्यप्रदेश के 11 कृषि जलवायु क्षेत्रों का सर्वेक्षण कर कृषकों के निजी भूमि में किये गये वृक्षारोपण एवं औषधीय पौधों की खेती के ऑकड़े एकत्र किया।

Important findings:

lkekU; fu"d"kZ

- मध्यप्रदेश के 11 कृषि जलवायु क्षेत्रों में सागौन का रोपण समूह में एवं खेतों के मेड़ों में पाया गया। जबकि खमेर का रोपण नर्मदा घाटी एवं वैन गंगा कृषि जलवायु क्षेत्र के अंतर्गत जबलपुर एवं बालाघाट जिले में समूह रोपण तथा कैमोर एवं सतपुड़ा की पहाड़ियां कृषि जलवायु क्षेत्र के अंतर्गत सतना जिले में कृषक के खेत के मेंड़ में पाया गया। एक मात्र शीशम का रोपण गुना जिले में निजी कपड़ा फैक्ट्री के परिसर में लगभग 2.30 एकड़ रकवा में पाया गया।
- मध्यप्रदेश के किसी भी कृषि जलवायु क्षेत्र में कृषि वानिकी के अंतर्गत सागौन, खमेर, शीशम का रोपण सर्वेक्षण के दौरान नही पाया गया। (कृषि वानिकी के अंतर्गत ऑवला के कुछ रोपण पाये गये जिनके साथ कृषकों ने गेंहूँ, सोयाबीन, चना, टमाटर की फसले ली थी लेकिन ऑवला रोपण स्थल में गेहूँ, एवं

सब्जियों की खेती करने से ऑवला के पौधों को अधिक पानी की वजह से हानि पहुँची है।) साथ ही कृषि उत्पादन में 15 से 20 प्रतिशत की कमी आई। ऑवला के फलों की वर्तमान कीमत एवं मजदूरी की दर को ध्यान में रखते हुए कृषि योग्य भूमि में व्यावसायिक दृष्टिकोण से कृषकों में ऑवला रोपण के प्रति कोई रूचि नहीं दिखाई दी।

- यूकेलिप्टस का रोपण मध्यप्रदेश के कुल 6 कृषि जलवायु क्षेत्रों यथा छत्तीसगढ़ से लगा पहाड़ी क्षेत्र, कैमोर एवं सतपुड़ा की पहाडियां, नर्मदाघाटी, वैनगंगा घाटी, गिर्द क्षेत्र एवं सतपुड़ा का पठार कृषि जलवायु क्षेत्र में किया गया है। इसमें से सर्वाधिक रोपण एवं वानिकी के अंतर्गत कैमोर एवं सतपुड़ा की पहाड़ियां तथा नर्मदा घाटी कृषि जलवायु क्षेत्र के कृषकों द्वारा क्लोनल यूकेलिप्टस के साथ सफलतापूर्वक परम्परागत खेती की जा रही है।
- कृषि जलवायु क्षेत्र वार विभिन्न प्रकार की मिट्टियों में किये जाने वाले सागौन रोपण में पौधों की वृद्धि दर का औसत समान किस्म की मिट्टी में कृषि जलवायु क्षेत्र के अनुसार भिन्नता पाई गई।
- अध्ययन में पाया गया कि जिन कृषकों ने ikS/kk ls ikS/kk ,oa drkj ls drkj ds chp 8 ls 12 QhV dh nwjh j[kh है तथा रोपण स्थल की वर्ष में 1–2 जुताई की है उस रोपण में पौधों की vkSlr xksykbZ vis{kkd`r vf/kd पाई गई, लेकिन ऑकड़ों के विश्लेषण में पाया गया कि ऐसे रोपण जिनमें पौधा एवं कतार के मध्य 4 से 6 फीट का अंतर रखा गया है mu jksi.kksa esa ikS/kksa dh vkSlr xksykbZ de gksus ds ckotwn Hkh izfr ,dM+ vkSlr dk"B dk okY;we vf/kd ik;k x;kA
- अध्ययनित वृक्षारोपणें को देखने से ज्ञात होता है fd o`{kkjksi.kksa esa vPNh o`f) ogh ij gS tgka e`nk xgjh dkyh ddjhyh] jsrhyh nqeV gS तथा मृदा में आर्दता, जल धारण क्षमता, रन्ध्रता एवं पोषक तत्वों की अच्छी उपलब्धता है जबकि उथली, ककरीली पीली, चिकनी, कड़ी एवं चूना युक्त मृदा में वृद्धि कम है।
- सागौन का रोपण करने वाले लगभग 95 izfr'kr d`"kdksa us ikS/kk f'ko'kDrh futh jksi.kh] gSnjkckn से प्रति पौधा रु. 55.00 से रु. 90.00 में प्राप्त किये है जबकि 5 प्रतिशत कृषकों ने वन विभाग से प्रति पौधा लगभग रु. 2.00 से 5.00 में प्राप्त कर रोपण किया है।
- मध्यप्रदेश में कृषकों ने निजी भूमि में वृक्षारोपण के समय पौधा एवं कतार के लिए कोई सुनिश्चित मापदण्ड नही अपनाया है। कृषकों ने उपजाऊ भूमि में सागौन रोपण के बाद परम्परागत खेती को भी साथ में करने के उद्देश्य से पौधा एवं कतार के बीच अधिक दूरी रखा, लेकिन 3–4 वर्ष बाद सागौन के पौधे बड़े हो जाने पर खेती में उत्पादन घटने लगा तथा लागत बढ़ने के कारण खेती करना छोड़ दिये।
- अध्ययनित रोपणों में विभिन्न अंतरालों पर किया गया है जैसे 4x4, 4x5, 4x6, 5x6, 8x8, 10x10, 10x12, 8x10, 6x10, 8x12 फीट।
- छोटे एवं मध्यम ग्रामीण कृषक स्वयं के उपयोग हेतु काष्ठ प्रजातियों को रोपित करना चाहते है। जबकि बड़े भू–स्वामी मजदूरों की कमी एवं खेती में बढ़ती लागत से होने वाले घाटे के कारण परेशान होकर उपयुक्त लाभ देने वाली प्रजाति का रोपण करना चाहते है।
- अध्ययन में पाया गया कि छोटे कृषकों में सागौन रोपण की अत्यधिक उत्सुकता पाई गई। मालवा, निमार एवं विन्ध्य का पठार कृषि जलवायु क्षेत्र में अधिकांश कृषकों ने खेतों के मेंड़ों में सागौन का रोपण किया है। इसी प्रकार अन्य कृषि जलवायु क्षेत्रों में कृषकों ने घरेलू उपयोग के लिए घरों की बाड़ी एवं खेतों के मेड़ों में यूकेलिप्टस का रोपण कर रखा है।

कृषि जलवायु क्षेत्र वार निष्कर्ष

- छत्तीसगढ़ से लगा पहाड़ी कृषि जलवायु क्षेत्र में वृक्षारोपण के अंतर्गत निजी भूमि में मुख्य रूप से सागौन, यूकेलिप्टस एवं खमेर तथा औषधीय प्रजातियों में ऑवला का रोपण किया जाना पाया गया। समूह रोपण के अंतर्गत सागौन की औसत छाती गोलाई 31.04 से.मी. पाई गई जो अन्य किसी भी कृषि जलवायु क्षेत्र की तुलना में सबसे अधिक है। इस कृषि जलवायु क्षेत्र में ऑवला से प्रति एकड़ प्राप्त होने वाली आय न्यूनतम रु. 0.03 लाख एवं अधिकतम रु. 0.52 लाख प्रति एकड़ रही।
- कैमोर एवं सतपुड़ा की पहाड़ियां कृषि जलवायु क्षेत्र में मुख्य रूप से सागौन, यूकेलिप्टस एवं खमेर तथा ऑवला का रोपण पाया गया। इस कृषि जलवायु क्षेत्र में समूह रोपण के अंतर्गत सागौन की औसत छाती गोलाई 18.89 से.मी. पाई गई। सिवनी जिले के कृषक द्वारा कृषि वानिकी के रूप में क्लोनल यूकेलिप्टस के साथ गेंहूँ की फसल ली गई तथा 5 वर्ष पश्चात् पौधों का निवर्तन किया गया। कृषक को पॉच वर्ष में प्रति एकड़ शुद्ध आय रु. 1.15 लाख अर्थात् प्रति एकड़ रु. 0.23 हजार वार्षिक प्राप्त हुए। इसी प्रकार ऑवला से प्रति एकड़ प्राप्त होने वाली अधिकतम आय रु. 0.096 लाख एवं न्यूनतम रु. 0.026 लाख प्रति एकड़ रही।
- विन्ध्य का पठार कृषि जलवायु क्षेत्र में सर्वाधिक रोपण सागौन के पाये गये केवल 1–1 रोपण यूकेलिप्टस एवं शीशम का पाया गया। औषधीय प्रजातियों में केवल 1 कृषक के द्वारा सफेद मूसली की खेती करना पाया गया अन्य सभी रोपण ऑवला के पाये गये। इस कृषि जलवायु क्षेत्र में समूह रोपण के अंतर्गत सागौन की औसत छाती गोलाई 21.10 से.मी. पाई गई। यहां की जलवायु एवं मिट्टी में सागौन की अपेक्षा शीशम एवं यूकेलिप्टस का रोपण ज्यादा प्रभावकारी एवं लाभप्रद होगा। इसी प्रकार ऑवला से प्रति एकड़ प्राप्त होने वाली अधिकतम आय रु. 0.20 लाख एवं न्यूनतम रु. 0.01 लाख प्रति एकड़ रही जबकि सफेद मूसली से प्राप्त होने वाली आय रु. 2.67 लाख प्रति एकड़ रही।
- नर्मदा घाटी कृषि जलवायु क्षेत्र में मुख्य रूप से सागौन, यूकेलिप्टस एवं खमेर तथा ऑवला का रोपण पाया गया। समूह रोपण के अंतर्गत सागौन की औसत छाती गोलाई 23.30 से.मी. पाई गई। इस कृषि जलवायु क्षेत्र में क्लोनल यूकेलिप्टस की सबसे अधिक वृद्धि काली मिट्टी के रोपण में (सर्वाधिक औसत छाती गोलाई 51.88 सेमी.) तथा काली दोमट मिट्टी में खमेर रोपण के पौधों की वृद्धि अन्य मिट्टियों के रोपण से अपेक्षाकृत अधिक पाई गई। जबलपुर जिले के कृषकों द्वारा कृषि वानिकी के रूप में क्लोनल यूकेलिप्टस के रोपण से पौधो का वर्ष 2010 में निवर्तन भी किया गया है, जिसमें प्रति एकड़ (लगभग 3.83 वर्ष में) लगभग रु. 1.36 लाख अर्थात् लगभग रु. 0.36 लाख वार्षिक शुद्ध आय अर्जित किया। जबकि क्लोनल यूकेलिप्टस का समूह रोपण करने वाले एक अन्य कृषक को प्रति एकड़ (लगभग 4.58 वर्ष में) लगभग रु. 0.84 लाख अर्थात् रु. 0.18 लाख वार्षिक शुद्ध आय प्राप्त हुई। इस रोपण स्थल में कभी खेती नही की जाती थी अर्थात् मिट्टी अनुपजाऊ किस्म की है। इसी प्रकार ऑवला की खेती से प्रति एकड़ प्राप्त होने वाली अधिकतम आय रु. 1.04 लाख एवं न्यूनतम रु. 0.47 लाख प्रति एकड़ रही।
- वैन गंगा घाटी कृषि जलवायु क्षेत्र में मुख्य रूप से सागौन एवं खमेर का रोपण पाया गया। इस कृषि जलवायु क्षेत्र में समूह रोपण के अंतर्गत सागौन की औसत छाती गोलाई 16.00 से.मी. पाई गई। लाल एवं काली मिट्टी में रोपित पौधों की वृद्धि समान एवं दोमट मिट्टी की अपेक्षा कम रही। इस कृषि जलवायु क्षेत्र में ऑवला की खेती करने वाले कृषक नहीं मिले और न ही उनकी जानकारी प्राप्त हुई।
- गिर्द कृषि जलवायु क्षेत्र में सागौन, यूकेलिप्टस एवं ऑवला का रोपण पाया गया। इस कृषि जलवायु क्षेत्र में समूह रोपण के अंतर्गत सागौन की औसत छाती गोलाई 28.43 से.मी. पाई गई। एक मात्र क्लोनल यूकेलिप्टस रोपण में पौधे की औसत गोलाई 16.90 सेमी. पाई गई। इसी प्रकार ऑवला से प्रति एकड़ प्राप्त होने वाली आय लगभग रु. 0.02 से रु. 0.03 लाख प्रति एकड़ रही।
- बुन्देलखण्ड कृषि जलवायु क्षेत्र में निजी भूमि के अंतर्गत किये गये वृक्षारोपण में केवल सागौन तथा औषधीय प्रजातियों के अंतर्गत सर्वाधिक मेंथा की खेती पाई गई। इस कृषि जलवायु क्षेत्र में समूह रोपण के अंतर्गत सागौन की औसत छाती गोलाई 19.09 से.मी. पाई गई। सागौन लाल मिट्टी के रोपण में

सर्वाधिक औसत वृद्धि पाई गई। सबसे कम वृद्धि दोमट मिट्टी के रोपण में पाई गई। इसी प्रकार मेंथा की खेती से संबंधित ऑकड़ों का विश्लेषण करने पर ज्ञात होता है कि कृषकों को प्रति एकड़ औसत रूप से रु. 0.37 लाख आय प्राप्त हो जाती है जबकि प्रति एकड़ औसत लागत रु. 0.12 लाख अर्थात् प्रति एकड़ शुद्ध आय रु. 0.25 लाख प्राप्त होती है। इस कृषि जलवायु क्षेत्र में मेंथा की खेती काफी लोकप्रिय है। ऑवला की खेती से प्रति एकड़ प्राप्त होने वाली वार्षिक आय रु. 0.02 से 0.06 लाख रही।

- सतपुड़ा का पठार कृषि जलवायु क्षेत्र में सागौन एवं यूकेलिप्टस के रोपण पाये गये। औषधीय प्रजतियों के अंतर्गत सर्वाधिक रूप से ऑवला एवं 1–1 कृषक के द्वारा आंशिक रूप से सफेद मूसली एवं एलोयवेरा की खेती की जा रही है। क्षेत्र में समूह रोपण के अंतर्गत सागौन की औसत छाती गोलाई 12. 14 से.मी. पाई गई। विभिन्न प्रकार की मिट्टियों में किये गये रोपण में से सर्वाधिक औसत वृद्धि दोमट मिट्टी के रोपण में पाई गई। जबकि लाल मिट्टी के रोपण में पौधों की औसत वृद्धि सबसे कम पाई गई। लाल मिट्टी में किये गये यूकेलिप्टस रोपण में पौधों की आलोच्य अंतराल में औसत वृद्धि बहुत कम (9.73 सेमी.) पाई गई। इसी प्रकार ऑवला की खेती से प्रति एकड़ वार्षिक आय रु. 0.02 से 0.75 लाख एवं सफेद मूसली की खेती में प्रति एकड़ औसत आय रु. 2.68 लाख ऑकलित की गई।

- मालवा का पठार कृषि जलवायु क्षेत्र के अंतर्गत निजी भूमि में केवल सागौन का रोपण पाया गया। जबकि औषधीय प्रजातियों के अंतर्गत ऑवला, अश्वगंधा, ईशबगोल एवं सफेद मूसली की खेती पाई गई। समूह रोपण के अंतर्गत सागौन की औसत छाती गोलाई 21.95 से.मी. पाई गई। इस कृषि जलवायु क्षेत्र के अंतर्गत इन्दौर और बड़वानी जिले में सफेद मूसली की खेती की जा रही है तथा कृषकों को न्यूनतम प्रति एकड़ लगभग रु. 0.38 लाख एवं अधिकतम रु. 1.78 लाख शुद्ध वार्षिक आय प्राप्त होती है। ईशबगोल की खेती में न्यूनतम प्रति एकड़ लगभग रु. 0.11 लाख एवं अधिकतम रु. 0.45 लाख, अश्वगंधा की खेती से न्यूनतम प्रति एकड़ लगभग रु. 0.19 लाख एवं अधिकतम रु. 0.25 लाख तथा ऑवला की खेती से न्यूनतम प्रति एकड़ लगभग रु. 0.02 लाख एवं अधिकतम रु. 0.09 लाख प्रति वर्ष प्राप्त होते है।

- निमार कृषि जलवायु क्षेत्र के अंतर्गत भी निजी भूमि में केवल सागौन एवं औषधीय प्रजातियों के अंतर्गत ज्यादातर ऑवला का रोपण पाया गया केवल एक कृषक के खेत में सफेद मूसली की खेती पाई गई जो दीर्घकाल से परम्परागत करता चला आ रहा है। समूह रोपण के अंतर्गत सागौन की औसत छाती गोलाई 26.31 से.मी. पाई गई। ऑवला की खेती से कृषकों को न्यूनतम प्रति एकड़ लगभग रु. 0.01 लाख एवं अधिकतम रु. 0.13 लाख वार्षिक आय प्राप्त होती है जबकि खरगोन जिले में सफेद मूसली की खेती से कृषक को प्रति एकड़ रु. 1.83 लाख की वार्षिक आय प्राप्त हो जाती है।

- झाबुआ की पहाड़िया कृषि जलवायु क्षेत्र में एक मात्र प्रजाति सागौन का एवं 1 कृषक के खेत में ऑवला का रोपण पाया गया। समूह रोपण के अंतर्गत सागौन की औसत छाती गोलाई 21.45 से.मी. पाई गई। सर्वाधिक औसत छाती गोलाई दोमट मिट्टी के रोपण में पाई गई तथा सबसे कम लाल पथरीली अनुपजाऊ भूमि के रोपण में पाया गया। इसी प्रकार ऑवला की खेती से प्रति एकड़ प्राप्त होने वाली वार्षिक आय रु. 0.16 लाख रही।

Current status of the Project-: Completed

Ongoing Projects : Three

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.

Progress:

1. Market information

- Periodical market survey and collection of market rates from national, state level, district & village level markets in Madhya Pradesh, Maharashtra and Chhattisgarh was done. Van Dhan Newsletter Vol 14 was published and disseminated.

2. Market promotion

- Two Market promotion workshops/ meetings were organized at Chhindi (Chhindwara district) and Ghunghuli, (Umaria district).

3. Market research

- Grade standards for 27 NTFPs were documented.
- Value chain analysis of 10 important medicinal plants was completed.
- Price trends of 58 important medicinal species were prepared.
- Analysis of prices collected from 2001-2014 was done for 58 species.
- Annual progress report.

Current status of the project: on going

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.

Activities carried out during the year:

- Driage of *Gloriosa superba L.* has been completed. Under three treatments
  1. Oven drying
  2. Sun drying
  3. Room temperature
- On the basis of size of samples each treatment was subdivided into:

  T1 : > 1 inch

  T2 : 1-2 inch

  T3 : 2-3 inch

Table 1: Driage percentage of Gloriosa superba L.

S. No	Treatment	Fresh eight (gms)	Days	Sub treatments	Driage percentage	Mean Wt.	SD	CV
1.	Oven drying	50	5	T1	80.0	10.0	0.61	6.1
				T2	82.0	9.0	1.6	18.2
				T3	84.4	7.8	2.3	30.1
2.	Sun drying	50	6	T1	89.4	5.3	0.6	10.8
				T2	82.6	8.7	1.5	17.6
				T3	86.0	7.0	4.0	57.1
3.	Room temperature	50	6	T1	84.6	7.7	2.1	27.2
				T2	82.6	8.7	2.9	33.3
				T3	77.4	11.3	6.8	60.1

Maximum driage percentage was reported from samples (>1 inch size) in sun and room temperature drying. However, oven drying reported maximum driage from samples varing (2-3 inch size) due to availability of comparatively high moisture content which was rapidly dried in oven.

- Driage of *Cassia fistula* has been completed.

  Samples were divided into two treatments
  - T1 Sun driage
  - T2 Shade driage

Table 2: Driage percentage of *Cassia fistula*

Draige percentage of Amaltas seeds							
S. No.	**Treatment**	**Fresh weight (gms)**	**Days**	**Draige %**	**Mean wt.**	**SD**	**CV**
1	Sun drying	80.0	8.0	25.5	59.6	1.3	2.3

2	Shade drying	80.0	9.0	22.5	62.0	1.0	1.6

Maximum driage % (25.5) was reported in sun drying.

Current status of the project: on-going

3. 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 upto 2000

Current status of the project: on going

Newly initiated project during the year
Externally funded : Two

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	:	3 years (April. 2014 – March, 2017)
Sponsoring Agency	:	APCCF, (R/E & Lok Vaniki), MP Bhopal
Principal Investigator	:	Dr. G. S. Mishra
Project Staff	:	Pradeep Kumar Kushwaha Virendra Kumar Bind

उद्देश्य :

- प्रजातिवार गोंद संग्रहण क्षेत्र एवं मात्रा का ऑकलन।
- जिलेवार गोंद संग्रहण की प्रचलित विधि, गोद उत्पादन में होने वाली कमी एवं वृद्धि के कारणों का ऑकलन।
- गोद की विपणन प्रक्रिया, बाजार एवं कीमत निर्धारण प्रकिया का अध्ययन।
- विभिन्न प्रजाति की खाद्य एवं अखाद्य गोंदो के परम्परागत औषधीय उपयोग का अध्ययन।

Activities carried out during the year:

- मध्यप्रदेश के दमोह, डिंडोरी, मंडला, बालाघाट, सागर, सिवनी, छिन्दवाड़ा, शिवपुरी, श्योपुर, मुरैना, ग्वालियर, में प्रारम्भिक सर्वेक्षण का कार्य तथा दमोह जिले में गोंद के संग्राहकों का सामाजिक आर्थिक सर्वेक्षण का कार्य पूर्ण किया जा चुका है।

Important findings:

- कुल्लू गोंद संग्रहण के लिए की जाने वाली टेपिंग के कारण इस प्रजाति के वृक्षों को भारी क्षति पहुॅची है। प्रारम्भिक सर्वेक्षण के दौरान प्राप्त जानकारी एवं जंगल में भ्रमण के दौरान पाया गया

कि भारी भरकम वृक्ष अप्राकृतिक विदोहन के कारण या तो सूख गये या टूटकर गिर गये है। श्योपुर वन मंडल में टेपिंग के कारण कुल्लू के वृक्षों के नष्ट होने के प्राप्त प्रमाण के फोटोग्राफ प्रबन्ध निदेशक, लघुवनोपज सहकारी संघ, भोपाल तथा वन मंडलाधिकारी, श्योपुर को उचित कार्यवाही हेतु प्रेषित कर दिये गये हैं।

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	:	03 Years (Aug.,2014 – July, 2017)
Sponsoring Agency	:	Indian Institute of Natural Resins and Gums, Ranchi
Principal Investigator	:	Dr. Pratibha Bhatnagar
Co- PI	:	Dr. Mayank Verma

Objectives :

- Conduct survey of the area for lac-insects 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 and/or host plants.

Activities carried out during the year:

- Regional lac germplasam bank was established in the nusery and *Flemingia microfila* were transplanted in pots and bag. A number of instruments equipment, furniture and computer desktop were purchased. A lac insect cooperating centre was established in the institute.

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

Completed project during the year : Nil

Internally funded : Nil

Externally funded : Four

1. The study on top drying of *Gmelina arborea* and its management.
2. Science plan for utilization of automatic weather station and agro-meteorological station data in Madhya Pradesh. India in collaboration with MP Forest Department.
3. Establishment of leaf orchard of Tendu.
4. Development of suitable nursery techniques of some important rare species of Madhya Pradesh forests.

On-going projects

Internally funded : Nil

Externally funded : Four

1. Integrated management of diseases of economically important tree species Dhawada, Bija and Achar occurring in forests of M.P.
2. Causes and remedial measures of sal mortality (*Shorea robusta*) in forest areas of M.P.
3. Establishment of Bambosetum and Bamboo Interpretation Centre at SFRI Jabalpur
4. Selection of superior races of Khamer (*Gmelina arborea*) through clonal propagation

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 : Four

1. Title : The study on top drying *of Gmelina arborea* and its management.

Project ID	:	TI/P/E/13-14/02
Project Period	:	April 2013 – March. 2015
Sponsoring Agency	:	APCCF (R/E & Lok Vaniki), MP Bhopal
Principal Investigator	:	Dr. Jyoti Singh

Objectives:

- To study the biotic and abiotic factors affecting top drying.
- To study the impact of microbial flora and edaphic factors on top dying.
- Survey of study sites to know about the effect of crop composition on top dying.
- To study the mode of infection and conditions favourable for disease development.
- Preparation of check list of organism causing the disease.
- To evolve suitable management strategies and its dissemination to users.
- Preparation of working manual to field officers for management of top drying.

Findings

In the present study pathogens and other factors which cause top drying in khamer have been studied in detail and efforts were made for management of the problem. We screened some commercially available fungicides viz. Bavistin, Diathane M-45, Fytolon and Thyrum were

applied in three concentrations, 0.1%, 0.2%, 0.3% concentration to find out appropriate dose that kills the pathogen under laboratory and field conditions. Result obtained from study clearly indicate that Diathane M -45 at 0.3% is most effective against pathogens. Diathane M -45 0.3% is used to drench soil to prevent inoculums buildup which later on cause disease. However Diathan M-45 at 0.3% is quite effective against top drying causing pathogen when good sanitation practices were strictly followed. The canker disease can be effectively controlled by spraying Dithane M-45, 0.3 percent in the end of July. Subsequently two more spray, one in early August and second in mid of August can successfully control the disease in the field.

Current status of project: Completed

2. Title : Science plan for utilization of automatic weather station and agro-meteorological station data in Madhya Pradesh, India in collaboration with MP Forest Department.

Project ID	:	TI/P/E/09-10/04
Project Period	:	Nov. 2009 to March 2015
Sponsoring Agency	:	Madhya Pradesh Forest Deptt., Bhopal and SAC, Ahmedabad
Principal Investigator	:	Dr Sachin Dixit
Co-PI	:	Dr. Jyoti Singh

Objectives :

- To collect data on height and girth of forest trees in different forest types of protected areas.
- To estimate the litter biomass in different forest types of protected areas.
- To estimate the herbaceous biomass in different forest types of protected areas.
- Soil analysis study in different forest areas.

Findings:

- Height and GBH of trees in plots are recorded and given below:

SN	Name of park/ sanctuary	Total species	No. of trees	Av Girth (cm)	Av Ht (m)
1	Kanha National Park	46	726	73.9	18.3
2	Bandhavgarh NP	40	431	72.4	14.5
3	Madhav National Park	17	541	48.0	6.9
4	Gandhisagar wild life sanctuary	15	269	51.6	6.6
5	Omkareshwar	26	488	60.8	12.2

- Soil samples were collected and analysed for pH, water holding capacity, EC, carbonic matter, soil moisture, Nitrogen, Phosphorus, Patassium and Calcium.
- Average herbaceous biomass and litter biomass were estimated for all selected parks and given below:

SN	Name of park/ sanctuary	Herbaceous biomass (q/ha)	Litter production (q/ha)
1	Kanha National Park	16.5	78.0
2	Bandhavgarh NP	20.9	97.6
3	Madhav Natinal Park	39.1	82.6
4	Gandhisagar wild life sanctuary	17.5	20.4

5	Omkareshwar	23.1	17.7

- All the collected data sent to SAC, Ahemdabad and PCCF (Project), Bhopal

Current status of project: Completed

3. Title : Establishment of leaf orchard of Tendu.

Project ID	:	TI/E/P/10-11/21
Project Period	:	March, 2011 - March, 2014 (Extended upto September 2014)
Sponsoring Agency	:	MPMFP (T&D) Fed. Bhopal
Principal Investigator	:	Dr. O. P Chaubey
	:	Dr. Sachin Dixit
	:	Dr. Jyoti singh

Objectives :

- To develop protocol for raising tendu leaf orchard.
- To develop tendu leaf resources near villages.
- To demonstrate and train the tendu leaf pluckers.

Findings

- Six forest divisions are identified as potential pockets of tendu leaves. These are Singroulli, Damoh, West Mandla, Balaghat, West Chhindwara and south Seoni.
- Poly-potted technique is the best propagation technique in open and shaded condition over other tried techniques i.e. naked seed, seedling, root-trainer, root-shoot and root-sucker.

Current status of project: Completed

4. Title : Development of suitable nursery techniques of some important rare species of Madhya Pradesh forests.

Project ID	:	TI/P/E/12-13/11
Project Period	:	April, 2012 - March, 2014 (Extended upto September 2014)
Sponsoring Agency	:	APCCF (R/E & Lok Vaniki), MP Bhopal
Principal Investigator	:	Dr. O. P Chaubey
Co-PI	:	Dr. Sachin Dixit
	:	Dr. Jyoti Singh

Objectives:

- To collect germplasm of important rare and endangered tree species namely.
- To know the impact of growth hormone on seed dormancy.
- To standardize size of polythene bag for optimum growth in nursery.
- To standardize size of root trainer for optimum growth in nursery.
- To determine best potting mixture for better growth of targeted species in nursery.
- To develop a field manual on nursery techniques (protocol development) of targeted species.
- To supply quality plans of targeted species to forest department to strengthen the germplasm.

Findings:

- Seed dormancy is recorded in Haldu & Kuchla and was broken when seeds were treated with 40 ppm concentration of GA3 or 100 ppm concentration of IBA hormones.
- Warm water found the best seed pre-treatment for good germination of Haldu, Kardhai, Mundi & Kuchla, while cold water found the best for Garari, Dahiman & Kullu. Extracted kernel, moist moss grass/coir pit and sowing of puncture seed are the best seed pre-treatment for good germination of Tinsa, Rakt Chandan & Ritha, respectively.
- Big size of polythene (28x14 cm) found the best for better growth of seedlings of Haldu, Kardhai, Garari, Mundi, Tinsa, Rakt chandan & Ritha, while medium size of polythene (25x11 cm) found the best for Dahiman, Kullu & Kuchla.
- Large cup root-trainer (315 cu cm) found the best for better growth of seedlings of Haldu, Garari, Kardhi, Mundi, Tinsa, Rakt chandan & Ritha, while medium size of root-trainer (187 cu cm) found the best for Dahiman, Kullu & Kuchla.
- FYM with soil & sand in ratio of 1:1:1 found the best for growth of seedlings of Haldu, Dahiman, Mundi, Tinsa, Rakt chandan, Ritha, Kullu & Kuchla, while leaf-litter with soil & sand in ratio of 1:1:1 found the best for Haldu & Kardhai.

Current status of project: Completed

On-Going Projects: Four

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

Project ID	:	TI/P/E/13-14/03
Project Period	:	April 2013 – March 2016
Sponsoring Agency	:	APCCF (R/E & Lok Vaniki), MP Bhopal
Principal Investigator	:	Dr. Jyoti Singh

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.

Achievements:

- Isolation and Identification is done.
- Observation of given treatment is in progress.
- Survey of infected areas of forests of selected sites is done in rainy, winter and summer season to identify the intensity of diseases in relation to seasonal variations is done.
- For examination of fungus samples of infected leaves, bark, root and stem were collected & isolation is done and identification of pathogens found on the affected trees is in progress.
- Examination of soil samples of 30cm, 60cm and 90 cm depth collected from all sites is done.
- An 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

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

Project ID	:	TI/P/E/13-14/04
Project Period	:	April 2013 - March, 2016

Sponsoring Agency	:	APCCF (R/E & Lok Vaniki), MP Bhopal
Principal Investigator	:	Dr. Jyoti Singh

Objectives:

- To study the intensity of diseases in relation to seasonal variation.
- To study the impact of microbial flora, edaphic factors, girth at breast height and coppicing on sal mortality in natural forests
- To develop suitable methods for management of diseases and prepare working manual for the same.
- 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.

Achievements:

- 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 are in progress.
- Data collection to study effect of girth at breast height, height of affected trees and climatic condition of study site is recorded.
- Examination of soil samples of 30cm, 60cm and 90 cm depth collected from all sites is done.

Current status of project: On-going

3. Title : Establishment of Bambosetum and Bamboo Interpretation Centre at SFRI Jabalpur.

Project ID	:	TI/P/E/10-11/01
Project Period	:	April 2010 – March 2011 (Extended upto Sept. 2015)
Sponsoring Agency	:	MP Forest Department, Bhopal
Principal Investigator	:	Dr. Sachin Dixit
Co-PI	:	Dr Jyoti Singh

Objectives :

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

Achievements :

- Bamboo articles have been collected.
- Maintained bambosetum
- Bamboo interpretation centre established at SFRI building.

Current status of project: On-going

4. 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.

Achievements:

- A total of 21 plus trees of khamer has been identified from Raipur, Bilaspur, Korba, Rewa, Chhindwara and Jabalpur.
- A total of 427 cuttings from 05 plus trees has been collected and raised in nursery. The cuttings were treated with 2000 ppm of IBA hormone.

Current status of project: On-going

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 Khamer (4), Aonla (01), Bhilwa (02) and Achar (01) 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 phonological 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 28.6 cm and 5.55 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 in the orchard.
- Bordeaux mixture has been applied in trees of the orchards.
- Barbed wire fencing was done.

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 :

- Barbed wire fencing was completed.
- Weeding and soil working was done 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 provenances (places) were planted in 3 replication at the spacing of 3m x 3m. A total of 120 plants were raised at SFRI campus.
- Maximum girth is recorded in Patalkot provenance(14.03 cm) while height is recorded highest in Rewa provenance (2.13 m)

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

K.V. Diwakar, IFS	**:**	Dy. Director (Extension)
Anirudhwa Sarkar	**:**	Research Officer

Activities

- Publication of Annual Research Report and Annual Action Plan of the institute.
- Organization of trainings, workshops, meetings and seminars.
- Participation in 'Kishan Mela', herbal fairs' and public events.
- Providing logistic support and co-ordination with different branches and allocation of ID Nos. to research projects.
- Maintainance 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.

Dissemination of information through publications

a. Annual Action Plan

The Annual Action Plan of the institute for the year 2014-2015 was compiled and prepared on quarterly basis from April 2014 to March 2015 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 2013-2014 was prepared, published, and disseminated to all the stakeholders.

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

i) 04 Residentital training programme on nusery training and management of field staff of Research and Extension Circle of MP Forest Department were conducted in four phases. The training programmes were attended by 99 trainees from Sagar, Betul, Bhopal, Jabalpur, Rewa, Seoni, Indore and Khandwa circles.

ii) Trainee Forest Range Officers posted in various forest divisions of M.P. and forest guards from Forestry Training School Panchmarni, 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

Dr. Gauri Shankar Shejwar Hon'ble Forest Minister and shri Sharad Jain, Hon'ble Minister of State, Health Department, Govt of M.P. visited the institute on 14th August, 2014 Plantation was done by Hon'ble Ministers in the Medicinal Plants Gene Bank of the institute.

Organization of meetings

S. N.	Meeting	Place	Date of organization
1.	28th meeting of Board of Governors of SFRI, Jabalpur	MPMFP Federation, Bhopal	2nd September 2014
2.	41st Research Advisory Committee of SFRI, Jabalpur	SFRI, Jabalpur	9th May 2014
3.	International herbal fair organized by MPMFP, Federation, Bhopal	Bhopal	19 to 23 Dec. 2014
4.	महाकौशल वन एवं व्यापार मेला 2015	Jabalpur	1st to 5th March 2015
5.	Market promotion meeting	Chhindi (Chhindwara district)	12.11.14
6.	Market promotion meeting	Ghunghuli (Umaria district)	11.1.15

Organization of Seminars/Symposiums/Workshops

S.N.	Topic	Organized by	Date	Participants
1.	5th Kamta Prasad Sagreiya Memorial lecture by Prof. Promode Kant, Director Institute of Green Economy, Noida, New Delhi on "What role can forests play in India's intended nationally determined contributions at the Paris Climate Summit"	SFRI & Society of Tropical Forestry Scientists, Jabalpur	18th February, 2015	Senior Forest Officers, Scientist, Research Officers and Research Scholars form various Forest Circles, Universities and Staff of SFRI

Organization of trainings

S.N.	Name of the programme	Organized by	Date	Organized for	No. of participants
1.	लघुवनोपज एवं औषधीय पौधों के सतत् विदोहन, प्रसंस्करण एवं उचित मूल्य वृद्धि प्रशिक्षण	S.F.R.I Jabalpur (Dr.R.K.Pandey, Mrs. Madhuri Shrivastava Mr. Vinay Kori)	Dec.03-11-2014 Dec.06-12-2014 Dec.09-16-2014 Jan.19-26-2015	लोक संरक्षित वनक्षेत्र जबलपुर, छिन्दवाडा, अनुपपुर, सतना के समिति सदस्यों	273
2.	Establishment, maintenance and periodic measurement of sample plots.	M.P. Forest Department	April 2014 - March 2015	Trainee Forest Rangers	Jabalpur- 5 Panna- 2 Guna-1 North Seoni- 1 South Seoni- 3 Badwani- 1 Katni- 4
3.	Training and demonstration on "Establishment and management of seed production areas, seed	SFRI, Jabalpur	17-19 September, 2014 08-10 December, 2014 26-28 February, 2015	Field foresters of 15 Forest Divisions and 03 R&E Centers	235

S.N.	Name of the programme	Organized by	Date	Organized for	No. of participants
	collection, testing, processing, storage, pretreatment and nursery management."				
4.	Training on seed collection, processing, storage, pre-treatment and nursery management with special reference to teak seed collection and plant preparation held at SFRI, Jabalpur, as resource person.	SFRI, Jabalpur	16.10.14 to 17.10.14, 10.11.14 to 11.11.14 and 13.11.14 to 14.11.14	Field foresters of MP Forest department (R&E and Lokvaniki circles of Jabalpur, Bhopal, Seoni, Ratlam, Sagar, Betul, Khandwa, Indore and Rewa)	Approx 60
5.	Imparted trainings on seed collection, storage, pre-sowing treatment, seed testing and seed certification, etc. through lectures and demonstration.	SFRI, Jabalpur	05.04.14, 21.04.14, 30.04.14, 07.06.14, 08.06.14, 11.06.14, 16.06.14, 18.06.14 & 21.07.14	Trainee forest Rangers and forest guard Seoni, Bhopal, Panna, Jabalpur, Gwalior, Lakhnadaun, Betul, Amarkantak, Shivpuri	356
6.	Seed collection, testing and certification	SFRI, Jabalpur	30.03.15	Farmers of Kashi Banaras	47
7.	Training on sustainable harvesting, primary processing, Storage, grading and marketing techniques of *Boswellia serrata, Sterculia urens and Anogeissus latifolia*	SFRI, Jabalpur	3.07.2014 to 05.07.2014	Gum collectors Shivpuri	101
8.	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	SFRI, Jabalpur	9.1.15 10.1.15 11.1.15 12.1.15 13.1.15 15.1.15	Bilaspur Ghunghuli Nigahri Karmasan Hata Sinoni	95 51 95 81 69 114

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

S.N.	Name of the programme	Organized by	Date	Participants
1.	Flowering Plant Reproduction & Diversity.	Dept. of Botany Fatima Mata National College, Kollam, Kerala.	09.01.2015 to 10.01.2015	Dr. Uday Homkar
2.	Underutilized and wild edible plants of India 'Future Crops"	Department of Botany, University of Kerala	December 10 & 11, 2014	Dr. Uday Homkar
3.	Sustainable Livelihoods Development through Non Timber Forest Products: Issues, Challenges and Way Forward	Society for Resource Integration and Development Action (SRIDA) Centre, Post- Barela, Mandla Road, Jabalpur- 483001 (M.P.) India.	26 to 27 September 2014	Dr. Uday Homkar
4.	राष्ट्रीय संगोष्ठी–सह–क्रेता विक्रेता सम्मेलन औषधीय एवं सगंध पौघो की उन्नत कृषि प्रसंस्करण एवं व्यवसाय	पादप कार्यिकी विभाग ज.ने.कृ.वि.वि.,जबलपुर	12–13 अगस्त, 2014	Dr. Uday Homkar
5.	National work shop on Carbon sequestration in forest and Non forest Ecosystem.	Dept. of forestry JNKVV, Jabalpur - 482004	16-17 February 2015	Dr. Uday Homkar Dr. S.K. Masih Dr. Sachin Dixit, Anupama Goswami,
6.	Biodiversity act 2002	TFRI, Jabalpur	19-20 March 2015	Dr. Uday Homkar & Dr. S.K. Masih
7.	National Seminar on "Bamboo for better future"	Madhya Pradesh State Bamboo Mission	5-6 June, 2014	Dr. O.P. Chaubey
8.	National seminar on technologies for sustainable production through climate resilient agriculture	JNKVV, Jabalpur	12-13 July, 2014	Dr. O.P. Chaubey
9.	National symposium on processing and marketing of medicinal and aromatic plants for improvement of agriculture	JNKVV, Jabalpur	12-13 August, 2014	Dr. O.P. Chaubey
10.	Workshop on "Establishing Forest Field Labs for Monitoring Climate Change Impacts in Forests"	IIFM, Bhopal	30 Sept, 2014	Dr. O.P. Chaubey

S.N.	Name of the programme	Organized by	Date	Participants
11.	National workshop on Carbon Sequestration in Forest and Non Forest Ecosystem	JNKVV, Jabalpur	16-17 Feb 2015	Dr. O.P. Chaubey
12.	Meeting on Science plan for utilization of automatic weather station and agro-meteorological station data in Madhya Pradesh	ISRO, Ahemdabad (Gujarat)	06 February 2015	Dr. O.P. Chaubey
13.	Three days National Workshop on " Research Methodology for Forestry"	IIFM, Bhopal	26-28 March 2015	Mohd Asif Mansoori, Tanvi Telang, Ruby Duggal, Smita Rajpur, Anupama Goswami, Alok Raikwar
14.	National workshop on corbon sequestration in forest and non forest ecosystem	EPCO Bhopal, NABARD Bhopal & MPCST Bhopal organized by Deptt. of Forestry JNKVV Bhopal	Feb -16-17-2015	Dr. R.K. Pandey Dr. Anjana Rajput , Smt. Richa Seth
15.	Managing crop damage by wild animals at Bhopal	RCVP Noronha Academy of Administation Bhopal	14-15 Feb 2015	Dr. R.K. Pandey Dr. Anjana Rajput ,
16.	5th Kamta Prasad Sagreiya Memorial lecture by Pramod Kant Director, Institute of Green Economy	SFRI & Society of Tropical Forestry Scientists, Jabalpur	18th Feb, 2015	Dr. R. K. Pandey, Dr. Anjana Rajput, Shri Rakesh Jain, Smt. Madhuri, Shrivastava, Shri Vijay Haldkar, Shri Shailendra Nema, Dr. O.P. Chaubey, Dr. A.K. Sharma, Mohd Asif Mansoori, Suresh Charmkar, Smt. Richa Seth, Dr. Sachin Dixit, Mrs. Anupama Goswami
17.	13th Silvicultural Conference	ICFRE, Dehradun	24-28 Nov. 2014	Shri S.K. Jain
18.	Role of Scientists in natural resource management and envrionment.	IIFM, Bhopal	16-20 Feb. 2015	Shri S.K. Jain, Dr. Pratiksha Chaturvedi, Dr. Jyoti Singh
19.	Winter training course Training on instrumentation	TFRI, Jabalpur	23-27 February, 2015	Dr. Pratiksha Chaturvedi, Smt. Manjula Parihar
20.	What role can forests play in india's intended nationally determined contributions at the paris climate summit	RDVV Jabalpur	18-02-2015	Mayank Makarand Verma, Suryakant Choubey

S.N.	Name of the programme	Organized by	Date	Participants
21.	Workshop on “Integrating Biodiversity Conservation & Human Well Being: Landscape Approach” under BCRLIP	WII Dehradun	17-11-2014 to 19-11-2014	Mayank Makarand Verma
22.	Walk in the Tiger Corridor "An awareness expedition in the wildlife corridor between Kanha and Pench tiger reserves"	WWF India	23-11-2014 to 29-11-2014	Mayank Makarand Verma
23.	Up-gradation of communication skills & Application of PRA tools in Agriculture extension	Extension Education Institute (Western Region) Anand Agriculture University Campus . Anand – 388110 (Gujarat) Research & Extension circle, Forest Deptt. Jabalpur (M.P.)	09 Mar 2015 10 - 11 Mar 2015	Shri Raghavendra Bisen
24.	Training Programme on “Network Project on conservation of Lac insect genetic resources.” at IINRG Ranchi	IINRG Ranchi	23-02-2015 to 28-02-2015	Mayank Makrand Verma
25.	World Ayurveda congress 2014	Dept. of Ayush Ministry of health and family welfare, Govt. of India, New Delhi	6.11.14 to 9.11.114	Radhika Urmalia
26.	Training on Instrumentation	Non Wood Forest Produce Division, Tropical Forest Research Institute, Mandla Road, Jabalpur	23.02.15 to 27.02.15	Dr. Sachin Dixit, Sr. Research Officer Dr. Jyoti Singh, Sr. Research Officer
27.	4th National seminar and Exhibition on "Spices and Herbs"	NDMC convention centre, New Delhi	18th April, 2015	Dr. Pratibha Bhatnagar

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. Palash	:	Dy. Director
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 60 technical bulletins and 44 extension series till date which are available for sale.

Journal Section

The branch is well furnished with a reading room. During the year 22 journals were subscribed for reference to the users.

Achievements during the year

1. Four issues of Vaniki Sandesh (Vol. 5 New No. 1-4) were published.
2. 21 project reports were documented.
3. A sum of Rs. 20229/- was received from the sale of bulletins, extension series, Vaniki Sandesh and Van Dhan.
4. 35 periodicals were received and displayed.
5. 370 articles were selected, photocopied, classified and filed into ledger files.
6. 150 damaged pages of ledger files were replaced by xerox copies.

Periodicals subscribed during the year 2014-2015

S. N.	Name of the Journal
1.	Annals of Forestry
2.	Sci tech Journal
3.	PTI Science Service
4.	Economic and Taxonomic Botany (Addl. Series 40)
5.	Current Science
6.	Economic and Political Weekly
7.	Indian Journal of Forestry
8.	Journal of Non Timber Forest Products
9.	Journal of Economic & Taxonomic Botany
10.	Journal of Genetics
11.	The Indian Forester
12.	TIDEE
13.	Journal of Tropical Forestry
14.	Indian Phyto-pathology
15.	JMAPS
16.	Indian Journal of Tropical Biodiversity
17.	Medicinal & Aromatic Plants Abstract
18.	Journal of Mycology and Plant Pathology
19.	वनधन व्यापार (संस्थान द्वारा प्रकाशित)
20.	वानिकी संदेश (संस्थान द्वारा प्रकाशित)
21.	Heritage Amruth
22.	Sanctury Magazine

S.F.R.I PUBLICATIONS

1. Technical bulletins

S N.	Bulletin No.	Title	Year	Price
1	2	Volume Table of *Terminalia tomentosa* 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 *Ranunculaceae* to *Polygonaceae* 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

S N.	Bulletin No.	Title	Year	Price
7	12	Standard volume tables of *Boswellia serrata* for Nimar tract in M.P.	1971	70.00
8	15	Bark Table for *Boswellia serrata*	1971	25.00
9	16	Family *Linanceae* to *Berseraceae*	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
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 पौधौं 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 *Buchanania lanzan* 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

S N.	Bulletin No.	Title	Year	Price
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

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 लेडिंया	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
22.	सफेद मूसली (क्लोरोफाइटम बोरिविलियानम)	2001	5.00
23.	कलिहारी (ग्लोरिओसा सुपरबा)	2001	5.00
24.	सनाय (केसिया आगस्टफोलिया)	2001	5.00

Ext. Series	Title	Year	Price
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 *Alectra chitrakutensis*	2011	60.00
34	Monograph on *Ceropegia bulbosa and Ceropegia macrantha*	2011	60.00
35	Monograph on *Crateva magna* and *ficus cupulata*	2011	60.00
36	Monograph on *Dioscorea tomentosa, D. wallichia* and *d. alata*	2011	60.00
37	Monograph on *Flemingia stricta* and *F. paniculata*	2011	60.00
38	Monograph on *Guggal (Commiphora wightii)*	2011	60.00
39	Monograph on Maida tree (*Litsea glutinosa)*	2011	60.00
40	Monograph on Padri tree (*Radermachera xylocarpa)*	2011	60.00
41	Monograph on Shyonaka (*Oroxylum indicum)*	2011	60.00
42	Some ethnic plants in cure of various human diseases	2011	250.00
43	कमरकस (पलाश) गोंद का सतत् विदोहन, प्राथमिक प्रस ंस्करण, श्रेणीकरण एवं भण्डारण तकनीकों का प्रदर्शन	2012	-
44	साल बोरर से साल वनो की सुरक्षा	2014	-

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 S. K. Palash	:	Dy. Director
Shri S. K. Jain	:	Asst. Director
S.S. Raghuvanshi	:	Senior Research Officer
Girish Kumar Shukla	:	Research Assistant

Activities

During the year 2014-2015, 20 new books were received with the total as under:

1.	Books (including 2631 gratis books)	7530
2.	Reports (Govt. and NGO's)	382
3.	Indian Forest Records	641
4.	Working Plans	1428
5.	Sanctuary Plans	24
6.	Working Schemes	85
7.	Forest Resource Surveys	27
	Total	**10117**

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	64 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

S.N. Nachane	:	Addl. 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 - 35, 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 Multidisciplinary Research and Development	Potential of botanic for the management of forest insect of Madhya Pradesh, India : an overview	R.S. Patel, Dipika Patel, Rita Bhandari, Uday Homkar and A.K. Gill.	1(7)	135-142
2.	International Journal of Bio-Science and Bio-Technology	Bio-reclamation of degraded ecosystem	O. P. Chaubey, Jamaluddin and Ram Prakash	(2014) Vol. 6(4)	145-154
3.	International Journal of Mycorrhizae News	Microbial restoration of degraded lands through plantation forests	O.P. Chaubey, Priyanka Bohre, Archana Sharma and Jamaluddin	(2014) Vol. 26(1)	9-14
4.	International Journal of Bio-Science and Bio-Technology	Structural and functional aspects of Sal (*Shorea robusta Gaertn. f.)* Forests in Kanha Tiger Reserve (KTR)	O.P.Chaubey and Archana Sharma	(2014) Vol. 6 (6)	49- 66
5.	Global Journal of Science Frontier Research: C Biological Science (USA)	Restoration of degraded lands through plantation forests	P. Bohre and O.P. Chaubey	(2014) Vol.14 (1)	19-27
6.	International Journal of Bio-Science and Bio-Technology	Biomass production and carbon sequestration by *Pongamia pinnata (Linn) Pierre* in tropical environment	P. Bohre, O.P. Chaubey and P.K. Singhal	(2014) Vol. 6 (2)	129-140
7.	Journal of Forestry Research (JFR), China (International Journal)	Biomass production and carbon sequestration by Azadirachta indica A. Juss	P. Bohre, O. P. Chaubey and P. K. Singhal	Accepted in (2014)	-
8.	International Journal of Bio-Science and Bio-Technology	Biotechnological approach to enhance the growth and biomass of *tectona grandis linn. f*. (teak) seedlings	Archana Sharma and O.P. Chaubey	(2015) Vol. 7(1)	19-28
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	O.P. Chaubey, Archana Sharma and G. Krishnamurthy	(2015) Accepted and publish in Vol. 7 (2)	-
10.	International Journal of Bio-Science and Bio-Technology	*Ex-situ* conservation of indigenous, threatened and ethno-medicinal diversity of forest species	O.P. Chaubey, Archana Sharma and G. Krishnamurthy	(2015) Accepted and publish in Vol. 7 (2)	-
11.	International Journal of Bio-Science and Bio-Technology	Phyto-diversity and population structure in southern moist mixed deciduous forest of Bori Wild Life Sanctuary of Madhya Pradesh, India	O.P. Chaubey, Archana Sharma and G. Krishnamurthy	(2015) Accepted and publish in Vol. 7 (3)	-

S.N.	Name of Journal	Title of paper	Author(s)	Vol. No.	Page No.
12.	Ecological Management of Bamboo Resource in India" (eds O.P. Chaubey, Archana Sharma and G. Krishnamurthy), Aavishkar publishers, distributors Jaipur, Raj. 302 003 India	Policy issues for sustainable management of Bamboo Forests	P.K. Shukla and O.P. Chaubey	(2015) Book is under printing/ publish	-
13.	-do-	Ecological management and rehabilitation of bamboo resource.	O.P Chaubey	(2015) Book is under printing/ publish	-
14.	-do-	Taxonomic identification of bamboo resource.	O.P Chaubey	(2015) Book is under printing/ publish	-
15.	-do-	Bamboo to enterprise development.	O.P. Chaubey	(2015) Book is under printing/ publish	-
16.	Journal of Tropical Forestry.	Sustainable utilization and conservation of leaves of Bauhinia vahlii: prospect of livelihood to the rural tribal communities in tropical forests of Madhya Pradesh.	R.K. Pandey	Vol . 30	14-29
17.	Journal of Tropical Forestry	Comparative growth rates of seedling origin, first generation coppice and second generation coppice origin crops of Eucalyptus.	Prakash Ram, Chadhar S.K. and Chaturvedi Pratiksha	30(4)	50-54
18.	International Journal of Bio-Science and Bio-Technology.	Application of chemical and biofertilizers on growth and biomass production of *Madhuca latifolia* (Mahua) Seedlings	Archana Sharma	Vol.6 No.4 (2014), ISSN: 2233-7849.	25-32
19.	International Journal of Bio-Science and Bio-Technology	Structural and Functional Aspects of Sal (*Shorea robusta* Gaertn. f.) Forests in Kanha Tiger Reserve (KTR)	O.P. Chaubey and Archana Sharma	Vol.6 No.6 (2014), ISSN: 2233-7849.	49-66
20.	International journal of *Mycorrhizae* News	Microbial Restoration of Degraded Lands through Plantation Forests	O.P. Chaubey, Priyanka Bohre, Archana Sharma and Jamaluddin	Vol. 26(1)	9-14
21.	International Journal of Bio-Science and Bio-Technology	Biotechnological Approach to Enhance the Growth and Biomass of *Tectona grandi*s Linn. F. (Teak) Seedlings	Archana Sharma and O.P. Chaubey	Book ISSN: 2233-7849. Vol.7, No. 1, Feb, 2015.	19-28
22.	Seed technology and seed pathology (eds. Archana	Seed technology for gum yielding tree species of *Sterculia urens*	Archana Sharma	Book ISBN No. 978-81-7132-	24-53

S.N.	Name of Journal	Title of paper	Author(s)	Vol. No.	Page No.
	Sharma, O.P. Chaubey and Ram Prakash), Aavishkar publishers, distributors, Jaipur, Raj. India,			777-5 (2014)	
23.	-do-	Technology for evaluation and standardization of quality seed collection of *Madhuca latifolia*	Archana Sharma and Ram Prakash	Book ISBN No. 978-81-7132-777-5 (2014)	128-143
24.	Sustainable bio-diversity conservation in the landscape (eds. O.P. Chaubey, Archana Sharma and Ram Prakash), published by Avishkar Publishers and Distributors, Rajsthan, Jaipur	Seed technology of *Sapindus trifoliatus* (Linn.) for enhancing seed longevity and germination	Archana Sharma	Book ISBN No. 978-81-7910-427-9, (2014)	153-164
25.	-do-	Germination characteristics and seedling growth in *Terminalia chebula* Retz. as affected by various pre sowing treatments under storage	Archana Sharma	Book ISBN No. 978-81-7910-427-9 (2014)	165-170
26.	Forest ecology in India (O.P. Chaubey, Archana Sharma and Ram Prakash)	*Schleichera oleosa* with respect to morphological physiological and biochemical attributes	Archana Sharma and O.P. Chaubey	Book ISBN No. 978-81-7910-468-2 (2014)	101-113.
27.	-do-	Productivity enhancement in flowering and fruiting of *Madhuca latifolia* (Mahua) for livelihood and ecological security	Archana Sharma and O.P. Chaubey	Book ISBN No. 978-81-7910-468-2 (2014)	114-122.
28.	-do-	Enhancement of seed longevity of some medicinal forest plants. published in self written book	Archana Sharma and O.P. Chaubey	Book ISBN No. 978-81-7910-468-2 (2014)	123-160.
29.	-do-	Sal Regeneration in Borer Affected Sal Forests	O.P. Chaubey and Archana Sharma	Book ISBN No. 978-81-7910-468-2 (2014)	90-100
30.	Gums and resin yielding plants (eds. Dr. Pratibha Bhatnagar). Published by Avishkar Publishers and Distributors, Rajsthan, Jaipur,	Pre-sowing seed treatment in *Sterculia urens* (Roxb.) to enhance seed germination and seedling growth	Archana Sharma	Book ISBN No. 978-81-7132-781-2 (2014)	137-144.
31.	Journal of Non Timber Forest Produce	Status of *Sterculia urens* Roxb. trees in Madhya Pradesh, India.	Pratibha Bhatnagar and Radhika Urmalia	21(4)	207-210

S.N.	Name of Journal	Title of paper	Author(s)	Vol. No.	Page No.
32.	Journal of Tropical forestry	Sustainable harvesting methods of karaya gum (*Sterculia urens* Roxb.)	Pratibha Bhatnagar Radhika Urmalia and Manish Goswami	31(1)	11-19
33.	International Forestry Review	Traditional silviculture through *Butea monosperma*: A multipurpose tree species in Balaghat, India.	Bhatnagar Pratibha	16(5).	
34.	International Forestry Review	*Boswellia serrata* gum oleo-resin and its contribution to rural economy of Sheopur district of central India.	Bhatnagar Pratibha	16(5).	
35.	Journal of Tropical Forestry	Volume tables of *Shorea robusta* (Sal) for Anooppur division.	Richa Seth	Under publication	
Papers published from SFRI					
1.	Vaniki Sandesh	A few rare and endemic plants of India	S.K. Jain	5(2)	34-38
2.	-do-	ग्लिरीसीडिया– कृषकों के खेतों के लिये एक बहुपयोगी जीवित बागड़ (लाइव हेज)	S.K. Jain	5(2)	26
3.	-do-	Volume tables of *Tectona grandis* (Teak) for Chhindwara division.	Richa Seth	Under publication	
4.	-do-	Haldu (*Adina cardifolia):* Nursery and Plantation Technique.	Chaturvedi Pratiksha & S.S. Raghuwanshi	5(1)	31-41
5.	-do-	Baheda (*Terminalia belerica):* Nursery and Plantation Technique.	Chaturvedi Pratiksha & S.S. Raghuwanshi	5(2)	33-40
6.	Van Dhan Vyapar	Grading practices for medicinal plants	Pratibha Bhatnagar	14 (3)	4-7
7.	-do-	Sustainable management of natural gums and resins in Madhya Pradesh.	Pratibha Bhatnagar and Radhika Urmalia	14 (2)	4-13
8.	-do-	e/;izns'k esa ck;fcMax (*Embelia ribes*) dk mRiknu ,oa foi.ku	Pratibha Bhatnagar, Rajesh Barman and Alok Raikwar	14(4)	4-8
9.	Vaniki Sandesh	Antifungal activities of plant extract against *Alternaria alternata* the causal agent of leaf spot disease of *Andrographis paniculata* W*all. ex.nees.*	Jyoti Singh & Anupama Goswami	Accepted for publication	-
10.	Vaniki Sandesh	Root rot disease of *Shorea robusta* (Sal) cause by	Jyoti Singh, Krishna Kumar Patel and	5	1-5

S.N.	Name of Journal	Title of paper	Author(s)	Vol. No.	Page No.
		Scytalidium lignicola Pesante	Parvez Jalil		
11.	Vaniki Sandesh	Screening and pathogenicity test of leaf spots and root rot causing fungi of *Shorea robusta* (Sal)	Krishna Kumar Patel and Jyoti Singh	Accepted for publication	
12.	Vaniki Sandesh	Leaf spot disease of Achar caused by *Pestaltiopsis versicolar(speg)*	Jyoti Singh & Anupama Goswami	Accepted for publication	

Papers presented in seminars/ symposiums/ workshops

S. No.	Name of seminars/ symposiums/ workshops	Title of paper	Author(s)	Vol. No.	Page No.
1.	Sustainable Livelihoods Development through Non Timber Forest Products: Issues, Challenges and Way Forward	*Ex-situ* conservation of medicinally important wild tuberous/rhizomatic plants in the Gene bank of S.F.R.I., Jabalpur.	Uday Homkar, R.K. Pandey , Kundan Sharma and Ram Prakash		
2.	राष्ट्रीय संगोष्ठी– सह–क्रेता विक्रेता सम्मेलन औषधीय एवं सगंध पौघो की उन्नत कृषि प्रसंस्करण एवं व्यवसाय	वन औषधीय पौधों की रोपणी, कृषि एवं अन्य व्यवसायः रोजगार के उत्तम वैकल्पिक संसाधन।	Uday Homkar, R.K. Pandey , Kundan Sharma and Ram Prakash		113
3.	-do-	बावची (*Psoralea corylifolia* Linn.) की कृषि तकनीक एवं आर्थिकी।	Uday Homkar, R.K. Pandey and Ram Prakash		112
4.	Flowering Plant Reproduction & Diversity.	*Ex-situ* conservation of medicinally important plants in the Gene bank of S.F.R.I., Jabalpur.	Uday Homkar, R.K. Pandey , Arvind Haldkar and Ram Prakash		
5.	Underutilized and wild edible plants of India 'Future Crops'	*Ex-situ* conservation of some medicinally important and edible species of genus dioscorea in the Gene Bank of State Forest Research Institute, Madhya Pradesh.	-	-	-
6.	Proceedings of World Congress on Agroforestry, 2014 held at Dehli India	Traditional knowledge systems and advances in agroforestry research to cope with ecological and environmental degradation	O.P. Chaubey and Archana Sharma	Souvenir	-
7.	Proceedings of the National Seminar on "Advancement and Recent Development in Tree Seed Technology to Enhance Forest Productivity held at State Forest Research	Eco-silvicultural requirements of problematic forestry species for maintaining ecological resilience	O.P. Chaubey and P.K. Shukla	Souvenir	-

Papers presented in seminars/ symposiums/ workshops					
S. No.	**Name of seminars/ symposiums/ workshops**	**Title of paper**	**Author(s)**	**Vol. No.**	**Page No.**
	Institute, Jabalpur 2014, pp 40-41.				
8.	Contributed the paper as key speaker in the International bamboo conclave & Expo-2013 held at Bangalore, 2014 (Excellent comments from the peer reviewers), Published in Souvenir	Eco-silvicultural treatments for rehabilitation of gregariously flowered bamboo (Dendrocalamus strictus) forests: An overview	O.P. Chaubey and Ram Prakash	Souvenir	-
9.	Participated and presented the paper as key speaker in the National Seminar titled "Role of green technology in agriculture, horticulture and forestry" held at Sagar, 2014, Published in Souvenir.	Restoration of degraded lands through planting of threatened and ethno-medicinally valued forestry species	O.P. Chaubey	Souvenir	-
10.	Proceedings of the National Seminar on "Bamboo for better future" Madhya Pradesh State Bamboo Mission, Forest Department, Government of Madhya Pradesh on 5th-6th June, 2014.	Bamboo harvesting and regeneration	O.P. Chaubey and Ram Prakash	Souvenir	-
11.	Proceedings of national seminar on technologies for sustainable production through climate resilient agriculture held at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur from 12-13, July, 2014.	Adaptation to mitigate impact of climate change through traditional practices by rural communities	O.P. Chaubey and Ram Prakash	Souvenir	-
12.	Proceedings of national symposium on processing and marketing of medicinal and aromatic plants for improvement of agriculture held at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur from 12-13, August, 2014	Conservation, planting techniques, processing and value addition of rare medicinal tree of Shivnag (Oroxylum indicum)	O.P. Chaubey and Archana Sharma (2014).	Souvenir	-
13.	Proceedings of one day workshop on	Impact of climate change on soil and plant diversity in	O.P. Chaubey and Ram Prakash	Souvenir	-

Papers presented in seminars/ symposiums/ workshops					
S. No.	**Name of seminars/ symposiums/ workshops**	**Title of paper**	**Author(s)**	**Vol. No.**	**Page No.**
	"Establishing Forest Field Labs for Monitoring Climate Change Impacts in Forests" Held at Indian Institute of Forest Management (IIFM), Bhopal on 30, Sept 2014	forest types/ sub types in Madh ya Pradesh and Chhattisgarh.			
14.	National workshop on Carbon Sequestration in Forest and Non Forest Ecosystem to be held at JNKVV, Jabalpur on 16-17 Feb 2015	KEY NOTE ADDRESS on "Carbon credit, carbon trading and carbon sequestration for sustainable management of degraded forest and non forest ecosystems"	G. Krishnamurthy and O.P. Chaubey	Souvenir	-
15.	Accepted in International Grassland Congress from November 20-24, 2015 at New Delhi.	Dry grassland management in relation to climate change.	O.P. Chaubey, Archana Sharma and G. Krishnamurthy	Souvenir	-
16.	Fifth international Conference on plant & environmental pollution	Invasion of weed species in water reservoir of Sanjay Gandhi Thermal Power Station, Madhya Pradesh India	Dr. R. K. Pandey Dr. Anjana Rajput Madhuri Shrivastava	–	–
17.	National seminar on environment conservation challenges and remedies	Impact assessment of Sanjay Gandhi Thermal Power Plant on water quality of Johila River Madhya Pradesh, India	M.K. Thakur, Dr. R. K. Pandey Dr. Anjana Rajput , Shiv Kumar Kaurav	–	–
18.	Fifth International conference on Plants and Environment Pollution (ICPEP-5) December 03-06, 2015, Lucknow	Invasive weed species in water reservoir of Sanjay Gandhi Thermal Power Station, Madhya Pradesh, India	Dr. R.K. Pandey	–	–
19.	Prospect of livelihood to the rural tribal communities in tropical forests of Madhya Pradesh.	Sustainable utilization and conservation of leaves of *Bauhinia vahlii*	Dr. R.K. Pandey	–	–
20.	World Biodiversity Congress (WBC-2014), November 24-27, 2014, Colombo, Sri Lanka.	Sustainable management and conservation of Non-Timber Forest Produces (NTFPs) through community participation in tropical forests of India - Case study on determination of sustainable harvesting limits of NTFPs	Dr. R.K. Pandey	–	–
21.	Convention on Climate change and Water organized by Suresh Gyan Vihar University,	Impact of Climate change *vis a vis* Ecosystems goods and services	Dr. R.K. Pandey	–	–

Papers presented in seminars/ symposiums/ workshops					
S. No.	**Name of seminars/ symposiums/ workshops**	**Title of paper**	**Author(s)**	**Vol. No.**	**Page No.**
	September 26-27, 2014 Jaipur (Rajasthan)				
22.	National seminar on Sustainable livelihood development through Non Timber Forest Products: Issues, Challenges and Way forward, September 26-27, 2014.	*Ex-situ* conservation of medicinally important wild tuberous/rhizomatic plants in the Gene bank of SFRI, Jabalpur	Dr. R.K. Pandey	–	–
23.	National seminar on Sustainable livelihood development through Non Timber Forest Products: Issues, Challenges and Way forward, September 26-27, 2014,	Active community participation for Rehabilitation of Forest Resource in Natural Tropical Forests under Joint Forest Management	Dr. R.K. Pandey	–	–
24.	National symposium Underutilized and wild edible Plants of India-Future crops: December 10-11, 2014,	*Ex-situ* conservation of some medicinally important and edible species of genus *Dioscorea* in the Gene bank of SFRI, Jabalpur	Dr. R.K. Pandey	–	–
25.	National seminar on Flowering Plant Reproduction & Diversity: January 09-10, 2015,	*Ex-situ* conservation and creation of awareness of medicinal and aromatic plants through establishment of Gene bank at SFRI, Jabalpur	Dr. R.K. Pandey	–	–
26.	"औषधीय एवं सगंध पौधों की उन्नत कृषि प्रसंस्करण एवं व्यवसाय" पर राष्ट्रीय संगोष्ठी सह क्रेता–विक्रेता सम्मेलन, दिनांक 12–13 अगस्त, 2014, पादप कार्यिकी विभाग, जवाहरलाल नेहरू कृषि विश्वविद्यालय, जबलपुर	"उत्पादन, संग्रहण, प्रसंस्करण एवं भण्डारण का महुआ फल एवं फूल की गुणवत्ता एवं मूल्य संवर्धन पर प्रभाव"	Archana Sharma and Ram Prakash	–	–
27.	-do-	बावची की कृषि तकनीक एवं आर्थिकी	Dr. R.K. Pandey	–	–
28.	-do-	वन औषधीय पौधों की रोपणी, कृषि एवं अन्य व्यवसाय, रोजगार के उत्तम वैकल्पिक संसाधन	Dr. R.K. Pandey	–	–
29.	13th Silvicultural Conference, Dehradun	Tree Outside Forest	S.K. Jain	--	Poster
30.	Regional workshop on "Extension of Research Findings" held at SFRI, Jabalpur, R&E and	Seed collection processing storage, pretreatment and nursery management with special reference to Teak,	Archana Sharma	–	–

Papers presented in seminars/ symposiums/ workshops					
S. No.	**Name of seminars/ symposiums/ workshops**	**Title of paper**	**Author(s)**	**Vol. No.**	**Page No.**
	Lokvaniki Division, 16.10.2014 & 10, 13.11.2014	Khamer and Bans			
31.	Proceedings of national symposium on "Processing and marketing of medicinal and aromatic plants for improvement of agriculture" held at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jaballpur from 12-13 August, 2014	Conservation planting techniques, processing and value addition of rare medicinal tree of Shivnag (*Oroxylum indicum*).	O.P. Chaubey and Archana Sharma	–	–
32.	2nd International conference on Advances in Plant Sciences (ICAPS 2014) Kuching Sarawak, Malaysia.	Traditional knowledge of Baiga tribe on ethnobotanical uses of forest produces.	Bhatnagar Pratibha and Radhika Urmalia	Technical Session VIII	OS73
33.	World Ayurveda Cngress 2014, New Delhi	Medicinally important plants growing under Tectona grandis	Radhika Urmalia		

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.	Seed technology and seed pathology. Edited book published by Pointer Publishers, Jaipur Raj. 302003 India.	Book published	Archana Sharma, O.P. Chaubey and Ram Prakash (2014)	Published book ISBN No. 978-81-7132-777-5, pp. 242	
2.	Forest Ecology in India. Book published by Aavishkar Publishers and distributors, Jaipur, Raj. 302 003 India.	Book published	O.P. Chaubey, Archana Sharma and Ram Prakash (2014).	Published book ISBN No. 978-81-7910-468-2, (2014) pp. 171.	
3.	Ecological Management of Bamboo Resource in India. Edited book published by Aavishkar publishers, distributors Jaipur, Raj. 302 003 India.	Book published	O.P. Chaubey, Archana Sharma and G. Krishnamurthy (2015).	(Book is under printing/publish) pp. 210.	
4.	ICAR-Indian Grassland and Fodder Research Institute, Jhansi (UP).	Grasslands management in wildlife protected areas in India.	Dr. R.K. Pandey	Under publication	–
5.	Compendium of Agroforestry Abstracts	Potential of Bamboo in Agroforestry systems for economic	Bhatnagar Pratibha and Radhika Urmalia	-	204-205

Paper published in edited books/ souvenirs					
S. No.	**Name of the edited books/ souvenirs**	**Title of the paper**	**Author(s)**	**Vol. No.**	**Page No.**
		development of tribals.			
6.	-do-	Potential of integrating gum yielding species under agroforestry system for livelihood enhancement	Bhatnagar Pratibha and Radhika Urmalia	-	208`
7.	-do-	Potential of medicinal species under agroforestry system: a case study from Madhya Pradesh	Pratibha Bhatnagar, Alok Raikwar, Rajesh Barman	-	209-10
8.	Gums and resin yielding plants		Pratibha Bhatnagar	978-81-7132-781-2	
9.	The edited book titled "Seed technology and seed pathology" (eds. Archana Sharma, O.P. Chaubey and Ram Prakash), Pointer Publishers, Jaipur Raj. 302003 India.	Eco-silvicultural requirements of problematic forestry species for maintaining ecological resilience	O.P. Chaubey and P.K. Shukla	(2014) Book ISBN No. 978-81-7132-777-5	23-52

Publication of technical bulletins / brochures

S. N.	**Name of technical bulletins/ brochures**	**Authors**	**Bulletin/ brochure Number**	**No. of pages**
1.	सामुदायिक भागीदारी द्वारा अकाष्ठीय वनोपजों के मानचित्रण एवं आंकलन विधि मार्गदर्शिका	R.K. Pandey	60	22
2.	Status of natural gums and gum oleo-resin of Madhya Pradesh.	Bhatnagar Pratibha and Radhika Urmalia	57	97
3.	कमरकस गोंद का सतत् विदोहन, प्राथमिक प्रसंस्करण, श्रेणीकरण एवं भण्डारण तकनीकों का प्रर्दशन	Bhatnagar Pratibha, Kiran Kawade and Rajesh Barman	43	26

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 (2014-15)

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)	4356016.00	53956000.00	58312016.00	60205633.00
Deposit Works (Sponsored projects)	60239090.00	38815760.00	99054850.00	33579799.00
Total Rs.	**64595106.00**	**92771760.00**	**157366866.00**	**93785432.00**

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 2014-15 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. (1.4.14 to 31.03.15) (Rs.)
1	Assessment of status and role of sacred groves in conservation of biodiversity at different levels in M.P. **BD/P/E/06-07/04**	MP State Biodiversity Board, Bhopal	229203	0	229203	436
2	Development of nursery techniques of Bai-bidang (*Embelia ribes*) Malkangani (*Celastrus paniculata*) **BD/P/E/09-10/11**	म.प्र.राज्य लघुवनोपज व्यापार एवं विकास सहकारी संघ मर्यादित म.प्र. भोपाल	74086	0	74086	1691
3	Studies on weight loss in stored Lac relation to time. (लाख में समय के साथ सूखत पर प्रतिशत की जांच करने हेतु अनुसंधान परियोजना) **BD/P/E/010-11/03**	म.प्र.राज्य लघुवनोपज व्यापार एवं विकास सहकारी संघ मर्यादित म.प्र. भोपाल	37613	0	37613	10527
4	Development of nursery techniques and models for plantation of rare, endangered and threatened (R.E.T.) species in natural condition **BD/P/E/10-11/08**	APCCF (Research, Extension & Lok Vaniki) MP	842549	426000	1268549	268944
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	0	0	0	0

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. (1.4.14 to 31.03.15) (Rs.)
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	208028	0	208028	11775
7	Mass Mulltiplication of Medicinal Plant **BD/P/E/11-12/24**	Horticulture and Medicinal Plant Mission Bhopal.	1200210	0	1200210	1219884
8	U.P. gradation and renvation of Museum at SFRI Jabalpur (M.P) **BD/P/E/12-13/18**	13th Finance Commission	8465266	0	8465266	726992
9	*Ex- situ* Conservation of medicinally important wild life Tuberous/Rhizomatic plant and studies on their phenology and grouth performance. **BD/P/E/13-14/05**	APCCF Research, Extension and Lokvaniki (M.P.) Bhopal	1348268	1138000	2486268	614333
10	Development of cultivation techniques of van jeera (Black Cumine) *Centrantherum antheleminiticum (L) Kantze*. **BD/P/E/13-14/16**	APCCF & Lokviniki Bhopal. MP	93781	0	93781	121696
11	Documentation of ethnobotanical information on natural gum and resin yielding plant of (M.P.) **BD/P/E/13-14/17**	APCCF R&D Extension and Lokvaniki (M.P.) Bhopal	211037	0	211037	45443
12	Documentation of some traditional knowledge of local & communities of Malwa Eco Region of M.P. **BD/P/E/13-14/19**	M.P. Concil of Science of Technology	196000	0	196000	64127
13	औषधीय पौधों के जीन बैंक एवं रोपणी का प्रबंधन एवं विकास। **BD/RA/1//01**	SFRI Jabalpur	176785	0	176785	181911
14	Impact Assesment of different treatments on rehabilitation of gregariously flowered bamboo forests in Madhya Pradesh. (समूहिक बांस पुष्पन परियोजना) **BOT/P/E/06-07/11**	APCCF (Development) MP	959733	0	959733	244
15	Modernization and digitization of existing forest herbarium of State Forest Research Institute Jabalpur (M.P.) **BOT/P/E/11-12/03**	APCCF (भू–प्रबंध) MP Bhopal	658432	0	658432	185215
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. **BOT/P/E/11-12/07**	अपर प्रधान मुख्य वन संरक्षक (भू–प्रबंध) म.प्र. भोपाल,	2592328	0	2592328	899926

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. (1.4.14 to 31.03.15) (Rs.)
17	Preparation on & reclamation plan & flag Mines of Shivpuri district, M.P. **BOT/P/E/11-12/18**	The M.P. State Mining Corporation Bhopal	303129	0	303129	0
18	National Seminar on " Strategy for Restoration of Forest Bio-diversity of Natural Forest and Plantation" **BOT/P/E/12-13/04**	अपर प्रधान मुख्य वन संरक्षक (कक्ष–समन्वय) म. प्र. भोपाल,	80123	0	80123	0
19	Development & enrichment of existing Botanic garden of SFRI Jabalpur with rare and endemic Angioperm and Pteridophytes**,** **BOT/P/E/12-13/26**		1228946	0	1228946	305866
20	Inventorization and publication of illustrated flora of Achankamar Amarkantak. **BOT/P/E/13-14/14**	APCCF Research, Extension and Lokvaniki (M.P.) Bhopal	229875	0	229875	0
21	Sustainable livelihood based management plan for Palpur Wild life Sanctuary. of M.P**.** **BOT/P/E/13-14-15**	APCCF Research, Extension and Lokvaniki (M.P.) Bhopal	141875	0	141875	92956
22	Studies on photosynthetic efficiency, biomass productin and carbon sequestration of bamboo in plantation forests **BOT/P/E/14-15/07**	APCCF Research, Extension and Lokvaniki (M.P.) Bhopal	0	0	0	16400
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/2006-07/17**	MPMFP (Trade & Dev.) Fed.Bhopal	280360	0	280360	0
24	Impact assessment 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 PTR Panna	384341	0	384341	0
25	Determination of sustainable harvesting limits of commercially important wild plant species in natural forest with active participation of users forest development communities in Chhindwara district of M.P. **ECO/P/E/08-09/05**	National Medicinal Plants Board New Delhi	390241	0	390241	4225
26	Consultancy for deciding in violate space in Kanha Tiger Reserve. **ECO/P/E/09-10/02**	Field Director Kanha Tiger Reserve Mandla	15384	0	15384	460

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. (1.4.14 to 31.03.15) (Rs.)
27	4 नये लोक संरक्षित क्षेत्र में प्रथम रिसोर्स सर्वे हेतु अध्ययन **ECO/P/E/10-11/06**	म.प्र.राज्य लघुवनोपज व्यापार एवं विकास सहकारी संघ मर्यादित म.प्र.भोपाल	1199246	1084000	2283246	355374
28	Impact assesment on flora & fauna in Bunder project in Baxwaha forest range of Chhatarpur forest Division. **ECO/P/E/10-11/11**	Rio Tinto Exploration India Private Ltd. New Delhi.	182108	0	182108	5982
29	Impact assesment of relocation and rehabilitation of forest village khakrapura of Bari Sanctuary **ECO/P/E/10-11/17**	Field Director Satpura Tiger Researve Hashagabad	386082	0	386082	12803
30	Management and poverty alleivatation non- timber forest produces resource assessimentand development **ECO/P/E/11-12/13**	Japan International Corporation Agency UP Forest Department	293283	1585800	1879083	126865
31	Non- Timber Forest Produces Resource Assessimentand Development **ECO/P/E/11-12/14**	-do-	1048081	1255500	2303581	56375
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.	425050	0	425050	644
33	Survey of existing Barahsingha & Blackbuck habitat evaluation for habitat viablity asessment for Kanha Tiger Reserve and Satupra Tiger Reserve. **ECO/P/E/11-12/26**	क्षेत्र संचालक सतपुड़ा टाइगर रिजर्व होशंगाबाद	183828	0	183828	26914
34	Environmental Impact Asessment 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**	संजय गांधी थर्मर पॉवर प्लांट बिरसिंहपुर उमरियॉ	648710	0	648710	72764
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.)	746162	0	746162	59404
36	सतपुडा ताप विधुत गृह सारणी स्थित वर्तमान राखड़ बांध हेतु रिक्लेमेशन 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	841098	0	841098	94362
37	Carrying out study/ evaluation and submission of impact of Runj project on wildlife and action to be taken to mitigate these impacts under Runj irrigation medium project district Panna (M.P.) **ECO/P/E/12-13/08**	Engineer - in Chief, Water Resources Department, Tulsi Nagar, Bhopal	2669369	588000	3257369	52352

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. (1.4.14 to 31.03.15) (Rs.)
38	Impact assessment on habitat fragmentation and wildlife habitat along with floral and faunal studies for the forest land to be used for 4-6 laning of National Highway-26 in Jhansi-Lalitpur section in Madhya Pradesh. **ECO/P/E/12-13/10**	National Highway Authority of India (Minitry of Road Transport and Highway	837160	0	837160	8206
39	Ecological Studies on Grasslands of Bandhawgarh Tiger Reserve with Special Reference To Wildlife Management. **ECO/P/E/12-13/24**	APCCF, R/E & Lokvaniki, MP, Bhopal	1449699	1010000	2459699	304546
40	Impact Assesment 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	4493329	0	4493329	295857
41	Development of technology for conservation and sustainable management of wild medicinal plants and NTFPs through community participation in Shahdol Forest Circle of Madhya Pradesh **ECO/P/E/14-15/01**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	0	2200000	2200000	284821
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**	M/s JK Minerals District – Balaghat M.P	0	900000	900000	97867
43	राज्य वन अनुसंधान संस्थान जबलपुर के अनुसंधान परियोजनाओं के निष्कर्षो का प्रचार–प्रसार हेतु कार्यशालाओं का आयोजन स्थल सिवनी **EXT/P/E/11-12/08**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	154480	0	154480	6132
44	Exposure Trips to the JFMCs & EDC Members of U.P. Forest Department **EXT/P/E/11-12/19**	Chief Project Director PMU UP PFM PAP	133800	0	133800	0
45	बुंदेलखंड विशेष पैकेज के अंतर्गत हितग्रहियों तथा फील्ड स्टाफ का भू–जल सरंक्षण तकनीक एवं प्रबंधन कार्य एवं प्रशिक्षण हेतु कार्यशाला का आयोजन। **EXT/P/E/11-12/21**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	511675	0	511675	200
46	Exposure Trips to the JFMCs & EDC Members of U.P. Forest Department **EXT/P/E/12-13/22**	Chief Project Director PMU UP PFM PAP	1077	0	1077	0

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47	नर्सरी विकास एवं प्रबंधन के संबंध में नर्सरी संचालकों का प्रशिक्षण। **EXT/P/E/12-13/27**	म.प्र. जन अभियान परिषद, भोपाल	2203	0	2203	0
48	अनुसंधान विस्तार वृत्त, में पदस्थ अधिकारीयों कर्मचारियों हेतु नर्सरी प्रबंधन पर दों दिवसीय आवसीय प्रशिक्षण कार्यक्रम। **EXT/P/E/13-14/06**	APCCF (R & D) Lokvaniki M.P. Bhopal	313186	0	313186	180675
49	राज्य वन अनुसंधान संस्थान जबलपुर के अनुसंधान परियोजनाओं के निष्कर्षो का प्रचार–प्रसार हेतु कार्यशाला 2 का आयोजन। **EXT/P/E/13-14/10**	APCCF (R & D) Lokvaniki M.P. Bhopal	379500	0	379500	64098
50	National Network on integrated Development of Jatropha. **GEN/P/E/2004-05/17**	NOVOD Board Gurgaon	183707	0	183707	500
51	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	38973	0	38973	0
52	Standardization of protocols for clonal multiplication of *Litsea glutinosa* (lour cb, rob and endangered medicinal plant. **GEN/P/E/2008-09/07**	NMPB,New Delhi	261450	0	261450	0
53	The Establishment of an Advanced Laboratory for Molecular Characterization and Chemo Profiling of *Commiphora wightii* Plant. **GEN/P/E/2010-11/18**	M.P. Biotechnology Council Bhopal	62862	0	62862	3965
54	Gentic diversity assessment of *Boswellia serrta* 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	71639	0	71639	262639
55	Clonal mass multiplication of Commiphora wightii a red-listed medicinal Plant. **EN/P/E/12-13/06**	-do-	78860	0	78860	0
56	Standaridization and multiplication of clonal propagation protocol for commercially important farestry species anogeissus pendula. **GEN/P/E/12-13/17**	APCCF (Research Extension and Lokvaniki) MP Bhopal	249592	140000	389592	205092
57	Clonal Multiplication of *Dendrocalamus aspe*r (Thailand bamboo) through Micropropagation technique **GEN/P/E/12-13/23**	APCCF (Research Extension and Lokvaniki) MP Bhopal	12858	64000	76858	52600

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. (1.4.14 to 31.03.15) (Rs.)
58	Development of integrated biotechnological package by genetic diversity assessment using molecular characterization, chemoprofiling and standardization of micro-propagation and cryopreservation protocol of four RET species. **GEN/P/E/14-15/02**	Govt. of India. Ministry of Health & Family welfare Department of Ayush National Medicinal Plant Board	0	1800000	1800000	546825
59	National Seminar on "Recent advances in research and development in medicinal and aromatic plants - A country scenario" Under National Medicinal Plants. **GEN/P/E/14-15/08**		0	500000	500000	0
60	Preparation of growth for coppice origin plants of important species in different regions of M.P. **MEN/P/E/08-09/16**	APCCF (Development) M.P., Bhopal	966968	0	966968	2798
61	Revision of Form factors for Teak & Sal in different Divisions of M.P.**MEN/P/E/09-10/03**	वनमण्डलाधिकारी उत्पादन वन मण्डल मण्डला	15526	0	15526	0
62	Revised- form factors table for important miscellaneous timber tree species of Madhya Pradesh. **MEN/P/E/11-12/12**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	343067	0	343067	64026
63	Revision of Form factors of Teak For Raisen Divisions of M.P. **MEN/P/E/11-12/16**	वनमण्डलाधिकारी उत्पादन वन मण्डल रायसेन	8658	0	8658	669
64	रोपणी मार्गदर्शिका का प्रकाशन **MEN/P/E/12-13/25**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	119022	0	119022	3978
65	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	0
66	Training and demonstration programme for transfer of technology of enhancing flowering and fruiting in Mahua trees through application lof fertilizers/Chemicals growth retardants. **SD/P/E/2008-09/15**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	390584	0	390584	0
67	Development of packages of seed techniques for important forestry species. **SD/P/E/2010-11/13**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	1055600	0	1055600	12720

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. (1.4.14 to 31.03.15) (Rs.)
68	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	313231	62000	375231	0
69	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	362044	62000	424044	50811
70	Effect of various pretreatment on Seed germination of fresh and stored Seeds of *Tactona gradis* (Teak) **SD/P/E/12-13/13**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	257363	55000	312363	144380
71	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	426208	0	426208	192244
72	Effect of vermicompost and Neem cake on Plant growth of same farestry species. **SD/P/E/12-13/16**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	132099	33000	165099	45473
73	Advance and recent development in tree seed technology to enhance forest productvity 2 day National Seminar. **SD/P/E/13-14/09**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	73388	0	73388	18670
74	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	0	1161000	1161000	388726
75	Digitisation of old records of M.P. Forest Department and Forestry Research. **SEM/P/E/09-10/ 05**	APCCF (Development.) MP Bhopal	56275	0	56275	0
76	Valuation of Forest Resources and its accounting. A case study of South Balaghat Forest Division. **SEM/P/E/09-10/ 06**	APCCF (Development.) MP Bhopal	95350	0	95350	847
77	Sustainable harvesting and primary processsing 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	201311	0	201311	176839

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78	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	335975	0	335975	2314
79	Training of sustainable harvesting processing grading and storage of gums. **SEM/P/E/10-11/20**	State Coordinator, Small Scale Industries Development, MP Rural Livelihood Project, Govt. of M.P. Panchayat & Rural Development Department	509021	0	509021	2774
80	Strenthehing of MIS call and Establishment of five regional markets data collection and analysis centre in Madhya Pradesh. **SEM/P/E/11-12/01**	MSP Fedration Trade and Development Bhopal	-97907	500000	402093	595414
81	वन विभाग का 150 वर्ष कार्यक्रम मनाने हेतु। **SEM/P/E/11-12/20**	APCCF (Research, Extension & Lok Vaniki) MP	292327	0	292327	126999
82	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	84117	0	84117	6400
83	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	0
84	Proservation and digitization of Research records of SFRI **SEM/P/E/12-13/15**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	66155	0	66155	116760
85	Devlopment of Storage system in Archive Room of SFRI **SEM/P/E/12-13/20**	APCCF Development, (M.P.)	435835	0	435835	143031
86	Tranining on technical know how of gum tapping fram how of gum tapping *Butea monosperina* 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	120625	0	120625	468303

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87	म0प्र0 प्रमुख गोंदो के संग्रहण के आंकड़ों का संकलन एवं प्राथमिक संग्राइकों पर सामाजिक आर्थिक प्रभाव। **SEM/P/E/13-14/18**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	175463	0	175463	248763
88	Network project on conservation of lac insect genetic resources **SEM/P/E/14-15/05**	Indian Institute of Natural Resins and Gums, Namkum, Ranchi	0	728000	728000	149022
89	Estimation of carying 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	1524172	0	1524172	283748
90	राष्ट्रीय वनीकरण कार्यक्रम से सम्बंधित कार्यों का मूल्यांकन **SIL/P/E/09-10/08**	CCF (JFM) FDA	845945	0	845945	1861
91	Evaluation of developmental works of Forest Villages. (वन ग्राम विकास कार्यक्रम से सम्बंधित कार्यो का मूल्यांकन) (वनग्राम) **SIL/P/E/09-10/09**	संयुक्त वन प्रबंधन एवं वन विकास अभिकरण सतपुडा भवन भोपाल	906884	0	906884	100
92	Standaridization of potting mixture of various soil type for optimum growth of *Tectona grandis* (Khamer) and *Dendrocalamus strictus* (Banboo) species. **SIL/P/E/10-11/14**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	273985	0	273985	11680
93	बुंदेलखंड विशेष पैकेज के विकास कार्यो का मूल्यांकन। **SIL/P/E/11-12/10**	अपर प्रधान मुख्य वन संरक्षक संयुक्त वन प्रबंधन/वन विकास अभिकरण सतपुड़ा भवन भोपाल,	1312092	0	1312092	15600
94	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	846525	500000	1346525	572336
95	Confrence on "Silviculture issues for producing enhancement and ecological security **SIL/P/E/12-13/19**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	32863	0	32863	368
96	वन विभाग द्वारा वृक्षारोपण की रणनीति पर कार्यशाला। **SIL/P/E/13-14/11**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	70072	0	70072	0

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97	म0प्र0 राज्य वन विकास अभिकरण द्वारा विभिन्न वन विकास अभिकरणों में वित्तीय वर्ष 2011–12 में प्रारंभ किए गए वनीकरण कार्यो 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 Bhopall	-29543	289532	259989	227128
98	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) MP Bhopal	153413	0	153413	2
99	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	784370	0	784370	11155
100	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) MP Bhopal	1191375	800000	1991375	895460
101	Establishment of Bamborium/ Bambusetum 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	651426	0	651426	107648
102	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) Bhopal	224845	0	224845	654
103	Establishment of leaf orchard of Tendu. **TI/P/E/10-11/21**	MPMFP Federation Bhopal	227075	0	227075	24297
104	Selection of superior races of Khamer (*Gmelina arborea* through clonal propagation **TI/P/E/12-13/02**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	597097	0	597097	35065
105	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	831582	0	831582	43988
106	The study on top duying of *Gmelina arborea* and its management. **TI/P/E/13-14/02**	APCCF. R&E M.P. Bhopal Forest Department Bhopal.	395055	0	395055	379662

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. (1.4.14 to 31.03.15) (Rs.)
107	Integrated management of disease of economically important tree species Dhawada, Bija, and Achar Occuring in forest of (M.P.) **TI/P/E/13-14/03**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	415344	0	415344	224466
108	Causes and remedial measures of Sal mortality *Shorea robusta* in forest area of (M.P) **TI/P/E/13-14/04**	APCCF (Research, Extension & Lok Vaniki) MP Bhopal	400351	0	400351	197699
	Total Project Balance		**57149066**	**16881832**	**74030898**	**13945791**
109	NOT DISTRIBUTED AMT. (APCCF)		1211200	17457644	18668844	17019332
110	Inter Bank		-150000	0	-150000	0
111	Interest Under Bank		1959783	4260381	6220164	2614676
112	Internal Project		15794	0	15794	0
113	MiscellaneousProject - 3987		53247	215903	269150	0
	Grand Total Exp. Rs.		**60239090**	**38815760**	**99054850**	**33579799**

Income of the A/c SB/3990 Revolving Funds for the year 2014-15

S.No.	HEAD	Income (In Lakh)
1	Gate Entry Fees - 3990	786322
2	Guest House Receipts - 3990	609810
3	House Rent & Water Charges From Employee - 3990	980790
4	Misc Receipts - 3990	10000
5	Plant Sale - 3990	693625
6	Training Receipts - 3990	330500
7	Transfered Received from A/c :	0
8	Allahabad bank SB/3741	181510
9	Allahabad bank SB/5351	4840710
10	Allahabad bank SB/3268	1179767
11	CRSP	6030

	INTEREST Account under A/c SB/3990 :-	
12	TDS Refund SB/3990	13302
13	Saving Interest - 3990	735039
14	Interest on FDR - 3990	700000
	Grand Total	**11067405**

Expenditure of the A/c SB/3990 Revoving Fund for the year 2014-15

S.No.	HEAD	Expenditure (In lakh)
1	Bank Charge - 3990	60
2	Daily Wages Exp. 3990	233358
3	Misc. Expenses - 3990	5000
4	Nursery Expenses - 3990	28900
5	Seminar & Meeting Expenses - 3990	24564
6	T.A. Advance	82835
7	Work Advance	36825
	Total	**411542**
	Transfered From A/c :	
8	Allahabad bank SB/3268	1390767
9	Sanchit Nidhi A/c 1661	881296
	Gross Total	**2683605**

Income incurred from the Reserve Fund for the year 2014-15 (Sanchit Nidhi) A/c 5007081661

S.No	Details	Income
1	SD Deposit	105800
2	EMD Deposit	349560
3	POL Charge Recovery - 1661	13033
4	RTI Receipts - 1661	2534
5	Soil Testing Charge - 1661	65650
6	Tender Form - 1661	16900
7	Books & Magazine Sales - 1661	25479
8	Gate Entry Fees - 1661	31138
9	Misc.Received Amt.	29362
10	Seed Sale	2850
11	Plant Sale	110
12	TDS Refund	80960

	Transfered Recieved From :-	
13	Interest on FDR – Sanchit Nidhi - 1661	5737329
14	SB/3990	881296
	Total Rs.	**7342001**

Expenditure incurred from the Reserve Fund for the year 2014-15 (Sanchit Nidhi) A/c 5007081661

S.No	Details	Income
1	EMD Deposit	46000
2	SD Deposit	32000
3	Misc.Exp.	8303
	Total Rs.	**86303**

Financial Status as on 31st March, 2015

S.No.	Details	Cash in Bank	F.D.R.	Total
1	Revolving Fund A/c SB/3990	11289861	8800000	**20089861**
2	Grant-In-aid A/c SB/3268	52280	0	**52280**
3	Deposit Work A/c SB/3987	36826611	23412479	**60239090**
4	Reserve funds A/c Sanchit Nidhi 50070181661	18699462	25999000	**44698462**

Chapter-10
ESTABLISHMENT
Postings, Transfers, Retirements (2014-2015)

Postings:-

S.No.	Name	Designation	Date of Joining
1	Dr. G. Krishnamurthy	Addl. Director	04-08-2014
2	Shri Vivek Kumar Kol	Ranger	03-11-2014
3	Raghuvendra Bisen	SDO	10-12-2014

Transfers:-

S.No.	Name	Designation	Date of Relieving
1	Shri P.K. Shrivastava	Ranger	14-09-2014

Retirement:-

S.No.	Name	Designation	Date of Reliving
1	Dr. Ramprakash	Director	31-12-2014
2	Shri Mohan Lal Koshta	Dakrunner	31-08-2014
3	Dr. Parvez Jalil	Scientist	31-08-2014

Temporary project staff engaged during the year (April 2014 to March 2015)

S. No	Name	Designation	Project under which appointed	Period	
				From	To
1	Shailendra Nema	SRF	Forest Resourse assessment in peoples protected forest areas of M.P.	March 2014	March 2015
2	Anupama Goswami	JRF	Integrated management of disease of economically important tree species Dhawra, Bija and Achar.	July 2014	July 2016
3	Rajesh Barman	SPR	Strengthening of MIS cell and establishment of five regional marketing data collection and analysis centre in M.P.	March 2014	March 2016
4	Moh. Asif Mansoori	Data Entry Operator	Modernization and digitatization of exisiting forest herbarium of SFRI	March 2014	March 2015
5	Abhisek Gupta	Data Entry Operator	Documentation of developed seed technology, nursery & planting techniques of important forestry tree species	March 2014	March 2015
6	Kundan Sharma	Pro. Astt.	Development of nursery technique and model for plantation of RET species in natural condition.	March-2014	March 2015
7	Ajay Prakash Tiwari	Lab Attd.	Preservation & digitization of old research record of SFRI.	March 2014	March 2015
8	Nitin Kumar Verma	Computer Operator	The study on top dying of Gmelina arborea and its	June, 2013	March, 2015
9	Mukesh Gavane	SPR	Strengthening of MIS cell and establishment of five regional marketing data collection and analysis centre in M.P.	March 2014	March 2015
10	Dr. Satvant Kaur Sani	Women Scientist	Ecological studies on grasslands of Bandhavgarh	March 2014	March 2015
11	Jitendra Singh	Field Asstt.	The Study on top dying of *Gmelina arborea* and its management.	March 2014	March 2015
12	Rakesh Sahu	Computer Operator	NRM JICA Project	March 2014	March 2015
13	Nitin Jaiswal	SPR	Strengthening of MIS cell and establishment of five regional marketing data collection and analysis centre in M.P.	March 2014	March 2015
14	Krishna Kumar Patel	JRF	Causes and remedial measures of sal mortality in forest areas.	March 2014	March 2015

S. No	Name	Designation	Project under which appointed	Period	
				From	To
15	Suryakant Choubey	Field Astt.	Estimation of carrying capacity of grazing in different forest types & canopy densities in M.P.	March 2014	March 2015
16	Imrat Sen	Field Asstt.	Development of nursery technique & model plantation of RET species in natural condition.	March 2014	Nov. 2015
17	Ravindra Gupta	Project Asst.	Modernization and digitalization of existing forest herbarium.	March 2014	March 2014
18	Bhupendra Vanraj	JRF	Preservation & digitization of research records of SFRI.	March 2014	March 2015
19	Radhika Urmaliya	JRF	Strengthening of MIS cell and establisment of five regional marketing data collection and analysis centre in m.p.	March 2014	March 2015
20	Krishna Kumar Patel	Project Associate	Causes and remedial measures of sal mortality (*Shorea robusta*) in forest sareas of M.P.	Juen, 2015	June, 2016
21	Pradeep Kori	JRF	Development of packages of seed techniques important forest tree species.	Nov. 2013	Dec.2014
22	Smt. Snehlata Mishra	Computer Operator	Revised form factors table for important miscellaneous timber tree species of M.P.	March 2014	March 2015
23	Smt. Poonam Mishra	JRF	Development and enrichment of existing botanic garden of S.F.R.I. Jabalpur with rare and endemic angiosperms and pteridophytes.	March 2014	March 2015
24	Kiran Kaware	JRF	Training on technical know how of gum tapping from *Butea monosperma* in Umaria nd Tikamgarh districts to local people.	March 2014	March 2015
25	Jitendra Soni	Project Astt.	Effect of various pretreatment on seed germination of fresh and stored seeds of *Tectona grandis* (Teak)	April 2014	April 2015
26	Rahul Kuswaha	SPR	Strengthening of MIS Cell and establishment of five regional marketing data collection and analysis centre in M.P.	April 2014	April 2015
27	Smt. Rashi Pandey	SRF	Standardization and multiplication of clonal propagation protocoal for commercially Important	April 2014	April 2015
29	Vineet Mehra	JRF	Clonal multiplication of *Dendrocalamus asper* through micropropagation	May 2014	April 2015

S. No	Name	Designation	Project under which appointed	Period	
				From	To
30	Mahendra Dubey	Computer Operator	Revised form factor tables for important miscellaneous timber tree species of M.P.	May 2014	April 2015
31	Pankaj Saini	Project Fellow	Development of nursery technique & model for plantation of RET species in natural condition.	May 2014	April 2015
32	Sangeeta Paroha	Computer Operator	NTFPs resource assessment and dev. JICA	May 2014	April 2015
33	Sachin Dhamangownkar	JRF	Development of nursery techniques and models for plantation of rare, endangered and threatened (RET) species in natural conditions.	May 2014	April 2015
34	Suresh Charmkar	JRF	Sustainable livelihood based management plan for Kuno-Palpur Wildlife Sanctuary of M.P.	May 2014	April 2015
35	Shailendra Singh Yadav	JRF	Genitic diversity assessment of *Boswellia serrata*	Oct.2014	Sept. 2015
36	Virendra Kumar Bind	Field Astt.	मध्यप्रदेश में प्रमुख गोंदों के संग्रहण के आंकडों का संकलन एवं प्राथमिक संग्राहकों पर सामाजिक आर्थिक प्रभाव।	Nov. 2014	Nov. 2015
37	Devendra Khobragarhe	SRF	Network project on conservation of lac insect genetic resources	Nov. 2014	Nov. 2015
38	Pradeep Kanojiya	JRF	मध्यप्रदेश में प्रमुख गोंदों के संग्रहण के आंकडों का संकलन एवं प्राथमिक संग्राहकों पर सामाजिक आर्थिक प्रभाव।	Nov. 2014	Nov. 2015
39	Smita Rajput	Field Astt.	Documentation of ethno botanical information of natural gum and resin yielding plants of m.p.	Nov. 2014	Nov. 2015
40	Sandeep Bhandari	Data Entry Operator	NTFPs resource assessment and dev. JICA	April, 2014	March 2015

Trainee field foresters in the poly house of medicinal gene bank of the institute

Trainee forest range officers in the botanical garden of the institute

Training of block level nursery managers on development & maintainance of nursery

Appraisal of forest pathological investigations to field foresters

-:Published by:-
Extension, Training & Consultancy Branch
State Forest Research Insitute, Narmada Road, Polipathar, Jabalpur (M.P.) 482008
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