



First Indian Forest Congress



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Volume III

Presentations



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- Dr. Nawa Bahar *Diploknema butyracea* a potential source of livelihood improvement
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THEME 1

Forests in Society

- 1.1 – Forests and Land Use Policy
- 1.2 – Forests in Urban Landscape
- 1.3 – Forest Governance and Institutional Reforms
- 1.4 – Forests and Community: Forging Partnerships
- 1.5 – Forests and Traditional Knowledge

Forests in Society

Speaker: Rajendra Singh



Tarun Bharat Sangh
Bheekampura- Kishori, Alwar
Rajasthan, India

1

Introduction of TBS

Tarun Bharat Sangh (TBS) is an NGO working in the state of Rajasthan, since 1985.

TBS seeks to bring dignity and prosperity to the life of destitute section of rural India through sustainable development measures.

As TBS situated in semi arid region of Rajasthan, the water and forest conservation becomes the first step of development. From this activity all other progressive activities flow.

2

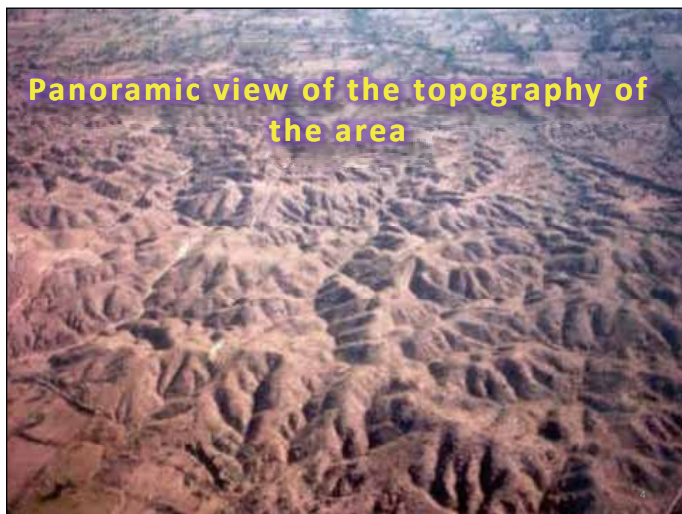
Project area of TBS

1000 villages of 18 districts of Rajasthan state of India



The major part of TBS's work is concentrated in 600 villages of district Alwar of Rajasthan.

3



- **Paradigm change**
- Exploitation and disintegration has taken the place of 'feeling together' and integration.
- **State takeover community functions**
- The State has dispossessed the Communities of their traditional rights and responsibilities.
- **Syndrome of dependence**
- Wherever the State succeeded (even partially or for a short period) in implementing modern amenities like water supply, sewage or power, the communities have lost their initiative.

6

- **Neglect of traditional systems**
- Due to implementation or expectation of modern facilities, the traditional systems have been neglected.
- **Disintegration of community institutions**
- The modern education and hollow dreams of modernity have disintegrated the community Institutions.

7

RE-AWAKING THE INDIGENOUS KNOWLEDGE Traditional Forest Management system in India

There are various types of methods of Forest Management in India. The main common features of all systems are:

- Use of local resources and technology
- Community based operation
- Community driven de-centralized forest management
- Sustainable conservation and use of natural resources

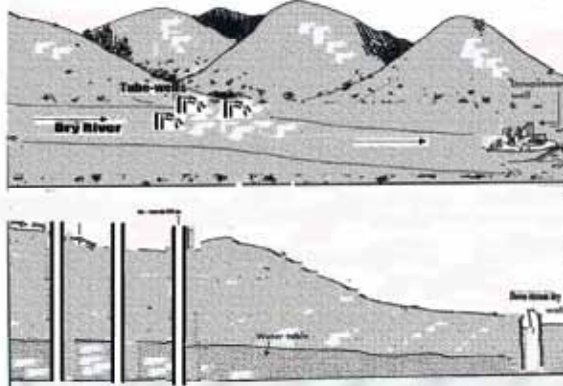
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Revival of systems using indigenous knowledge

- Interventions understanding traditional systems and use of indigenous knowledge
- Mobilization of community around land, water and forest
- Participation in rejuvenating old systems and evolving of new systems.
- Creation of new village level and forest area institutions.

9

River Goes Dry:



Excess withdrawal of Groundwater

River is flowing:



Forests and Land use Policy ...A perspective

A.K.Jha

Land Use: determinants

Land use is determined by the soil and topography, water table in general and availability of water in particular, production and productivity of land, and the parameters of socio-economic development.

Determinants: statutory/ Mgmt

- National Forest Policy 1988
- Indian Forest Act 1927
- Wildlife Protection Act 1972
- Forest Conservation Act 1980
- Biodiversity Act
- State-specific Grazing policy and Grazing Rules
- Working Plan prescriptions
- Microplans under JFM/VEDs
-But Regional Planning Acts ..donot include ..

The Statistics

- India has a geographical area of 3.07 lakh Sq.Km : world's 2.4%.
- The recorded forest is 7.65 lakh Sq.Km and the forest cover 6.33 lakh Sq.Km : world's 1.8%.
- India's livestock population is 47 crores which is world's 18% while the grazing land is 0.5% of the world's grazing land.
- Approximately 27 crore livestock graze in the forests.
- Human population in India is 121 crores

The gradual transition

The previous two decades of National initiatives in forestry and nature conservation have **been accompanied simultaneously** with the increase in understanding and empowerment of the institutions of democracy, governance and decentralization of functional authority to local self-governing institutions.

Transition

LAND IS LIMITED....whether under forest category or not.. A resource that cannot be created.....it can of course be diverted.....

Mindsets:

Resource management

- By whom
- For whom

Institutional issues:

- Who controls what
- Who controls whom

Forest land use change due to proximate (direct) cause

- Agriculture expansion,
- Infrastructure development, (road construction, dams, mining, power stations, etc.)
- Deforestation (illegal fellings)
- Management practices
- Climate change
- Fire and Invasive species.

Forest land use change due to (indirect) causes - social and institutional processes

- Market dynamics and perverse incentives
- Corruption
- Inappropriate state policies and institutional failure
- Population pressure
- Poverty
- complex mix of socio-economic, cultural, and political factors

An approach to land use policy development and implementation : **The Strategy**

- Adopt a holistic point of view
- Challenge the poverty paradox of rural and tribal populations.
- Introduce statutory interventions
- Put in place institutional structures of multi-disciplinary character
- Strong co-ordination amongst various related departments, NGOs and various stakeholders.
- Adopt inclusive and informed Landscape approach.

Components: 1. Conceptual Aspects

- Long term Sustainability of resources as well as livelihoods
- Address equity issues
- Benefit the land-less also
- The policy must be operational irrespective of ownership of land
- Sustain and improve productivity and prevent the degradation of stressed lands

2. Institutional level interventions

- 'Forest Land-use Authority' be set up.
- Put in place a programme for 'Non-Forest Wastelands Development through involvement of Private Sector' (NWDIPS).
- FDAs be designated as the nodal and co-ordinating agency.
- The working plan wing should be strengthened to ensure compliance of forest land use policy with special reference to the exercise of forest rights.

3. Statutory interventions

- Empower Gram Sabhas
- The National Bank for Agriculture and Rural Development Act, 1981 be amended to become National Bank for Agriculture, Forestry and Rural Development Act for facilitating management of the mosaic of land use.
- Rationalize rules regarding planting, felling, and transit

Statutory interventions

- Rural credit system and Micro-credit laws be rationalized to accommodate village level participatory management institutions.
- Panchayat Acts, ZP Acts be amended to ensure compulsory investment of certain proportion (Say 10%) of their revenue on appropriate and sustainable forest land use options.
- Clear tenure-rights over resources with responsibility through harmonization of FRA, PESA etc.

4. Market related interventions

- Incentivize private growers
- Forest based industries' capital be attracted for investing on public as well as private Wastelands.
- Industries showing interest in energy sector: provide opportunity to invest on forest lands on "Public Private Partnership" basis.
- Minimum support prices be introduced for the site-appropriate crops.
- 5. Subsidize the tackling of problematic lands.

5. Plan and Technology related interventions

- Appropriate R&D facilities be set up/ integrated through networking : develop technological options to match the appropriate land use.
- Operational research related to forward linkages, market dynamics, community mobilization, and institution building aspects.
- Plantations and SMC works under MNREGA be redesigned for catering to Landscape approaches on project basis.

Plan and Technology based interventions

- Suitable schemes be devised and incentivized for sustainable use of steep slopes.
- Traditional and indigenous techniques of treatment be documented and used as required.
- Area specific models for agri-silvicultural, silvi-pastoral, agri-silvi-pastoral, agri-silvi-horticultural, agri-silvi-horti-pastoral etc. interventions be developed.
- Use of latest technologies.
- Interface between Silvicultural and Watershed approaches

6. Implementation level interventions

- Identification of viable units of treatable lands within the framework of landscape management.
- Utilize the strengths and capacities developed under programmes like IWDP, JFM etc. as a part of convergence strategy.
- Capacity building at all levels and for all stakeholders should precede field level implementation

Summing up..

**Its high time..
..that Nature be helped
by us to help sustain
mankind !**

FRA and other Acts induced land use change

- More than 11 lakh Individual Right Holders finalized today out of 33 lakh applicants (Area involved approx. 99 lakh acres.) mostly pock marked....
- Very few Community Rights are being claimed- but the process of making them prefer their claims is on. (2/3rd forest area will be under community claims)
- There is a spate of new encroachments
- FRA and PESA at loggerhead on MFP ?
- Land use – Working Plans –FRA intervention--

Land use – remedies?

- Do we really want a land use or policy?
- Can we have a land use map that could be relevant on a long time frame ?
- Shall technological innovations necessarily have positive effects on maintaining and sustaining forest land use?
- Do we adopt Reducing emissions from the tropical deforestation and forest degradation (REDD+) for firming up land use?
- Do existing legal instrument sufficiently back land use choices?

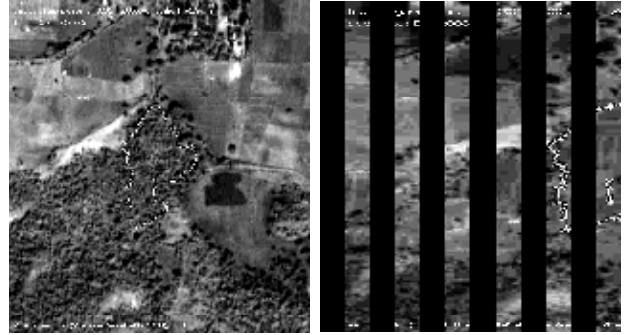
Land use categories

- **Forest**
- Non-agricultural use
- Barren and unculturable land
- Permanent pasture and other grazing land
- Land under miscellaneous Tree crops
- Culturable wasteland
- Fallow lands other than current fallows
- Current fallow
- Net area sown
- Gross cropped area

Gadchiroli Distt.-Village "Bamni"- forested areas were claimed on large scale on the fringes !!



Ineligible case : Claimant ID-0301kha00bpp4
Jalgaon: Massive change in land use after Nov.2005





Taking Forestry in India to a new level

Dr. Bransdon Corrie, IFS
Addl Principal Chief Conservator of Forests,
Kerala.



The time for action is *now*.

- We are at a defining moment in the history of humanity and forests occupy centre stage
- Changes in global climate are already stressing forests
- In this climate of change focus is increasingly shifting to forests



Current status of forestry in India

- Forestry in India is more about the science of forestry and less about the science of management
- The National Forest Commission has opined that **the forest personnel on their part need to radically change their mind set, vision and professionalism.**
- The forest service must become more specialized and professional and receive political, infrastructural and financial support





The challenge

- With 1.8% of the world's forest area the country is to meet the needs of 16% of the world's population and 18% of its domestic cattle
- Livelihood issues of 7 crore tribals and 20 crore non tribal rural population is linked to forests.
- 4 crore people live in 1.73 lakh village in and around forests

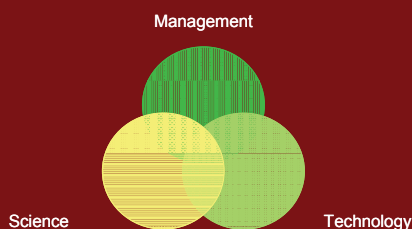


The way ahead

- With a rapidly rising population, a steadily diminishing resource base and increasing levels of consumption foresters face the greatest of challenges.
- To meet these challenges successfully forest management practices in India must be taken to a new level.



Taking forestry to a new level



Materials and Methods

- The 7S Framework is used as a tool to present the Strategic model for Forest Management
- Initiatives in Kerala Forest Department
- Survey of State Forest Departments
- Experiential Learning of Forest Management practices of the various agencies in US.



KFD Initiatives

- HRD Plan with a Placement Policy
- Motivational Programmes ignite the fire of enthusiasm
- Personal Action Journal
- Technical Audit of sanctuaries
- Protocols for monitoring habitat and species



Survey of SFD's

- Questionnaire and telephone interviews
- Vision, Mission, goals, values
- Organizational environment
- Systems and protocols, and
- Technology use





Experiential learning

- Ecosystem approach- US Forest Service
- Adaptive management- USF&WL S
- Visitor experience-NPS
- Managerial principles-USFS
- Enabling environment-USFS
- Technology-USFS
- Systems and protocols-USFS
- Certification-DNR-Minnesota



The 7S Framework

- **Super ordinate Goals:** Vision, Mission, Goals, values, culture
- **Strategy:** The plan for marshalling resources
- **Structure:** Hierarchy, reporting system, duties and responsibilities
- **Systems:** The protocols, its codification and institutionalization
- **Style:** approach, attitude of leadership
- **Staff:** capabilities, capacity building, performance enhancement
- **Skills:** the ability to deliver to a reasonable standard on the assigned task



1. Super ordinate goals

- **Vision:** Luxuriant forests professionally managed to provide ecosystem goods and services to society on sustainable and equitable principles
- **Mission:** To serve society through responsible stewardship of forests
- **Goals:** To manage forests on sustainable and equitable principles so that the ecosystem goods and services flow to all sections of society in perpetuity
- **Core values:** Fairness, camaraderie, loyalty, discipline.
- **Organization culture:** values, beliefs, underlying assumptions, attitudes, and behaviors



2. Strategy

- Develop and share a Vision
- Focus on personnel, leadership development
- Provide an enabling environment
- Develop the route map- Plans, procedures, processes, practices, policies
- Codify and institutionalize systems and protocols
- Ecosystem approach, adaptive management
- Technology use
- Annual audit and certification of institutions and individuals



3. Structure

- Flatten
- Line hierarchy
- Line reporting
- Duties and responsibilities
- Review and revamping existing structure



4. Systems

- Protocols – procedures and processes
- Planning
- Management
- Documenting
- Reporting
- Monitoring
- Evaluating
- Certification





5. Style

- Leadership approach
- Organizational approach
- The fundamental task of a leader is to prime a good feeling in those they lead
- The absence of this singular element is responsible for the failure of the India Forest Service to leverage the great talent and experience that is resident dormant in the service



Leadership

Visionary	Affiliative	Democratic	Coaching	Pacesetting	Commanding
Mobilizes people toward a vision	Creates harmony and builds emotional bonds	Forges consensus through participation	Develops people for the future	Sets high standards for performance	Demands immediate compliance
For new direction/ change management	To motivate	Consensus to get inputs	To improve performance	To get quick results	In crisis, with problem employees
Strongly positive	Positive	Positive	Positive	Negative	Negative



6. Staff

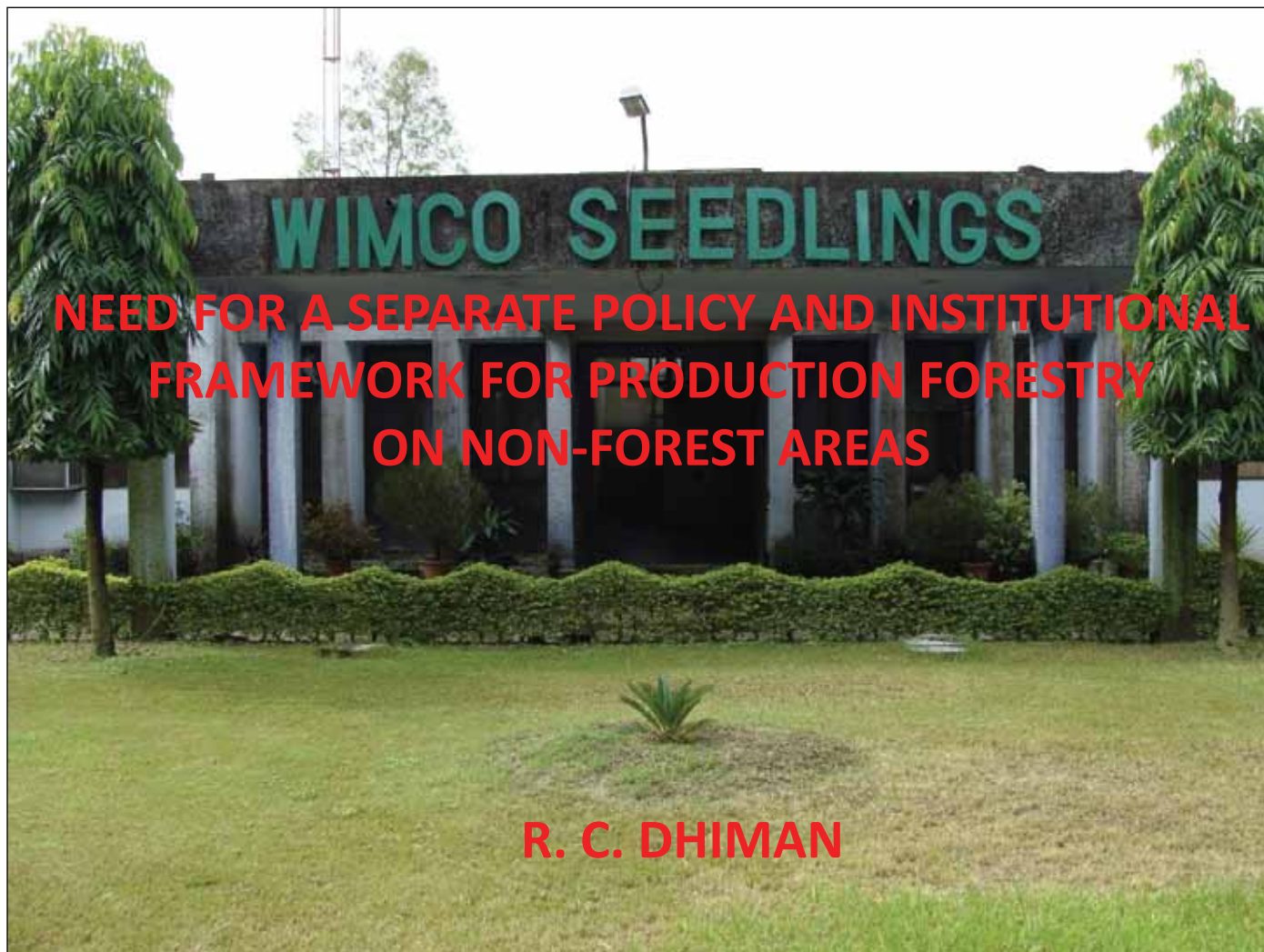
- Capability
- Ability
- Capacity building- skills up gradation
- Focus- on outcomes



7. Skills

- Technical
- Human
- Conceptual
- Design





TRASFORMING PRODUCTION FORESTRY

- SUSTAINABILITY OF THE TRADITIONAL WOOD PRODUCTION MODEL ????
- SHIFT IN THE MAIN STACK-HOLDERS
- FARMERS-THE MAIN WOOD GROWERS
- PRIVATE SECTOR ALSO A KEY PLAYER
- SHIFT IN LAND USE FOR WOOD PRODUCTION
- PRODUCTION FORESTRY BEING REDEFINED
- FORESTS ARE BETTER REGARDED FOR ENVIRONMENTAL VALUES

SOURCES FOR WOOD AVAILABILITY

- FOREST AND TREE COVER: **21%(69.1 Mha)**
- TREE COVER (ToFS) OVER **3%**
- EFFORTS FOR ADDITION OF **33.6 Mha** FOR ACHIEVEING **33%** TARGET
- EFFORTS TO INCREASE TREE COVER IN **AGRO-FORESTRY**
- **IMPORTS**

CONSUMPTION OF WOOD & WOOD PRODUCTS (FAO REPORTS)

YEAR	FIRE-WOOD	IND. WOOD	SAWN TIMBER	WB PANELS	PULP	PAPER & P. BOARD
	000(m ³)	000(m ³)	000(m ³)	000(m ³)	000(t)	000(t)
2009	306332	27231	14943	2758	4500	5301
2007	303839	21069	17534	2448	3781	4795
2005	300564	21298	7922	700	2775	4493
2003	287390	3804	16297	429	2732	4248
2001	274334	26840	17462	419	2580	3934
1999	279343	25302	17450	348	2132	3369

IMPORTS OF WOOD & WOOD PRODUCTS (FAO REPORTS)

YEAR	FIRE-WOOD	IND. WOOD	SAWN TIMBER	WB PANELS	PULP	PAPER & P. BOARD
	000(m ³)	000(m ³)	000(m ³)	000(m ³)	000(t)	000(t)
2009	79	4043	173	277	507	1427
2007	0	1933	54	194	370	944
2005	0	1998	30	67	198	620
2003	10	2232	9	86	145	647
2001	0	1684	16	82	259	674
1999	0	336	17	20	265	350

ESTIMATED WOOD AVAILABILITY

- 1-2 Mm³ TIMBER FROM GOVERNMENT FORESTS
- ??? FIREWOOD FROM GOVERNMENT FORESTS
- 5-6 Mm³ FROM IMPORTS
- REST???????

NFP FEATURES: SUPPLY OF RAW MATERIAL TO FBI

- THE PRACTICE OF SUPPLY OF FOREST PRODUCE TO INDUSTRY AT CONCESSIONAL PRICE SHOULD CEASE.
- NEW UNITS TO MAKE OWN WOOD ARRANGEMENTS

NFP FEATURES : FOREST BASED INDUSTRY(PARA 4.9)

- AS FOR AS POSSIBLE, FBI SHOULD RAISE THE RAW MATERIAL NEEDED FOR MEETING ITS OWN REQUIREMENTS, PREFERABLY BY ESTABLISHING A DIRECT RELATIONSHIPS BETWEEN THE FACTORY & INDIVIDUALS WHO CAN GROW THE RAW MATERIAL BY SUPPLYING THE INDIVIDUALS WITH INPUTS INCLUDING CREDITS, CONSTANT TECHNICAL ADVICE & FINALLY HARVESTING & TECHNICAL SERVICES.

NFP FEATURES :SOCIAL FORESTRY(PARA 4.9)

- FARMERS, PARTICULARLY SMALL & MARGINAL FARMERS, WOULD BE ENCOURAGED TO GROW, ON MARGINAL/DEGRADED LANDS AVAILABLE WITH THEM, WOOD SPECIES REQUIRED FOR INDUSTRY.

NFP FEATURES :SOCIAL FORESTRY

- THE ABOVE CONSIDERATIONS, WILL HOWEVER, BE **SUBJECT TO THE CURRENT POLICY RELATING TO LAND CEILING AND LAND LAWS.**

LAND HOLDINGS FOR SOME MAJOR USES DEFINED

- **AGRICULTURAL CROPS**
- **HORTICULTURAL CROPS**
- **PLANTATION CROPS LIKE TEA, RUBBER etc..**
- **FORESTRY PLANTATIONS???**

NFP FEATURES: FORESTRY RESEARCH IN PVT SECTOR

- **NFP 1988 (PARA 4.12) DEALS WITH THE FORESTRY RESEARCH IN GOVERNMENT SECTOR, NO MENTION THAT OF PRIVATE SECTOR RESEARCH**

NFP FEATURES : ON INVENTORY

- **NFP (PARA 4.14) ON FOREST SURVEY AND DATA COLLATION**
- **PERIODICAL COLLECTION, COLLATION AND PUBLICATION OF RELIABLE DATA**

NAP FEATURES:MENTIONS

- **GROWTH BASED ON EFFICIENT USE OF RESOURCES AND CONSERVES OUR SOIL, WATER AND BIODIVERSITY**
- **GROWTH THAT IS SUSTAINABLE TECHNOLOGICALLY, ENVIRONMENTALLY AND ECONOMICALLY**

NAP FEATURES: AF & SF (PARA 11)

- **AF & SF ARE PRIME REQUISITES FOR MAINTAINING OF ECOLOGICAL BALANCE & AUGUMENTATION OF BIOMASS PRODUCTION IN THE AGRI-SYSTEM. AF WILL RECEIVE A MAJOR THRUST FOR EFFICIENT NUTRIENT CYCLING, NITROGEN FIXATION, O.M. ADDITION & FOR IMPROVING DRAINAGE.**



AGRONOMICALLY COMPATIBLE



MULTITIER: POPLAR+WHEAT+SAPOTA

OVERLAPPINGS & CONTRADICTIONS

- **CULTURE, EXTENSION & MARKETING SUPPORT, FOR EXAMPLE:**
- **BOTH MANDI AND FOREST REGULATIONS SIMULTANEOUSLY ON THE TREE PRODUCE OBTAINED FROM THE FARMS**
- **AGRICULTURE V/S. FOREST PRODUCE**
- **LINKAGES: LINE DEPARTMENTSOLD REGULATIONS/NEW CHALLENGES**
- **LAND CAPABILITY CLASSIFICATION**
- **MARKETING REGULATIONS**

NEED INCORPORATIONS OF LATEST COMPONENTS

- **LIMITATIONS OF METHODOLOGIES FOR A&R PROJECTS AND FSC CERTIFICATIONS OF FOREST PRODUCE**
- **LIMITATIONS IN TRADE OF NON-FOREST AREA GROWN FOREST PRODUCE**

WAY FORWARD

- **OVER POPULATION AND LAND DEFICIT SCENARIO CALL FOR INTEGRATED LAND USE POLICIES AND PROGRAMMES**
- **POLICY AND INSTITUTIONAL FRAMEWORK NEEDS TO DRAW SUPPORT FROM THE EXPERIENCE & LESSON LEARNINGS FROM INTEGRATED PROJECTS**

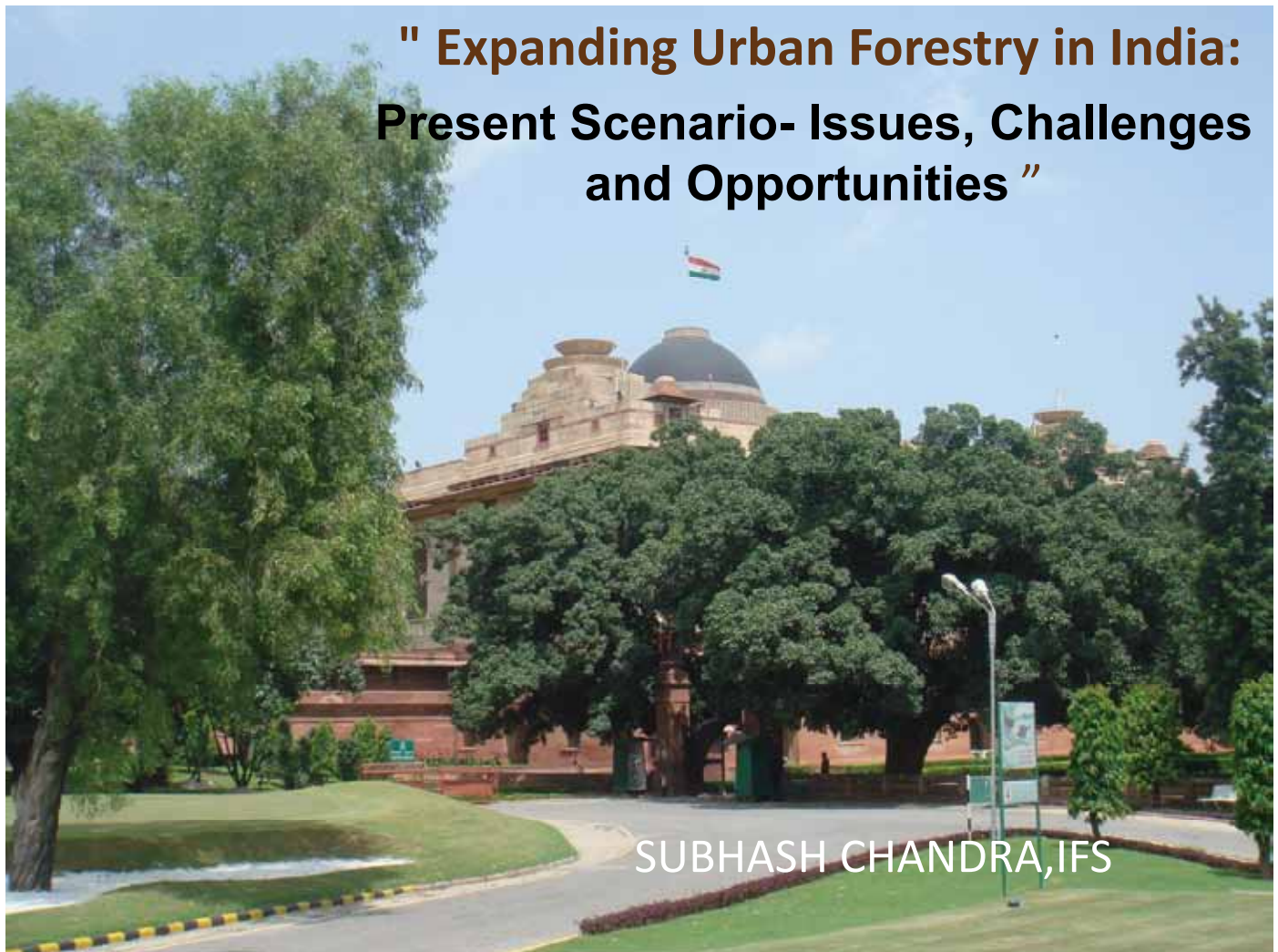
EXPECTATIONS FROM THE NEW POLICY

- **FOCUSSED**
- **REALISTIC**
- **STACK HOLDERS ORIENTED**
- **ATTAINABLE/ RESULT ORIENTED**

**EXPECTATIONS FROM THE
INSTITUTIONAL FRAMEWORK**

- **MUST HAVE AN AUTHORITY**
- **MUST BE REPRESENTED BY
THE ACTUAL STACKHOLDERS**
- **AN EXCELLENT OPPORTUNITY
FOR PPP MODEL**

" Expanding Urban Forestry in India: Present Scenario- Issues, Challenges and Opportunities "



SUBHASH CHANDRA, IFS

Urban forestry....

“the art, science, and technology of managing trees and forest resources in and around urban ecosystems for the psychological, sociological, economic, ecological, and aesthetic benefits trees provide society.”

- *The Dictionary of Forestry*
J.A. Helms, ed. 1998

“Urban forestry does not deal entirely with city trees or with single tree management, but rather with tree management in the entire area influenced by and utilized by urban population”

Jorgensen, 1970



Urban Forestry for Human wellbeing and healthy citizens

Urban Forests

- For a city to be sustainable, it must have adequate open spaces, clean air, and a wholesome environment flanked by trees, meadows, stream and opportunities for recreation and social gathering. If cities are to be sustainable, they must be designed using native plant materials and natural processes that will stand up to time and temptation of age to weather and fail.

-Frederick Law Olmsted (1822-1903)



Urban forestry includes . . .

- Forestry
- Arboriculture
- Landscape architecture
- Land use & urban planning
- Horticulture
- Public policy & administration
- Soil science
- Spatial ecology & information
- Green Laws
- Parks management
- Recreation management
- Social science
- Communications
- Government's support
- NGO's support
- Remote sensing/GIS

Urban Forests include Parks, Gardens, Avenues, Woodlands/ City forests, Green belts and diffused tree population etc. and provide significant environmental and material benefits.

Urban forests comprise trees in and along...

- Streets
- Parks (passive)
- Recreation areas (active)
- School yards
- City greens
- Power-line right-of-ways
- City forests/ woodlands
- Landfills
- Riparian zones etc.



Urbanization

- Growing urbanization-a reality, cities are expanding as never before
- Urban population (2010): 31.2% in India, growth of 31.80% in Urbanization since 2001.
- Urban population more than the total population of Russia+ Canada +Australia
- Growth of rural population 12.18% in the same period.
- Asia will have 17 out of 27 World's largest Megacities in 2015
- In 1901, only 1 out of 9 Indian lived in Cities. (total urban population: 26m)
- In 1991, 1 out of 4 Indian is in cities
- 42 Cities have more than 1 Million Population in 2010. Projected 68 Cities in 2030.
- 2/3rd of Indian Population lives in Class I Cities (more than 1 lakh population)
- Kolkatta, Chennai, Greater Mumbai, Hyderabad, Delhi, Chandigarh, Pune, Bangalore, Ahmadabad and Kanpur most populous cities account for more than 7-8 % of the country' population.
- By 2030, it is estimated that 40% of India's population will reside in cities.

India & Urban Greenery

- 27.8% live in urban India.
- 6 Mega cities (4 M +)
- 35 Metropolitan cities (1 M +).
- 393 Large towns (0.1 M +)
- 3,784 small and medium towns (<0.1 M).



- In the context of carbon offsets, green open spaces required in urban areas to provide shade and insulation to buildings.
- Urban green open spaces play a vital role in the amelioration of urban environment.



Hyderabad - founded in 1591 - Md. Quli Qutub Shah, 5th sultan of Qutub Shahi dynasty

- GHMC - about 650 sq. kms - population about 4.5 million.
- HMDA area 2200 Sq.kms; Population 5.7 million
- Hyderabad is the **Fifth largest** urban agglomeration in India.
- Population density is **17000 per Sq.km.**



Eco-restoration & conservation of lake in Banjara Hills



1999
A dying water body - in 15 acres

- Grazing ground
- swimming pool for the poor
- hunting ground for the birds
- garbage & sewerage dumping
- dhobi-ghat

Now



NTR GARDEN



Kolkatta

Banabitan Park

- AREA-58 ACRES
- Water body 16 ACRES-remnant of E. Kolkata wetlands
- SALLAKE –KOLKATA HEART OF KOLKATA OFFICE COMPLEXES
- YEAR OF CREATION-1992
- NO. OF VISITORS IN A YEAR- 6-7 LACS
- CENTRAL WATERBODY WITH RESIDENTIAL BIRD,MAMALS,REPTILES,FISH,BUTTERFLY POPULATION
- HERBAL GARDEN, MODERN NURSERY, CHILDREN PARK,BUTTERFLY PARK,ORCHIDIUM, GUEST HOUSE,SALE COUNTER FOR SEEDLINGS,NTEP. FAMILY SEC.,WATER BODY-9 MAJOR SECTIONS
- MORNING WALKERS, YOGA GROUP

Butterfly-	75 major species
Birds-	80 major species
Medicinal plants-	100 species
Shrubby & trees-	220 species
Small mammals-	5 species
Reptiles-	17 species
Fishes-	15 species
Insects-	12 species

Banabitan Park



DELHI: THE GREEN CAPITAL

Delhi is one of the greenest metropolitan cities in the world with more than 20% under permanent green cover

Sir Edwin Lutyen's plan for New Delhi was based on 'the Garden city' concept, with one-third area as greens, which was prevalent in Europe. Lutyen's plan for New Delhi was based on 'the Garden city' concept, with one-third area as greens, which was prevalent in Europe.

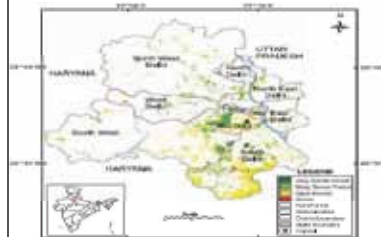
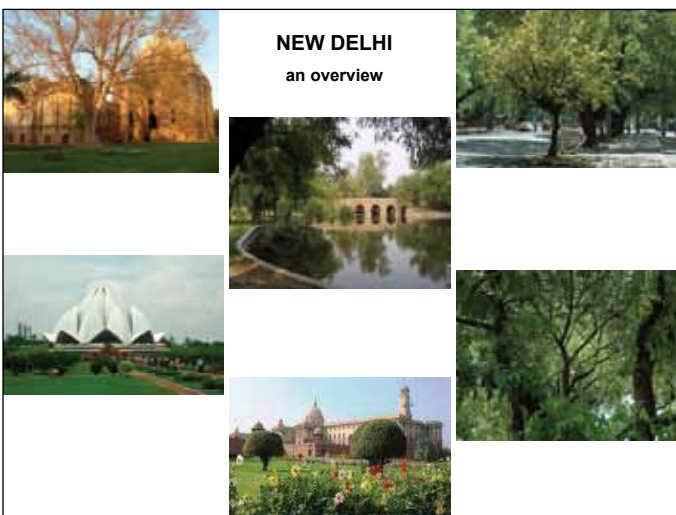


Fig 7.6 : Forest cover map of Delhi

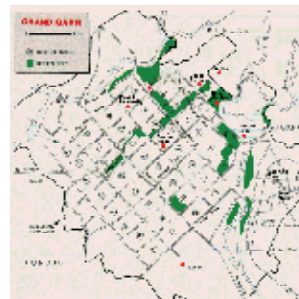


NEW DELHI an overview



Chandigarh

- 2nd smallest UT/State : 114 Km (Lakshadweep : 325q Km)
- 2nd Most densely populated UT/ State 7900.3 / sq Km (Delhi : 9339.5 /sqKm)
- 2ndLowest Sex Ratio: 777 / 1000 males (Daman & Diu : 710) Area : 78 Sq km(total including rural : 114 sq km)
- 56 rectangular sectors including 2 industrial areas (First Phase: 1-30 and remaining in second Phase)
- Each sector measures 246 acres (1200 x 800 m)
- Population: 9,00,914 (Designed for 3 lac people)
- Total Population density : 7903/km2 (2nd highest in States & UTs)
- Urban Population density : 10194 persons/ km2
- Floating population : > 3 lacs daily
- State owned Forest cover : 35.75%
- Private forests : nil
- Total Ann. Rainfall: 111 cm
- Temp. range : 6.7 –44.2oC
- Motorised vehicles: 6.5 lac/per capita maximum in the country





**Comparative Forest Cover of Metropolitan Cities
(in sq. km.)**

CITY	GEO. AREA	FOREST COVER	TREE COVER	% OF GEO. AREA
Delhi	1483	176.58	123	20.20
Mumbai & Mumbai Suburban	157+446 603	2+111	NA	18.73
Chennai	144	6	NA	4.17
Kolkata & Howrah	185+1467= 1652	80	NA	4.84
Bangalore Urban	2190	164	NA	7.49
Bangalore Rural	5815	828	NA	14.24
Hyderabad & Rangareddy	7710	389	NA	5.05
Ahmadabad	8707	144	NA	1.65

**Comparative Forest Cover of main Metros/ Cities/
Urbanised Districts (in sq. km.)**

CITY	GEO. AREA	FOREST + TREE COVER	% OF GEO. AREA
Delhi	1483	300	20.20
Mumbai	157	2	1.27
Mumbai Suburban	446	120	26.91
Chennai	144	9	6.25
Kolkata	185	0	0.00
Howrah	1467	146	9.95
Bangalore City	2190	149	6.80
Bangalore Rural	5815	810	13.93
Hyderabad & Rangareddy	7710	391	5.07
Ahmadabad	8707	143	1.64
Chandigarh	114	28	24.56
Lucknow	2528	301	11.91

Contd...

CITY	Geo. Area	Forest + Tree Cover	% OF Geo. Area
Jaipur	14,069	631	4.49
Pune	15,643	1,732	11.07
Bhopal	2,772	366	13.20
Indore	3,898	704	18.06
Nagpur	9,892	2,023	20.45
Gurgaon	2,766	229	8.28
Faridabad	2,151	93	4.32
Gandhinagar	649	42	6.47
Dehradun	3,088	1,607	52.04
Coimbatore	7,469	1,870	25.04
Jodhpur	22,850	93	0.41
Udaipur	13,419	3,115	23.21

Contd...

CITY	GEO. AREA	FOREST + TREE COVER	% OF GEO. AREA
Patna	3,202	16	0.50
Guwahati/ Kamrup Distt	4,345	1,432	32.96
Ranchi	7,698	1,904	24.73
Raipur & Dhamtari	16,468	5,469	33.21
Agra	4,027	276	6.85
Bhubaneswar (Khurda)	2,813	375	13.33
Thiruvananthapuram	2,192	1,350	61.59
Kanpur (Nagar+ Dehat)	6,176	109	1.76
Mysore	6,854	1,069	15.60
Amritsar	5,088	29	0.57
Ludhiana	3,578	63	1.76

Impact of Delhi Metro



Construction activities around tree basins

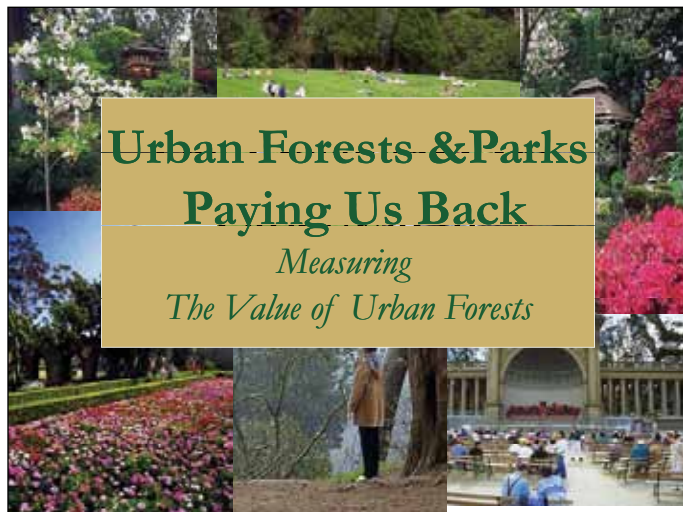


Damage to trees due to compaction of soil



Changing face of the Avenue

Barakhmba & Sikandra Road



Urban Forests & Parks
Paying Us Back
Measuring
The Value of Urban Forests

UPF for

Products/Goods :

- Wood/ firewood/ small timber
- Food: Fruits, leaves, bark, flowers, grasses
- Medicinal products
- Firewood for crematoria
- Water
- Clean Air
- Grazing, livestock support
- Rocks, minerals, soil etc.

UPF for

Environmental Services:

- Erosion control: reduce stormwater runoff, flood control
- Soil amelioration, Soil conservation
- Wind break & Shelter belt
- Nature conservation (urban biodiversity- birds, insects, reptiles etc.)
- Climatic influences: moderating climate, providing shade, lower temperature-less use of AC.
- Ground water conservation, maintaining water cycle
- Anti-pollution effects, Filter particulate and gaseous air pollutants: dust, black carbon, VOC's,CO, NOx, SOx, Ozone
- Reduce urban heat island effect
- Reduce CO2 through carbon sequestration in trees and soil.

UPF for

Intangible but important (Tertiary) benefits:

- Healthy cities: good environment for growth
- Beautiful cities
- Condition social behaviour, Social cohesion
- Recreational avenues
- Bio-aesthetics: beautiful cities
- Adds value to locality,
- Resilience to natural calamities
- Brings nature into built environment of cities
- Softens the hard surface features comprising modern buildings, roads etc.
- Decongestion of Cities

UPF for

Supporting Poor:

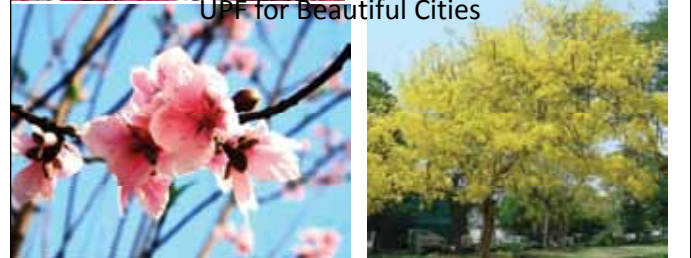
- Employment to skilled, semiskilled, unskilled poor
- Food and sustenance to poor
- Recreational opportunities to all, equal access
- Extension of living open spaces to people staying in cramped accommodation,
- Much needed shade in hot summer,
- Awareness/ knowledge about nature to young / students



UPF for Beautiful Cities



UPF for Beautiful Cities



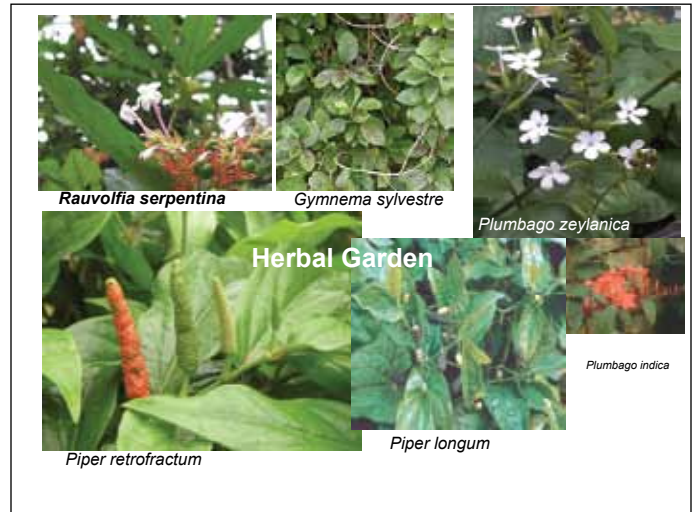
Urban Biodiversity Conservation

Common Birds in Cities



Urban Biodiversity Conservation





Functions of urban forests

- Urban forests as a critical part of urban infrastructure
- Climate Change mitigation
Carbon sequestration – GHG removal, Cooling/heating energy efficiency, reduction in emissions
- Climate Change adaptation

Urban forests for climate amelioration

- Abatement of noise and air pollution;
- Mitigate pollution by reducing energy use and carbon dioxide emissions
- Some absorb common pollutants like sulfur dioxide and nitrogen dioxide
- Aid in the removal of airborne particulate
- Bio-filters

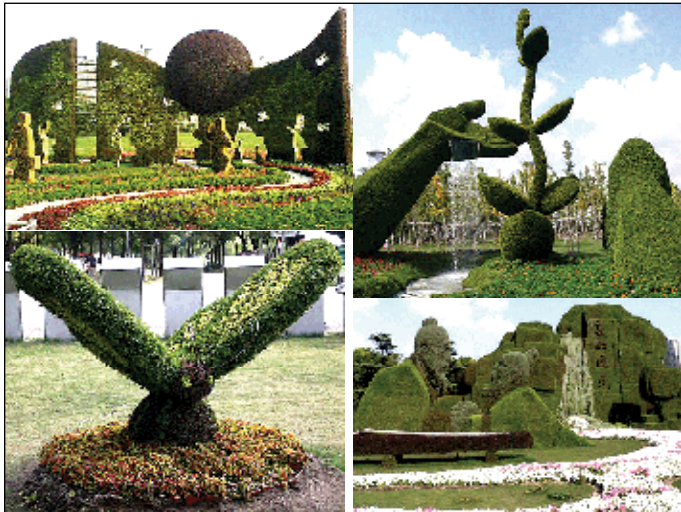
T : Temperature moderation
R : Removal of Pollutants
E : Erosion-of-soil control
E : Energy provider
S : Sustenance wildlife

Social benefits of Urban Forests

- For better physical/mental health,
- Greens increase recovery rate in a hospital;
- Psychological benefits, de-stressing- Getting away from crowded cities,
- Protecting health of poor from adverse effect of Climate Change,
- Protection from vulnerable weather conditions (heat waves, flood, cold waves, dusty winds etc.),
- Crime reduction-people's involvement in productive work,
- Education-many schools in run under trees

Social Benefits

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Mosaiculture of Shera and CWG Logo

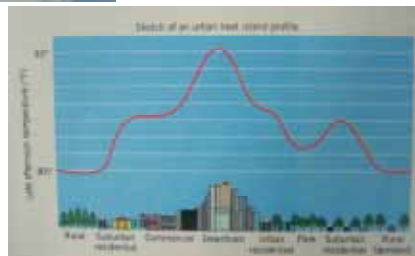


Vertical landscaping along the wall through Mosaiculture

Maintaining Hydrological Cycle



Urban Heat Island Effect



How Much Value Does a City Receive from its Urban Forests System?

1. Environmental Value through Cleaner Air
 - Number of Trees
 - Percent of Tree Canopy
2. Environmental Value through Cleaner Water
 - Percent of Tree Canopy
 - Type of Soil
 - City Cost for Stormwater Management
3. Resident Value through Direct Use
 - Number of Users
 - Types of Uses
 - Value of Each Use on the Open Market



4. Resident Value through Improved Health
 - Amount of Active Recreation
 - Age Distribution of Park Users

Contd....

5. Overall City Economic through Tourism

- No. of Tourists attracted
- Distance travelled and days spent

6. Overall City Economic Appreciation through Hedonic (Property) Value

- Number of Homes Located within 500 Feet of Parkland
- Quality of Parks

7. Overall City Value Appreciation through Gain in Social Capital

- Donations to Park Charities
- Donations of Time and Volunteer Labour



CHALLENGES IN GREENING OF URBAN AREAS

- Difficulties in long term planning, frequent change of landuse
- Trees vs. developments: Trees occupy extremely valuable space in Cities which comes into conflict with other commercial and infrastructural uses.
- Limited space availability-tree viewed as obstruction to development and become the first causality in the process.
- Lack of integration with planned development: Trees as afterthought not as an integral part of City plan
- Water scarcity
- Poor quality of soil
- High development and maintenance cost
- High public pressure due to high floating population
- Lack of respect, sensitivity and care from society. Young saplings prone to vandalism

Approaches

Urban Greening different form normal forestry:

- Focus is on individual or group of trees
- Intensity of maintenance and skill is high
- Combination of trees, shrubs, lawns, ground covers, climbers, hedges used for maximizing bio-aesthetics
- Choice of species is important in view of limited land. Needs innovative approach.
- Multiplicity of agencies and stakeholders.

Approaches

- Increase in tree density in Parks: try to increase tree canopy in parks to around 0.5 %
- Upto 0.5 acres: trees in groups and corners
- From 0.5 -1.0 acres: trees along boundary & in groups
- Between 1.0 acre > 5.0 acres: trees along boundary , groups and along footpaths
- Above 5.0 acres: woodlands component Block planting
- Planting of mix of Suitable tree spp. Like Bel, Amla, Jamun, Anjeer, Khirni, Banyan, Neem, Peepal, Pilkhan, Gular, Mango, Arjun, Dhak, Gulmohur, Amaltas, Bahera, Khirni, Mahua, Imli etc.
- Mix of Trees, shrubs, climbers, topiaries,hedges etc. to create holistic greens.

Interventions

- Support afforestation in-
 - Recorded or notified forest areas.
 - Open spaces/ green spaces like parks & gardens, city forests, etc.
 - Creation of new Parks/ Greens.
 - Diffused planting in avenues, central verges, roundabouts, drain-sides, colony parks, households, water bodies etc.
 - Institutional lands, schools/ colleges/Universities, business/ industrial, residential colonies etc.
 - Appropriate cost norms for plantation & maintenance.

Strategies.....

- Identification of lands-Land availability limited due to high real estate value.
- Engagement of multi-institutions/ organizations. Role institutions like Municipality, cantonment Board, Development Authority, Corporate sector very important
- Bringing Development of Greens a new component in Plans under JNNURM.

Strategies ...

- Creation of Nurseries to provide good quality planting stock with for holistic greening.
- Garden and avenue designing, Green Corridors & Strips in the City development Planning.
- Incorporation of Tree Conservation Areas in City Plans
- Integration with buildings, parking & other facilities.
- Tall planting. Planting trees in movable planters.
- Tree Management. Need for Arboriculturist, Tree Surgeons. R& D for Proper Management of Trees
- Preparation of Proper Maintenance Protocol.
- MoUs with other organizations for greening.

Identification of Cities & Institutions

Cities

- I Phase: Cities with Population of over 1 m
- II Phase: Cities with population > 0.5 m – 1 m
- III phase: Cities with Population > 0.1 m- 0.5m

Institutions & Local Bodies, RWAs etc:

- Municipalities
- Cantonment Boards
- Central & State institution having land
- Farmers/ departments for Nursery creation

GREEN INDIA MISSION

SUB: MISSION- 3: ENHANCING TREE COVER IN URBAN/ PERI-URBAN AREAS

- Coverage : 0.20 m Ha
- Total Cost: 2000 Crores
- Needs: Growing urbanization & providing ecological services & amenities to people in cities

Urban Population:

- Present: 310 million
- By 2030: 40% of Total Population
- By 2045: Around 800 Million

Present Scenario

- Cities are losing trees and greens due to development process. Situation same in all cities.
- Planners are not concerned.
- Open spaces facing completion from other uses
- People losing cultural attachment with trees
- Difficulties in growing trees as young saplings are damaged frequently
- Limited species are planted to ensure survival
- Staff is ageing in greening agencies.

CHALLENGES IN GREENING OF URBAN AREAS

- Difficulties in long term planning, frequent change of land use
- Trees vs. developments: Trees occupy extremely valuable space in Cities which comes into conflict with other commercial and infrastructural uses.
- Limited space availability-tree viewed as obstruction to development and become the first causality in the process.
- Lack of integration with planned development: Trees often as afterthought not as an integral part of City plan
- Water scarcity
- Poor quality of soil
- High development and maintenance cost.
- High public pressure due to high floating population
- Lack of respect, sensitivity and care from society. Young saplings prone to vandalism

Approaches

Urban Greening different form normal forestry:

- Focus is on individual or group of trees
- Intensity of maintenance and skill is high
- Combination of trees, shrubs, lawns, ground covers, climbers, hedges used for maximizing bio-aesthetics
- Choice of species is important in view of limited land. Needs innovative approach.
- Multiplicity of agencies and stakeholders.

Approaches

- Increase in tree density in Parks: try to increase tree canopy in parks to around 0.5 %
- Upto 0.5 acres: trees in groups and corners
- From 0.5 -1.0 acres: trees along boundary & in groups
- Between 1.0 acre > 5.0 acres: trees along boundary , groups and along footpaths
- Above 5.0 acres: woodlands component Block planting
- Planting of mix of Suitable tree spp. Like Bel, Amla, Jamun, Anjeer, Khirni, Banyan, Neem, Peepal, Pilkhan, Gular, Mango, Arjun, Dhak, Gulmohur, Amaltas, Bahera, Khirni, Mahua, Imli etc.
- Mix of Trees, shrubs, climbers, topiaries,hedges etc. to create holistic greens.

Interventions

- Mission to Support afforestation in-
 - Recorded or notified forest areas
 - Open spaces/ green spaces like parks & gardens, city forests, etc.
 - Creation of new Parks/ Greens
 - Diffused planting such as on avenues & central verges, roundabouts, along drains, colony parks, households, water bodies/ ponds etc.
 - Institutional lands, schools/ colleges/Universities, business/ industrial, residential colonies etc.
 - Appropriate cost norms for plantation & maintenance.

Strategies.....

- Land availability limited due to high real estate value less private initiatives expected.
- Role of State & Local Govt. & institutions like Municipality, cantonment Board, Development Authority, PWDs, CPWD, Horticulture Deptt., RWAs, NGOs, Builders, corporate sector, important
- Identification of lands
- Engagement of multi-institutions/ organizations.
- Bringing Development of Greens a new component in Plans under JNNURM

Strategies ...

- Creation of Nurseries to provide good quality planting stock of large no of tree / shrubs and other plants spp for holistic greening.
- Conservation and care of existing trees
- Garden and avenue designing, Green Corridors & Strips in the City development Planning.
- Incorporation of Tree Conservation Areas in City Plans
- Integration with buildings, parking & other facilities.
- Tall planting. Planting trees in movable planters.
- Tree Management. Need for Arboriculturist, Tree Surgeons. R& D for Proper Management of Trees
- Preparation of Proper Maintenance Protocol, MoUs with other organizations

Identification of Cities & Institutions

Cities

- I Phase: Cities with Population of over 1 m
- II Phase: Cities with population > 0.5 m – 1 m
- III phase: Cities with Population > 0.1 m- 0.5m

Institutions & Local Bodies, RWAs etc:

- Municipalities
- Cantonment Boards
- Central & State institution having land
- Farmers/ departments for Nursery creation

Ideas for People's support

- Biodiversity Parks
- Botanical Gardens
- Butterfly Parks
- City Forests
- Theme Parks like Nakshatra Garden
- Heritage parks
- Archeological Parks
- Sacred groves
- Smriti Van
- Tree conservation areas etc.

Support from the GIM

As land with Forest Department is limited in urban areas what should be role of Forest department? FDs can provide-

- technical support
- supply Plants
- financial scheme based support
- create favorable regulatory framework to support private initiatives
- awareness and publicity for participatory approach
- creating Employment opportunities for urban poor youth in plantation efforts and maintenance of Greens

Policy Support

- Integration of existing woodlands as Master plan greens in expansion of Cities or in creation of new Suburbs.
- Policy for conservation of urban greens & trees.
- Focus on individual tree
- 20-33% area to be made green compulsorily in new housing, industrial or other projects.
- Obligatory role of citizens for supporting tree preservation and incentives for plantation may be through concessions/ rebate in property tax.

Selection criteria for species

- Climatic factors: Forest / soil type; water scarcity
- Environmental Factors: Pollution tolerant, hardy,
- Evergreen/ Semi-evergreen versus deciduous species: shade in summer & leaf fall in winter.
- Water requirement: less / or more water in initial years, lowering of water table makes it difficult for trees to absorb water from sub soil.
- Average life of a tree spp.
- Shade/ Flowering or ornamental species
- Height of trees; large/ tall trees make adjoining buildings/ traffic vulnerable for damage in storms etc.



Selection Criteria.....

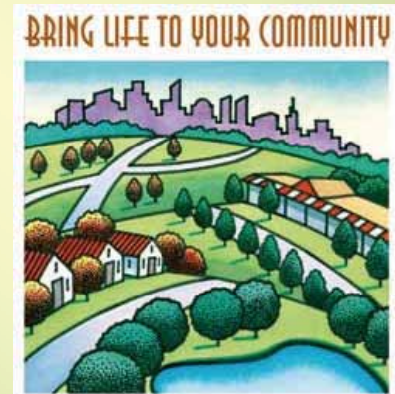
- Shape/ form of tree, branching pattern
- Foliage/ canopy characteristics; requirement of frequent pruning
- Strength of timber/ wood; soft or hard stem branches; frequent breaking of branches
- Strong Root system
- Horticulture waste management/ burning of leaves/ composting
- Growth pattern: slow/ fast growing
- Single tree species/ combination of trees
- Flowering/ fruiting pattern
- Retention time/ rotation of trees

Trees in group as a landscape feature



Selection criteria....

- Trees as single or in groups of single or multiple spp.
- Trees to be of year round interest based on texture and pattern of leaves, bark, branching patterns, seasonal change of leaf colour, flowering and fruiting etc.
- Trees can be used in built up areas to soften the hard outlines of building and roads, screening of service areas and car parking.
- Trees can heighten the sense of enclosure and perspective, creating the impression of more and less space.



From the collections of Dr. N.S.K Harsh



Assessment of Tree Health along Trevor Road, New Forest, Dehradun: A Case Study

By
Kavita and Dr. N.S.K. Harsh



Forest Pathology Division
Forest Research Institute
Dehradun

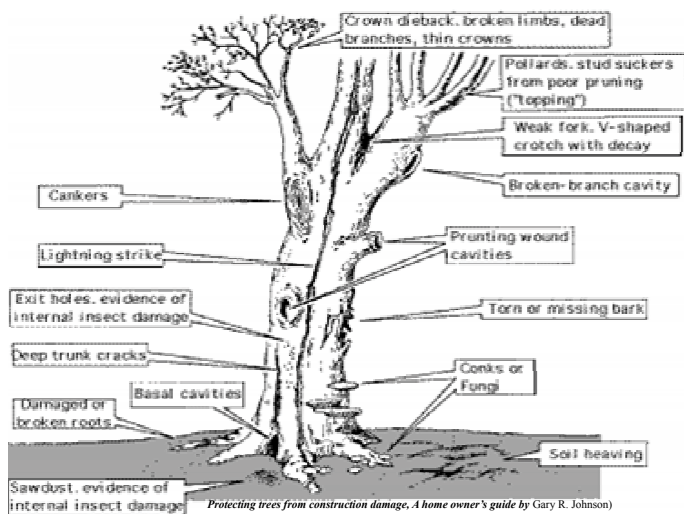
Forests in urban landscape

Occurrence:-

- along railway lines,
- along canal banks,
- along tank bed and
- along road sides etc

Benefits:-

- Productive viz. timber, fuel, NTFPs etc.
- Protective viz. earth's air purifier, climate amelioration, soil and water conservation, wildlife habitat etc



Objectives

- Study of all the defects and diseases of trees on the Trevor Road
- Biotic and abiotic factors which affect the tree vigour
- Categorization into various hazard tree categories on the basis of study
- Suggestions to improve the condition of Road side plantation

Methodology Used

- Selection of Study Area i.e. Trevor Road, FRI, New Forest
- Division of road into three sections i.e. Section "A" from Shatabdi dvar to Wilmot crossing, Section "B" from Wilmot crossing to Hart Road crossing and then Section "C" from Hart Road crossing upto Hill Road
- Numbering of trees of left and right hand side separately from shatabdi dvar.



Contd.

- Twenty five sub-factors under three main factors viz. types of defects, soil conditions and human interference were taken for study.
- Types of defects include dead tree or branches, diseased tree, root problems, cracks, weak branch union, poor architecture and epiphytes
- Soil conditions were studied on the basis of soil grade and compactness.
- Foot/ vehicle trampling, electricity wiring, nails around branches, domestic wastes, pole and trenches within the protected root zone suggests the human interference

[25 factors and result table](#)

[<< Back to contents](#)

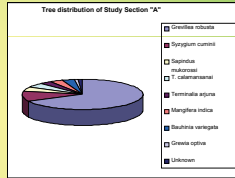
Results

Result's table

Summary of results of Section "A"

Tree species and their numbers

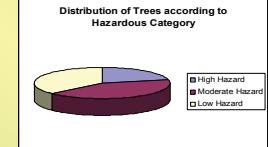
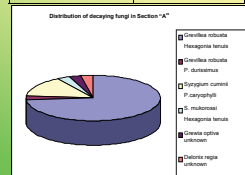
Name of tree species	Number of trees
<i>Grevillea robusta</i>	59
<i>Syzygium cumini</i>	10
<i>Sapindus mukorossi</i>	4
<i>Bauhinia variegata</i>	4
<i>Terminalia arjuna</i>	2
<i>Mangifera indica</i>	3
<i>Terminalia calamansanai</i>	3
<i>Grewia optiva</i>	1
<i>Terminalia tomentosa</i>	1
Unknown	1



Distribution of decaying fungi in section "A" Hazard category wise distribution of trees

Name of Tree species	Name of Sporophore	No of Trees
<i>Grevillea robusta</i>	<i>Hexagonia tenuis</i>	25
<i>Grevillea robusta</i>	<i>Phellinus durissimus</i>	1
<i>Syzygium cumini</i>	<i>Phellinus caryophylli</i>	5
<i>Sapindus mukorossi</i>	<i>Hexagonia tenuis</i>	1
<i>Grewia optiva</i>	unknown	1
<i>Delonix regia</i>	unknown	1

Category	No. of Trees
High Hazard	19
Moderate Hazard	37
Low Hazard	33



Relationship from the Height-Girth Ratio and Hazard Category:

Height: Girth ratio range	Hazard category
6 - 11	'1' or '2'
11 - 14	'2' or '3'
>14	'3'

Value of correlation coefficient between the two = 0.405

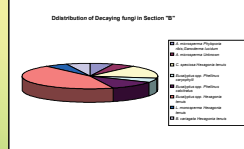
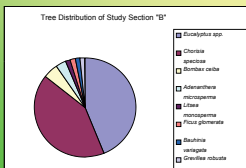
Summary of Section "B" Trevor Road

Tree distribution in section "B"

Tree Species	Number of Trees
<i>Eucalyptus spp.</i>	28
<i>Chorisia speciosa</i>	27
<i>Bombax ceiba</i>	3
<i>Adenanthera microsperma</i>	2
<i>Litsea monosperma</i>	1
<i>Ficus glomerata</i>	1
<i>Bauhinia variegata</i>	1
<i>Grevillea robusta</i>	1

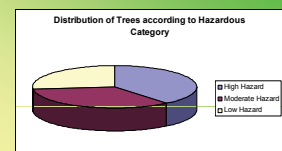
Distribution of decay fungi in Section "B"

Name of Tree species	Name of Sporophore	No.
<i>Adenanthera microsperma</i>	<i>Phyloporia ribis, Ganoderma lucidum</i>	1
<i>Adenanthera microsperma</i>	Unknown	1
<i>Chorisia speciosa</i>	<i>Hexagonia tenuis</i>	3
<i>Eucalyptus spp.</i>	<i>Phellinus caryophylli</i>	1
<i>Eucalyptus spp.</i>	<i>Phellinus calcitratus</i>	2
<i>Eucalyptus spp.</i>	<i>Hexagonia tenuis</i>	8
<i>Litsea monosperma</i>	<i>Hexagonia tenuis</i>	1
<i>Bauhinia variegata</i>	<i>Hexagonia tenuis</i>	1



Hazard category wise tree distribution

Category	No. of Trees
High Hazard	25
Moderate Hazard	23
Low Hazard	16



Relationship from the Height-Girth Ratio and Hazard Category:

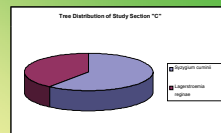
Height: Girth ratio range	Hazard category
6 - 11	'1', '2' or '3'
11 - 14	'1' or '2'
> 14	'2'

Value of correlation coefficient between H:G and HC= 0.0405

Summary of section "C" of Trevor Road

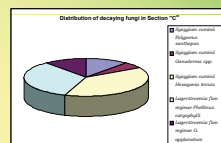
Tree distribution in the section

Tree species	Number of Trees
<i>Syzygium cumini</i>	44
<i>Lagerstroemia flos-reginae</i>	29



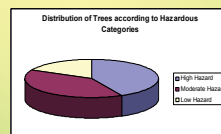
Distribution of decaying fungi in section "C"

Name of Tree species	Name of Sporophore	No of Trees
<i>Syzygium cumini</i>	<i>Polyporus xanthopus</i>	2
<i>Syzygium cumini</i>	<i>Ganoderma spp.</i>	1
<i>Syzygium cumini</i>	<i>Hexagonia tenuis</i>	7
<i>Lagerstroemia flos-reginae</i>	<i>Phellinus caryophylli</i>	6
<i>Lagerstroemia flos-reginae</i>	<i>Ganoderma applanatum</i>	2



Hazard category wise tree distribution

Category	Number of Trees
High Hazard	31
Moderate Hazard	29
Low Hazard	13



Relationship from the Height-Girth Ratio and Hazard Category:

Height: Girth ratio range	Hazard category
3 - 9	'1'
9 - 15	'2' or '3'
>15	'3'

Value of correlation coefficient between H:G and HC= 0.591

Only 3 trees out of 73 are with height- girth ratio greater than 15

Condition of Trees on Trevor Road



Damaged trees after storm of 19 april,2010



Preventive and Remedial Measures

As all the trees whether they are in hazard category 1, 2 or 3 are potential hazards for the life and property and the only way to completely eliminate a tree hazard is its removal. Complete removal of all the trees is not acceptable; moreover it is also not suggestible. However, trees of hazard category "1" should be replaced immediately as they are the trees facing maximum number of problems with severe decay and for hazard category "2" and "3", preventive and remedial measures should be applied.

Preventive measures:

During construction of roads, walls, trenches for cabling and drains near the trees they are commonly exposed to following injuries:

1. Stem wounds 2. Root Wounds 3. Fill.

To avoid all these problems, design and construction should be carefully planned to avoid tree damage. Soil mounding around the tree bases should be leveled. Grass cutting near the tree bases need to be done carefully.

Remedial measures:

> Policy decision for removal of trees in hazard category '1' and/or their treatment should be worked out. New plantation need to be carried out with proper planning, spacing and suitable species as replacement. Take people into confidence for removal of trees and branches to avoid queries, petitions and explanations.

> Proper pruning followed by wound dressing can take care of large dead branches and tops of the trees which are having poor architecture because of large branches. Canopy reduction is also advisable for the trees affected by root diseases and stresses. This will maintain the balance of the canopy and the roots.

> Instead of blazing, for tree numbering and naming, small stainless steel nails should be used for numbering or naming the trees (Bakshi *et al.* 1963).

> For cavity treatment, first decayed wood should be removed and then cavity should be filled with inert material like polyurethane foam after surface treatment with fungicides like Tridemefon.

> Epiphytes such as *Ficus* spp. which are in their young age and phanerogamic plant parasites such as *Loranthus* spp. should be removed from the trees. Epiphytes at later stages may completely stragulate the tree and phanerogamic plant parasites reduce the vigour of the trees.

> Remove wires attached to the trees/ branches and in future avoid wiring the branches as they cause girdling.

> Dead and decaying branches should be removed before seasons of storms and rains by regular examination of trees.

> Forks should be examined and one of the branches should be removed to create balance followed by treatment of cut ends.

> Remove sporophores (fruit bodies) of fungi from the trees and burn them as they produce innumerable spores spreading the infection to neighbouring and other trees.

Conclusion

The health status and condition of trees growing along Trevor road in New Forest campus, Dehradun have been assessed and it was found that the trees are showing different hazard categories, as many as 75 trees are falling in hazard category "1" and 90 trees are in category "2". Various biotic and abiotic stresses have been attributed to the condition of trees. Preventive and remedial measures have been recommended which need to be applied immediately to check for the deterioration of the condition of trees.

Acknowledgements

> I offer my sincere gratitude and personal regards to my, competent and reverent supervisor **Dr. N. S. K. Harsh, Scientist F, Head of Forest Pathology Division of F.R.I Dehradun, for judicious leadership, valuable discussions, extensive ideas, constructive criticism, constant encouragement support during the entire period of my work.**

> I owe my sincere thanks to **Director FRI, Dean FRIU** and also my **Course Coordinator** for giving me the opportunity to work on this project.

My grateful thanks to **Dr. Amit Asthana, Dr. S.D. Sharma, Mr. D. P. Singh** for their help in GIS lab.

> I owe my gratitude towards **Dr. Amit Pandey, Dr. Partharthi Mohanty, Ms. Pooja Arya, Ms. Shailja Rawat & Ms. Sona Singh** for their constant help in lab.

> I am also thankful to all my **friends** for their constant support.

> I am pleased to express my grateful thanks towards the persons who met me in every morning during my work, took interest and appreciated specially **Mr. R. V. Singh, Retired Director General of ICFRE, and Mr. Vijay Rawat, IFS.**

> I also owe my gratitude to my **parents** who encouraged me throughout the tenure of my research work.

> And ultimately I wish to thank almighty '**God**' supreme power of Universe.

Air layering: A technique for creating urban landscape



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Silviculture Division, Forest Research Institute, Dehradun
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Theme:
Forest in Society

1st Indian Forestry Congress

Sub theme:
Forest in Urban Landscape

- India's population has crossed **1.2 billion**
- More than half of this population lives in urban areas, and the number is growing rapidly
- If scientists want to help the majority of the population, they need to turn their attention to urban areas. (Nature, 2010. Vol.467:883-884)

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Major constraints in urban plantations

- **Poor soil fertility**
- **Drought conditions**
- **Inadequate infrastructure for propagation**
- **High planting cost**

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Dilemma of Urban People

- How can I grow a plant ?
- Where can I grow ?
- I do not have **enough time** for daily inspection
- But, still I want to grow and plant a tree and give my contribution to conserve this beautiful planet

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Answer : Air Layering

- Marcottage or gootee (presently used)
 - Action: Remove bark around the branch
 - Limitation:-
 - Need specialised training
 - More laborious and time consuming
 - High cost of production
 - More chances of harm to plant
 - Hence, used in difficult to root plants only
- Tourniquet technique (rarely used)
 - Action:- A branch tied with wire
 - Limitation:-
 - More laborious and time consuming
 - Applied to only hard branches
 - Damage to plant during application



Gootee



Tourniquet

Contd..

Contd..

- ‘Rooter Strand’ (Developed by us)
 - Action: Branch tied with ‘Rooter Strand’
 - Benefits:
 - No need of specialised skills.
 - Enhance working efficiency
 - Can be applied on both hard and soft branches
 - Rooter Strand decomposes on its own if rooting does not occur
 - Less harm to plant
 - Cost effective



Rooter Strand

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Rooter Strand

- It is a novel and GREEN-PRODUCT
- Rooter Strand has been successfully used in those species where cuttings failed to root i.e. difficult to root species e.g. *Zantboxylum alatum* Roxb., *Santalum album* L.
- Rooter Strand has been tested in more than 20 species with success.

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Rooter Strand used in various species...



Elaocarpus ganitrus
Roxb. & G.Don.



Santalum album L.



Simarouba glauca
DC



Pongamia pinnata (L.)
Pierre



Hybrid Citrus



Nerium oleander L.



Artocarpus heterophyllus Lam.

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Contd..

Rooting pattern in different spp. with Rooter Strand



Lagerstroemia indica L.



Jatropha curcas L.



Ficus palmata Forssk



Hibiscus rosa-sinensis L.



Ficus recemosa L.



Litchi chinensis Sonn.

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Results

S. No.	Name of species	Rooter Strand No.	Rooting percentage
1	<i>Artocarpus heterophyllus</i> Lam.	2	50
2	<i>Citrus maxima</i> (Burm.) Merr.	1	45
3	<i>Diploknema butyracea</i> (Roxb.) H. J. Lam.	1	50
4	<i>Elaeocarpus ganitrus</i> Roxb. & G. Don.	5	50
5	<i>Ficus palmata</i> Forssk.	1	100
6	<i>Ficus recemosa</i> L.	2	90
7	<i>Gardenia jasminoides</i> Ellis.	1	100
8	<i>Hibiscus rosa-sinensis</i> L.	5	80
9	Hybrid Citrus	1	100
10	<i>Litchi chinensis</i> Sonn.	5	60

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Results

S. No.	Name of species	Rooter Strand No.	Rooting percentage
11	<i>Nerium oleander</i> L.	1	87
12	<i>Pongamia pinnata</i> (L.) Pierre	1	87
13	<i>Populus deltoides</i> Bartr. ex Marshall	1	100
14	<i>Psidium guajava</i> L.	1	100
15	<i>Lagerstroemia indica</i> L.	1	100
16	<i>Jatropha curcas</i> L.	Rooter Strand successfully produced roots	
17	<i>Cassia angustifolia</i> Vahl.		
18	<i>Santalum album</i> L.		
19	<i>Simarouba glauca</i> DC.		
20	<i>Zanthoxylum alatum</i> Roxb.		

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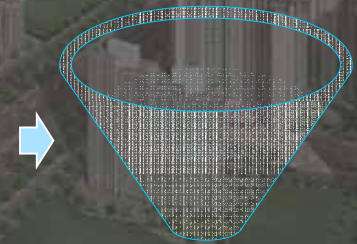
Importance of Present Technique

- Air layering is very easy and does not require much skilled workers.
- No need of land for nursery or mist chamber.
- Plants can be propagated in natural environment even in remote areas (in FOREST or URBAN fields).
- Sustaining plant biodiversity and reduce monoculture.
- Not much time consuming as in previous techniques of air layering.
- It is a cost-effective method for producing true-to-type plant material and can be adopted for multiplication of superior material where cuttings root poorly.

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This is perhaps one of the best plant propagation techniques in the world which requires

HALF GLASS OF WATER



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Future Applications

- This simple technique can be used in large scale plantation programmes of Govt. of India:
 - GIM,
 - CAMPA,
 - National Biodiesel Mission,
 - MNREGA etc.
- Employment to landless people in urban areas
- Superior germplasm can be multiplied by this technique for increasing productivity in future plantations programmes. For this purpose, it needs to be tested in more species

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*"Forest Sector Challenges :
Need for Forestry Institutions to adapt"*

**Presentation at the Indian Forestry Congress
At Delhi, India 23rd November 2011**

Theme 1 : Forests in Society

***Sub-Theme 1.3 : "Forest Governance and
Institutional Reforms"***

***Dr. Arvind Boaz
Additional Principal Chief Conservator of Forests
CHHATTISGARH***

FORESTRY-THE CURRENT SCENARIO :

- **FORESTRY SECTOR HAS LITTLE SAY AT POLITICAL, BUREAUCRATIC, OPINION LEADERS AND PRIVATE SECTOR AND EVEN THE COMMUNITY LEVEL**
- **ISOLATED AND SIDELINED :** INSPITE OF SUCH A BIG EMPHASIS ON THE ENVIROMENT, THE FORESTRY SECTOR IS STILL ISOLATED AT THE NATIONAL AND STATE LEVEL IN POLICY, PLANNING AND BUDGETRY ALLOCATIONS. IN SEVERAL KEY ISSUES LIKE BIODIVERSITY, TREES OUTSIDE FORESTS, BAMBOO AND FOREST BASED POVERTY REDUCTION, ENERGY AND NTFPS THE FORESTERS ARE LARGELY SIDELINED.
- **FORESTRY AND WILDLIFE AGENDA HIGHLY HIGHJACKED** BY NGOs, CSOs, VARIOUS INSTITUTIONS, ENVIRONMENTALISTS OUTSIDE THE FORESTRY SECTOR ESPECIALLY IN THE NEW CLIMATE CHANGE REGIME

FORESTRY-THE CURRENT SCENARIO (Contd....)

- **FAILING TO ADAPT :** FORESTERS EXTREMELY RIGID IN THEIR APPROACH TO ADAPT TO CHANGE. ARE ALSO SHY OF UPGRADING KNOWLEDGE ABOUT VARIOUS OTHER SECTORS AFFECTING FORESTRY ESPECIALLY VARIOUS POLICIES AND STRATEGIES LIKE POVERTY REDUCTION, ECONOMIC GROWTH, FOOD AND ENERGY SECURITY. ALL THESE POLICIES ARE IN A CONSTANT STAGE OF FLUX AND WE NEED TO KEEP PACE WITH THE CHANGING SCENARIO.
- **FORESTERS ARE ALSO NOT READY TO ADOPT NEW TECHNOLOGIES THAT ARE BEING DEVELOPED AROUND THE WORLD EVEN IN FORESTRY. THIS RESISTANCE TO CHANGE AND CONTENTMENT IN THE PRESENT STATUS QUO HAS LEFT THE INDIAN FORESTRY SECTOR WAY BEHIND IN THE PRESENT NATIONAL AND WORLD SCENARIO.**
-

FORESTRY-THE CURRENT SCENARIO (Contd....)

- **A SAGA OF LOST OPPORTUNITIES** : IN THE PAST WE HAVE LOST SEVERAL OPPORTUNITIES TO GRAB THE LIME LIGHT ESPECIALLY IN ISSUES LIKE BIODIVERSITY CONSERVATION, ROLE IN THE BAMBOO MISSION, WASTELAND DEVELOPMENT, NTFP MANAGEMENT UNDER PESA AND TRIBAL RIGHTS ACT.
- **MORE OPPORTUNITIES ARE KNOCKING AT OUR DOOR BUT WE ARE FAILING TO RESPOND IN A PROMPT AND SUITABLE MANNER**-ISSUES LIKE TRIBAL COMMUNITY RIGHTS UNDER THE TRIBALRIGHTS ACT, JOINT FOREST MANAGEMENT, TREES DEVELOPMENT OUTSIDE FOREST AREAS, CLIMATE CHANGE ESPECIALLY THE REDD AND REDD PLUS APPROACH, WILD LIFE MANAGEMENT ETC.

	Till Late 1970's	Late '70's - '90's	'80's - 2000	21 st Century
Trends	-Forestry for timber EXPLOITATION & hunting	-Social Forestry -NTFPs -Forestry – Poverty Alleviation -Forestry for Commercial / Industrial Purposes / Hunting /Wildlife -Commercial Plantations	-Forest Management -Forestry – Livelihood Linkages -Tribal and indigenous peoples' rights over forest resources -Increased environmental concerns -Watershed Management Commercial needs	-Community / Participatory / Joint Forest Management -Forestry – NTFP- Medicinals -Livelihood Linkages -Tribal and indigenous people's rights over forest resources -Increased environmental concerns -Commercial needs Desertification -Biodiversity, Land Degradation
Actors	Government -Industry -People as workers	Multilateral/Donor Agencies Government Industry Forest Dependent Communities Research Institutions Estd of Forest corporations	Multilateral/Donor Agencies Government Non-government Organizations Forest Dependent Communities Civil Society Organizations Research/Scientific Institutions Industry	Non-government Organizations Civil Society Organizations Government Forest Dependent Communities Multilateral/Donor Agencies Research/Scientific Institutions Industry Media Citizens groups & others

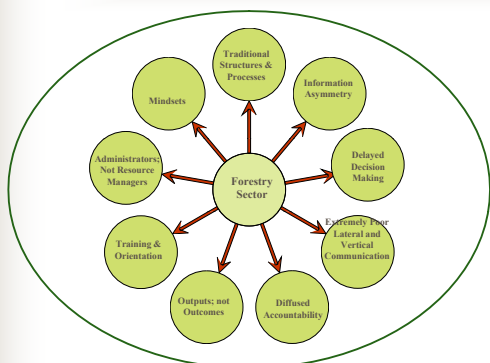
Forestry Institutional challenges

- ❖ Great National and International concerns about the environment & forest degradation
- ❖ India's galloping economic growth, globalization, growing disparities in resource allocation, resource conflicts, rapid diversion of forest land for development
- ❖ Marginalization of public forestry Institutions
- ❖ Rapid Entry of new Vocal players in the sector- External experts, NGOs and CSOs
- ❖ Role of foresters in forest policy level decisions minimised
- ❖ Challenging scenario -very existence of public forestry institutions threatened

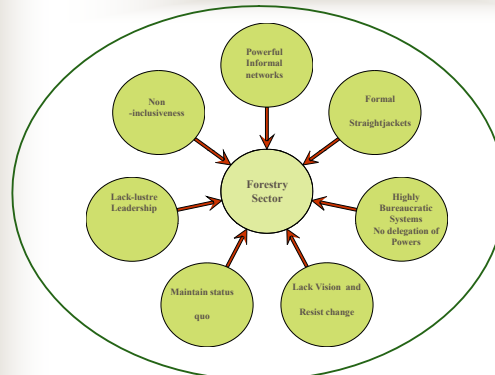
Forestry Institutional challenges (contd)

- ❖ Current challenges being often addressed through 19th/ 20th century organizational structures and institutional mechanisms
- ❖ Forestry institutions largely myopic in outlook, limited in scope and irrelevant in the face of changes in the external environment.
- ❖ Need for better and holistic implementation of Policy. Needs immediate revision to address current challenges
- ❖ Shift from traditional 'command and control' to coordinate and connect' mode half hearted and often resisted
- ❖ No coordinated communication strategy at National and state level to make stakeholders aware of the work being done and the rewards accruing to society because of this work by foresters in most hostile conditions

Organisational Issues in Forestry Sector :



Institutional Issues :



Conclusion

Time to Adapt Quickly to the rapidly changing Environment

Otherwise, the sector is bound to lose its Role and Acceptability in society and may be Perish

The Solution :

- an Enabling Environment for the Practitioners of the forestry Discipline to develop confidence
- Good Governance
- Give Power to People and in turn derive power of the Peoples' support
- Encourage Specialisation in various streams of Forestry and make yourself wanted
- Become Technical Bridge between people, policy makers, private and public sectors and Cross-sectoral Centres of Excellence on core issues of SFM, MDGs, Climate, democracy and development.

The Action Plan :

Organizational :

- ❖ Delegate / de-concentrate functions and powers to lower levels
- ❖ Integrate forestry with development-Implement integrated forest sector strategies based on livelihood and development approaches
- ❖ Try to work on best practices in human resource management and meritocracy culture
- ❖ Rules apply to all, irrespective of power brokers. *Enforce laws without fear or favor; especially the latter*
- ❖ *Review outdated policies seriously -and implement in a time bound serious manner.*
- ❖ *Review and change outdated training curricula, methodologies, practices, working plans to suit current needs*

The Action Plan contd....

Institutional :

- ❖ *Drastic not Cosmetic changes in organizational reforms needed- institutional reforms at all levels are critical for the change processes to attain desired outcomes*
- ❖ *Take different stakeholder groups in confidence and work with them to develop and deliver effective strategies. Treat Stakeholders as 'partners' and 'customers'.*
- ❖ *Understand the Herculean task through rigorous analyses for designing due change and undertaking reforms.*
- ❖ *Accept the changing environment and fight it out by taking the Bull by its Horns. Legislations like PESA, the Indigenous Peoples & Tribal Rights Act, RTI have the power to make forest departments completely irrelevant. Counteract. Drop the ostrich approach, take advantage of the strong environment and forestry sentiment developed in the recent past. Push through strong counter legislations and amendments to these Acts by pro-active education of legislators and people in response.*
- ❖ *Stop being timid about change. Once committed, do not adopt a haphazard approach to change for 'quick wins'.*

FORESTS AND COMMUNITIES FORGING PARTNERSHIPS

Kartikeya V. Sarabhai

**1st Indian Forest Congress
New Delhi, November 22nd-25th, 2011.**



Centre for Environment Education -
Aerial View



CEE - 1985



CEE - 2010

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Manekbaug

Manekbaug, 1999



Manekbaug, 2011

Sacred Trees & Protection



Outside Prabhudas Thakkar College, Ahmedabad

Sacred Grove in Tamilnadu



JFM Programme - VIKSAT experience

With the intervention of the VIKSAT Bhiloda Field office the work of regeneration has been done through Tree Growers Cooperative Societies (TGCS) of Bhiloda Taluka of Sabarkantha District.

Total 77 TGCS are formulated. 56 TGCSs are registered under the cooperative society act. Total 7992 hectare area of Forest Land is protected. On regeneration of the degraded forest people are getting Non Timber Forest Produce (NTFP) like the fodder, fuel, Timru leaves etc.

Before



After JFM Programme





Perspective Planning

SGP India - Project Impacts

- ❑ Grantee Name : SRUJAN
- ❑ Project No : IND/SGP/OP4/Y1/RAF/2008/02/MS 26
- ❑ Project Title: "Restoration of Forests to Ensure Survival of Kolam - a Primitive Tribe"
- ❑ Grant Amount : USD 30,833
- ❑ Co-financing : USD 41,666
Oxfam scaling up into the district for 15 villages

Sowing of Seeds in Forest Areas



Local Actions Ensure Conservation and Livelihoods



Non-Alcoholic Food Products from Mahua Flowers



Spirit of JFM

1. Degraded Forest land now better forests but the promise of share in Timber needs to be acted upon. Harvesting long overdue in some cases.
2. FD not competing with NGOs. Need better tools to select partner NGOs. Tendering not appropriate technique.
3. Not to convert JFM committee into a "sub-contractor" for hiring people
4. Carbon credit sharing mechanism

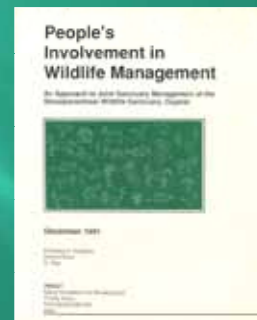
Grassland and Blackbuck



Lesser Florican



Shoolpaneshwar



Human Animal Conflict



Indian Sandalwood Plantation



2008, Kununurra, Western Australia



Tropical Forestry Services (largest Indian sandalwood company) manages the largest area of Indian sandalwood plantation in the world with 3,770 hectares planted in the Ord Irrigation Scheme

Forests & National Accounts

- ❑ “There are estimates of what forests generate for the economy but no valuation of the standing forests and their role in water and soil protection, and certainly no valuation of the minor forest produce, which provides livelihood to the poor.
- ❑ There is no assessment of the role of forests as providers of grazing land, which in turn provide for animal care and dairying.
- ❑ Contribution of this sector—defined as agriculture, forestry and fishing—has sharply declined each year. Its annual growth rate in 2005-06 was 5.2 per cent. By 2009-10 its growth rate turned negative.
- ❑ Place taken by the mining and quarrying sector, which registered a growth rate of 8.7 per cent in 2009-10 against 1.3 per cent in 2005-06.
- ❑ Forests have been blacked out in the economic assessment of the country.”

Sunita Narain in Down to Earth

CEE Campus



Paryavaran Mitra



- ❑ 2 lakh schools
- ❑ Curricular class room programme and
- ❑ Eco-club activities

- ❑ Materials in 15 languages



Sanjeevani

Explores Biodiversity Education Through Waste Reuse

- ❑ Post basic schools – based on Gandhian ideology of education.
- ❑ Aushadh Baug - Biodiversity Conservation Resource Area (BCRA)
- ❑ More than 150 medicinal plants.
- ❑ Focus on dignity of labour and self sufficiency,

Farmer Field Schools

- ❑ To demonstrate and facilitate Sustainable Agriculture Practices
- ❑ Halvad, Gujarat, 15 Field Farmer School with a membership of 225 Farmers
 - Drip irrigation,
 - Organic farming,
 - Green manuring,
 - Soil and water testing,
 - Dry land horticulture,
 - Boundary plantation,
 - Bio compost,
 - Vermi compost, vermi wash,
 - Bio pesticide,
 - Training and exposure



Source: Rural Knowledge Centre (Halvad), CEE

Student Amateurs in School Yard Agriculture (SASYA) Project

- ▣ CEE with the support of UNICEF Hyderabad and the Department of Education (Sarva Siksha Abhiyan), in 150 schools in the Medak district of Andhra Pradesh, India
- ▣ Chemical-free, nutrient-rich vegetables to the children and to provide an opportunity to learn by doing.
- ▣ A small start-up kit - with a manual, guidelines, vegetable seeds and other requirements like sample bio-fertilizers, bio-pesticides and equipment like hand sprayers
- ▣ A research group formed with a teacher, Mandal Educational Officer and a field coordinator from a NGO
- ▣ Village community were part of garden lay out plan, prepared land for sowing, helped sowing seeds, provided farm yard manure and seeds
- ▣ Produce utilized for the mid day meals served in schools and also shared with community as well as the teachers

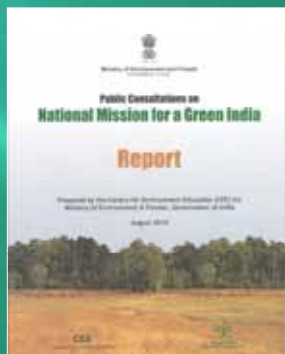


Source: SASYA Project, CEE Andhra Pradesh

Public Consultation



GIM consultation



Monitoring & Feedback

- ▣ EcoSampark
- ▣ College Monitoring Programme

Key elements of Partnership

- ▣ A sense of joint "ownership"
- ▣ Participation in Key Decision making
- ▣ Sharing of Benefits
- ▣ Recognition of larger role of Forests – Ecosystem services
- ▣ Transparency and Access
- ▣ Value addition possibilities
- ▣ Capacity Building
- ▣ Weaving in local traditions
- ▣ Participation in Monitoring



INTERPRETING MEDICINAL PLANTS IN INDIAN TRADITIONS FOR SETTING CONSERVATION PRIORITIES

D.K. Ved

Institute of Ayurveda and Integrative Medicine,
Foundation for Revitalisation of Local Health Traditions, Bangalore.
November, 2011



What is a Medicinal Plant?



All plants have potential medicinal value. This was recognised more than a 1000 years ago in *Ashtanga Hridaya*.

‘.....जगत्येवमनौषधम्
न किञ्चिद्विद्यते द्रव्यं वशान्नानार्थयोग्यो : ”

In *Ashtanga Hridaya*.

Sutra Ch.9 – verse 10, Ashtanga Hridaya.

There is nothing in this universe, which is non-medicinal, which cannot be made use of for many purpose and by many modes.

Profile of India's Medicinal Plants

- ∞ India's rich medical heritageone of the oldest living traditions in the world (> 3000 years old).
- ∞ As per FRLHT's database around 6200 plant species are recorded in medicinal use in India by > 4000 ethnic communities

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Profile of India's Medicinal Plants

Cross tabulation of number of Medicinal Plants Used across Medical Systems

	AYURVEDA	FOLK	FOLK (V)	HOMEO.	SIDDHA	TCM	TIBETAN	UNANI	WESTERN
AYURVEDA	1539	776	310	176	758	359	248	429	74
FOLK	776	4765	283	161	773	673	187	332	80
FOLK (V)	310	283	547	47	300	138	82	111	14
HOMEO.	176	161	47	490	145	129	69	137	102
SIDDHA	758	773	300	145	1152	289	211	337	59
TCM	359	673	138	129	289	881	109	206	80
TIBETAN	248	187	82	69	211	109	252	179	23
UNANI	429	332	111	137	337	206	179	496	63
WESTERN	74	80	14	102	59	80	23	63	190

Total species: 6248

Cultural Context



- India has one of the most mature plant-based medical traditions in the world.
- Sophisticated theoretical foundations (*Dravya Guna Shastra*) for the study of biological properties and actions of plants.
- 25,000 brilliantly designed herbal formulations in the codified medical tradition (thousands of medical manuscripts).
- 50,000 herbal formulations based on around 8000 species, estimated to be known to folk tradition.

Economic Context

- Around 600,000 registered practitioners of Indian systems of medicine whose practice depends on use of medicinal plants.
- Over 9000 manufacturing units with annual turnover >Rs. 8000 crores.
- International annual trade in medicinal plants more than a billion USD.



Medicinal plants traded in India

- Out of 8,000 plant species recorded in medicinal use in India, about 1000 species are estimated to be in commercial trade as plant raw drugs.
- Inventory of such species, prepared by FRLHT, based on extensive surveys of plant raw drug markets across the country has listed 1289 botanical entities pertaining to 960 plant species. (2006-07)

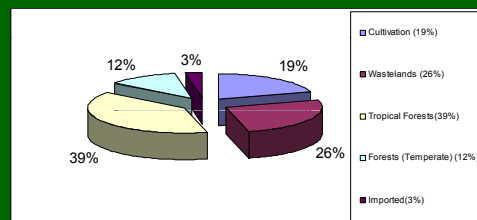
Break –up of Traded Botanicals

- 41% of these 960 species are herbs, 26% trees, 18% shrubs and 15% climbers.
- More than 50% of plant raw drugs in trade involve collection of whole plants, roots, wood or bark (destructive harvesting).
- 178 Species identified in high volume (>100 MT/Yr.) trade
- Annual demand of botanical raw drugs estimated at 3,19,500 MT (dry wt.)

Key findings

178 Species traded in High volumes (>100 MT/yr.)

- A list of 178 species in high trade (> 100MT/Yr.) has been generated based on data of industrial consumption as well as data of production, supply and trade recorded during the study. An analysis of supply sources for these 178 species is given below:



Key findings

91 wild species, in high trade, needing focused management interventions

- 21 of these are obtained from temperate forests (Himalaya) and 70 from tropical forests.

21 Species obtained from Temperate Forests(Himalayan region): *Abies spectabilis* (Brahmi talis), *Aconitum ferox* (Bachnag), *Aconitum heterophyllum* (Atis), *Berberis aristata* (Daruhalidi), *Berginia ciliata* (Pashanbheda), *Cedrus deodara* (Devdar), *Cinnamomum tamala* (Tejpatra), *Ephedra gerardiana* (Somlata), *Juniperus communis* (Hauber), *Jurinea macrocephala* (Dhoop), *Nardostachys grandiflora* (Jatamansi), *Onosma hispidum* (Ratanjot), *Parmelia species*(Chadila) , *Picrorhiza kurroa* (Kutki), *Pistacia integerrima* (Kakarsingi), *Rheum australe* (Revandchini), *Rhododendron anthopogon* (Talis patra), *Swertia chirayita* (Chirata), *Taxus wallichiana* (Talis), *Valeriana jatamansi* (Mushkbal), *Viola pilosa* (Banafsha).

Key findings

70 Species, in High Trade, obtained from Tropical Forests of India

Acacia catechu, *Acacia nilotica*, *Acacia sinuata*, *Aegle marmelos*, *Albizia amara*, *Alstonia scholaris*, *Anogeissus latifolia*, *Asparagus racemosus*, *Baliospermum montanum*, *Bombax ceiba*, *Boswellia serrata*, *Buchnania lanzan*, *Butea monosperma*, *Careya arborea*, *Cassia fistula*, *Celastrus paniculatus*, *Chlorophytum tuberosum*, *Cinnamomum sulphuratum*, *Clerodendrum phlomidis*, *Coscinium fenestratum*, *Cyclea peltata*, *Decalepis hamiltonii*, *Desmodium gangeticum*, *Embelia tsjerium-cottam*, *Emblia officinalis*, *Garcinia indica*, *Gardenia resinifera*, *Gmelina arborea*, *Gymnema sylvestre*, *Helictus isora*, *Holarrhena pubescens*, *Holoptelia integrifolia*, *Holostemma ada-kodien*, *Ipomoea mauritiana*, *Ixora coccinea*, *Lannea coromandelica*, *Litsea glutinosa*, *Lobelia nicotianaefolia*, *Madhuca indica*, *Messua ferrea*, *Mimusops elengi*, *Morinda pubescens*, *Mucuna pruriens*, *Nilgiriathus ciliatus*, *Operculina turpethum*, *Oroxylum indicum*, *Premna integrifolia*, *Pterocarpus marsupium*, *Pterocarpus santalinus*, *Rauvolfia serpentina*, *Rubia cordifolia*, *Santalum album*, *Sapindus mukorossi*, *Saraca asoca*, *Schrebera swietenoides*, *Semecarpus anacardium*, *Shorea robusta*, *Smilax glabra*, *Soymida febrifuga*, *Sterculia urens*, *Stereospermum chelonoides*, *Strychnos nux-vomica*, *Strychnos potatorum*, *Symplocos racemosus*, *Terminalia arjuna*, *Terminalia bellirica*, *Terminalia chebula*, *Vateria indica*, *Wrightia tinctoria*, *Zizyphus xylocarpus*.

Key findings

46 Species, in High Trade, largely/ entirely obtained from wastelands/ roadsides

Abrus precatorius, *Achyranthes aspera*, *Aerva lanata*, *Andrographis paniculata*, *Bacopa monnieri*, *Boerhavia diffusa*, *Cardiospermum halicacabum*, *Cassia absus*, *Cassia tora*, *Centella asiatica*, *Centratherum anthelminticum*, *Citrullus colocynthis*, *Convolvulus microphyllus*, *Curculigo orchiooides*, *Cynodon dactylon*, *Cyperus esculentus*, *Cyperus rotundus*, *Datura metel*, *Eclipta prostrata*, *Fumaria indica*, *Hedyotis corymbosa*, *Hemidesmus indicus*, *Hydrophylla schulli*, *Ipomoea nil*, *Merremia tridentata*, *Ocimum americanum*, *Peganum harmala*, *Phyllanthus amarus*, *Pluchea lanceolata*, *Plumbago zeylanica*, *Pseudarthria viscida*, *Psoralea corylifolia*, *Sida rhombifolia*, *Sisymbrium irio*, *Solanum anguivi*, *Solanum nigrum*, *Solanum virginianum*, *Sphaeranthus indicus*, *Tephrosia purpurea*, *Tinospora cordifolia*, *Tragia involucrata*, *Tribulus terrestris*, *Trichosanthes cucumerina*, *Vetiveria zizanioides*, *Withania coagulens*, *Woodfordia fruticosa*.

Some of these species need to be cultivated for meeting the specific quality requirements relating to the plant raw drugs.

Key findings

36 Species, in high trade, largely/ entirely obtained from cultivation / plantations

Abelmoschus moschatus, *Acorus calamus*, *Adhatoda zeylanica*, *Aloe barbadensis*, *Alpinia calcarata*, *Azadirachta indica*, *Caesalpinia sappan*, *Cassia angustifolia*, *Catharanthus roseus*, *Cichorium intybus*, *Croton tiglium*, *Curcuma angustifolia*, *Curcuma zerumbet*, *Ficus benghalensis*, *Ficus religiosa*, *Gloriosa superba*, *Indigofera tinctoria*, *Inula racemosa*, *Jatropha curcas*, *Kaempferia galanga*, *Lawsonia inermis*, *Lepidium sativum*, *Ocimum basilicum*, *Ocimum tenuiflorum*, *Piper longum*, *Plantago ovata*, *Plectranthus barbatus*, *Pongamia pinnata*, *Prunus armeniaca*, *Saussurea costus*, *Silybum marianum*, *Simmondsia chinensis*, *Trachyspermum ammi*, *Vitex negundo*, *Withania somnifera*, *Zizyphus jujuba*.

Some of these may need development of improved varieties / Cultivars

Key findings

5 Species, in high demand, largely/ entirely obtained through imports

- 2 species, namely *Aquilaria agallocha* (Agar) growing in N.E India and *Commiphora wightii* (Guggul) growing in western India, need augmentation of their wild populations and sustainable harvest practices.
- The remaining 3 species namely *Glycyrrhiza glabra* (Mulethi), *Piper chaba* (Gajjippal) and *Quercus infectoria* (Majuphal) are exotics and may have to be considered for cultivation in suitable areas for meeting the domestic demand.

Note: A few high value imported species, like *Anacyclus pyrethrum*, may also be considered for such cultivation.

Native traded medicinal species obtainable from specific bio-geographic zones

- From Himalayan region: *Aconitum* species, *Picrorhiza kurroa*, *Swertia chirayita*, *Dactylorhiza hatagirea*, *Nardostachys jatamansi*, *Valeriana jatamansi*, *Podophyllum hexandrum*, *Angelica glauca*, *Saussurea costus*.

- From Western Ghats: *Coscinium fenestratum*, *Garcinia indica*, *Hydnocarpus pentandra*, *Vateria indica*, *Myristica malabarica*.

- From Deccan Peninsula: *Decalepis hamiltonii*, *Pterocarpus santalinus*

- From N.E.India: *Aquilaria malaccensis*, *Coptis teeta*, *Taxus wallichiana*

Medicinal plants in high volume trade and of conservation concern



Coscinum fenestratum (Gaertn.) Coleb.
Critically Endangered (Regionally)

Sanskrit name : Darvi, Daruharidra
Tamil name : Maramanjil

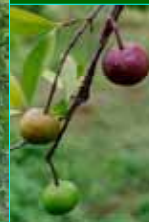


Medicinal plants in high volume trade and of conservation concern



Garcinia indica (Thouars) Choisy
Vulnerable (Globally)

Sanskrit name : Amlavetasa, Vrksamla
Tamil name : Murgal



Medicinal plants in high volume trade and of conservation concern



Saraca asoca (Roxb.) Wilde
Endangered (Regionally)

Sanskrit name : Asoka
Tamil name : Asoka

Medicinal plants in high volume trade and of conservation concern



Decalepis hamiltonii Wight & Arn.
Endangered (Globally)

Sanskrit name : Sariva, Shweta sariva
Tamil name : Makali kilangu

Medicinal plants used in high volume trade and of conservation concern



Embelia ribes Burm.f.
Vulnerable (Regionally)

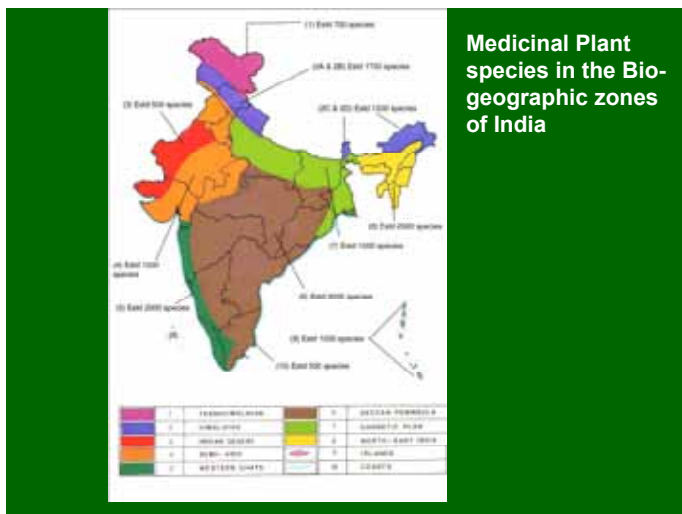
Sanskrit name : Vidanga
Tamil name : Vaividangam



Distribution of Indian Medicinal Flora

∞ India's Medicinal Plant Diversity is distributed across different forest types (16) / bio-geographic zones (10) / biotic provinces (25) of the country.

∞ Conservation action has, therefore, to take place across these categories.



Conservation context

It is likely that a quarter of all species of Indian plants may be either extinct or on way to extinction within 25 years, and the great majority of the species present now are likely to be extinct within a century. To allow this to happen would be an unforgivable crime against the future generations of India and it would constitute the loss of a significant portion of the global bio-diversity heritage.

Conservation context

Estimation of Conservation Status

- Large number of plant species are now believed to be under threat of extinctionIUCN’s global list of threatened plants (1997) enlists nearly 12.5 % of all known species in this category.
- Using this proportion it is estimated that nearly 1000 medicinal plants of India would fall into this category.

Conservation context

Estimation of Conservation Status

- Three volumes of Red Data Book of Indian plants (by BSI) enlist only around 60 medicinal plant species.
- The large gap between this documentation and the estimated 1000 threatened Indian medicinal plants needs to be addressed through a rapid assessment methodology.

State wise list of medicinal plant species assigned RL status based on Rapid threat assessment exercises (CAMP process)

S.No.	State	No. of RLS	Year & Location of CAMP workshop
1	Karnataka	81	1995,1996,1997,1999 all at Bangalore
2	Kerala	85	1995,1996,1997,1999 all at Bangalore
3	Tamil Nadu	80	1995,1996,1997,1999 all at Bangalore
4	Andhra Pradesh	47	2001 at Hyderabad
5	Maharashtra	35	2001 at Pune
6	Chhattisgarh	47	2003 at Bhopal
7	Madhya Pradesh	50	2003,2006 both at Bhopal
8	Arunachal Pradesh	44	2003 at Guwahati
9	Assam	16	2003 at Guwahati
10	Meghalaya	25	2003 at Guwahati
11	Sikkim	24	2003 at Guwahati
12	Jammu & Kashmir	62	1998 at Kullu, 2003 at Shimla
13	Himachal Pradesh	62	1998 at Kullu, 2003 at Shimla
14	Uttaranchal	60	2003 at Shimla
15	West Bengal	43	2007 at Kolkatta
16	Rajasthan	38	2007 at Jaipur
17	Orissa	40	2007 at Bhubaneshwar

Total no. of species (NT and above) = 335

Conservation context

In situ conservation is the primary and most cost-effective method for long-term conservation of the medicinal plants diversity. Cultivation can ensure immediate availability, but cannot ensure long-term conservation of species.



Towards Conservation Action

- Enlistment of Wild Medicinal Plants of each state.
- Survey and assessment of species wise collections of medicinal plants from the forests.
- Rapid assessment of prioritized species using CAMP (Conservation Assessment and Management Prioritization) process and following IUCN Red List categories & criteria(2000) for informed conservation action.

Towards Conservation Action

- Establishment of a network of 200 to 300 Medicinal Plants Conservation Areas (MPCAs) across different forest types / bio-geographic regions of the country
- Putting in place a suitable policy frame work for supporting the Forestry sector to include medicinal plants conservation, with community participation, as one of the goals of forest management.

Conclusions

- A very large number of medicinal plants in trade are obtained from the wild with implications on their conservation and sustainable utilization.
- This concern has a higher priority for species that are endemic or narrowly distributed and assessed as threatened.
- There is a need to develop management practices for ensuring conservation of these resources as well as meeting the livelihood needs of the large number of collectors involved in harvesting.

Forests and Traditional Knowledge with particular reference to Medicinal Plants

by

B.S. Sajwan

PCCF(HoFF) and Principal Secretary(E&F)

Arunachal Pradesh

Formerly CEO, National Medicinal Plants Board

World Forestry Landscape

- **Forests**
 - Cover more than 4 billion Ha (30%) of landmass
 - Account for more than 5000 commercial products- medicines, clothing etc
 - Are home to 2/3 rd of terrestrial species
 - Provide livelihood to 1.6 billion people
 - Are source of herbs and herbal products which provide health care to almost 80% of population in the developing world
 - Being lost @ 13 million ha every year with about 100 species getting extinct every year

Traditional Knowledge

- **Forms**
 - Folk non-codified
 - Codified, like, Ayurveda

TK is understood as knowledge derived and transmitted outside the boundaries of formal scientific/technical discourse. It is based on practical experience and experimentation involving trial and error, codified to varying degrees. TK is often governed by customs and social conventions making it very widely available. It is not protected today by any legally defined rights.

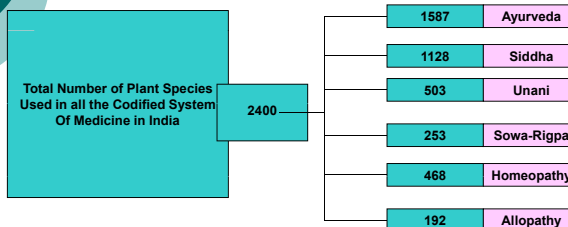
Traditional Medicine in India

- Officially recognized systems of medicine in India besides the Allopathic system are:
- A: Ayurveda
- Y: Yoga and Naturopathy
- U: Unani
- S: Sidha
- Sowa Rigpa
- H: Homeopathy

In addition there are a large number of folk healers(86000 MT of consumption) who provide health care but are not part of the formal system of medicine in India

Plants in use in different Systems

Total Plants in use: 6500-7500
Folk Systems: About 5500

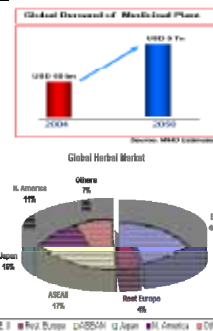


Medicinal Plants

- For health security
 - 90% of AYUSH products are plants based
 - More than 6500 plants used in folk and documented systems of medicines
- For livelihood
 - Almost 50% of the household income comes from medicinal plants collection in some forest rich states
- For employment generation
 - 35 million mandays
 - Main source of off season employment
 - 25,000 herbal traders

Medicinal Plants - Global Scenario

- International market in year 2004 was around \$60 billion and growing at the rate of 15%.
- Industry is expected to attain a value of USD 7 trillion by 2050.
- Demand for herbal medicine is especially high in European Union (EU) and United States (US). These two markets are the key driver of global herbal trade.
- Large number of Indian herbs already included in GRAS list and Herbs of Commerce by USFDA



Source: Report Herbal Processing

Medicinal Plants - Overview

- It was estimated that by 2010-11 at least two-thirds of the US population will be using alternative therapeutic approaches.
- More than 1500 herbals are sold as dietary supplements or ethnic traditional medicines
- Growing popularity of Traditional Chinese Medicine (TCM)
- Global acceptance of Ayurveda
- Steep rise in the demand for medicinal plants from India.

Source: Ayurveda and Traditional Chinese Medicine: A Comparative Overview, Advance Access Publication 27 October 2005

Medicinal Plants – Indian Scenario

- India has 47,000 diverse plant species.
- Flowering Plants about 16000-17500
- About 6,500-7,500 plants are known to have medicinal usage and used in traditional systems of medicine in India
- Presently, India contributes less than 1% to the global herbal trade & about 9% of exports
- Large domestic manufacturing sector(>9000 registered units)
- 2/3 of exports as raw herbs/extracts
- 80% of the production sourced from forests and waste lands and only about 40 species from cultivation

Challenges to Medicinal Plants Conservation

- Almost 25% of annual production of medicinal plants is collected by traditional healers for use and dispensing through non-formal health care system
- Almost 2/3rd of the herbs collected through destructive harvesting. In case of trees the replacement cycle can take 10-15 years
- Almost a total lack of regeneration program under Forestry sector Schemes except a weakly enforced regulatory framework
- Inadequate understanding of reproductive biology and sustainable harvesting system for a number of RET species
- Long Supply chain in trade causing poor returns to primary collectors leading to more collection
- Almost 1/3rd of herbs collected get rejected by the industries causing irreversible loss of species from forests
- Subsistence collection replaced by commercial collection under influence of market forces
- Non-destructive harvesting of fruits etc often replaced by destructive harvesting to save labour costs and maximise outputs

Plant Parts wise usage

S.No.	Items	unit (in %)
1	Leaves	5.8
2	Flowers	5.2
3	Fruits	10.3
4	Seeds	6.6
5	Stem	5.5
6	Wood	2.8
7	Bark	13.5
8	Whole	16.3
9	Rhizome	4.4
10	Roots	29.6
	Total	100

Implications for Traditional Medicine and Health care

- Loss of medicinal plants biodiversity from forests leads to:
 - High usage of substitutes and even adulterants
 - Efficacy and quality of medicines affected-bringing the systems in to disrepute
 - Adverse impact on of trade and exports
 - Permanent loss of biodiversity and threat of extinction to the rare, endangered and threatened species

Substitutes and Adulterants

S.No.	Official Drug	Substitute/Adulterant
1.	<i>Saraca asoka</i> bark	<ul style="list-style-type: none"> ○ <i>Polyalthia longifolia</i> ○ <i>Shorea robusta</i> ○ <i>Bauhinia variegata</i> ○ <i>Tremna orientalis</i>
2.	<i>Berberis aristata</i>	<ul style="list-style-type: none"> ○ <i>B. chitria</i> ○ <i>B. asiatica</i> ○ <i>B. lycium</i> ○ <i>Cocinium fenestratum</i>
3.	<i>Commiphora whightii</i>	<ul style="list-style-type: none"> ○ <i>Boswellia serrata</i>
4.	<i>Swertia chirayita</i>	<ul style="list-style-type: none"> ○ <i>S. angustifolia</i> ○ <i>S. alata</i> ○ <i>Andrographis paniculata</i>

Regulatory Framework

- CITES
- Biological Diversity Act 2002
- Indian Forest Act 1927
- Wild Life (Protection) Act 1972
- Forest (Conservation) Act 1980
- Negative List of 29 Plants
- State Laws:
 - AP Red Sanders wood Possession Rules 1989
 - Tamilnadu Sandalwood Transit Rules 1967
 - HP Forest Produce Transit rules 1977
 - MP Sustainable Harvesting Act 2005

Laws regulating Health sector

- Drugs and Cosmetics Act 1948
- Central Council for Indian Medicines Act
- Magic Remedies Act
- Schedule 'T' of DCA especially regulates the licensing, registration of AYUSH medicines and Quality aspects through GMPs
- Notification in 2008 requires AYUSH industry to maintain and furnish the medicinal plants consumed to State Drug Controller and NMPB- a landmark initiative to ensure traceability and hence quality

Kuth Story

- A critically endangered species(IUCN) used in Ayurvedic medicines – Annual consumption more than 500 MT
- Cultivated extensively until 1985. Was included in Appendix II in 1975 and upgraded to A I in Appendix I in 1985
- Also brought under Schedule 6 of WL(P) Act in 1991-92
- Area cultivated reduced to less than 40ha from 400ha
- Wild population declined by 70%
- India has become net importer in the last 15 years. Import during 2008-09 was 685 MT
- Available in Market/trade but without invoice
- Cultivation switched to *Inula racemosa*
- Occurs largely in J & K and virtually non existent in wild in HP now. Not reported from Uttarakhand
- No conscious policy in FD to promote cultivation or promote regeneration in the wild

Guggal (*Commiphora wightii*)



- Used in more than 100 Ayurvedic preparations
- Guggulsterone a & b well known for anti- hyperlipidemic, anti-arthritis activity,
- More than 100 patents
- Domestic consumption >1000MT
- Occurs in Rajasthan, Gujarat, MP, Maharashtra and Karnataka
- More than 90% demand met through imports-largely from Iran, Afghanistan, and Pakistan
- No conscious policy to conserve, regenerate under normal forestry schemes
- 4000 ha of coverage for the first time

Ashoka (*Saraca asoca*)



- Occurs in Western and Eastern ghats and the foothills of Eastern Himalayas
- Ashokarhist-the key Ayurvedic formulation for gynecological disorders
- Annual consumption of bark-2000MT
- IUCN categorized the species as globally vulnerable
- High incidence of use of Adulterants, viz *Polyalthia longifolia*, *Shorea robusta*, *Tremna orientalis*, *Bauhinia variegata*, *Brownia ariza*
- No specific regeneration program in FDs
- NMPB launched special projects for the species in Orissa, Karnataka, Kerala and Gujarat-estimated coverage of 1000 ha

Traditional Knowledge and IPR

- Patents on Indian Plants in US, Japan and EU countries a common occurrence. On an average about 2000 Patents on Indian Plants at IPOs every year
- A study showed that in US there are over 2300 patents on Yoga, 2315 trade marks at USPTO and 150 copyrights
- Traditional Knowledge existing in Sanskrit, Persian, Arabic, Urdu and Tamil one of the reasons for wrong patenting
- Haldi and Neem patents led to TKDL
- Biological Diversity Act 2002 regulates IPR on biodiversity and associated knowledge

Issues relating to TK (Non-codified)

- Novelty and innovation?
- Industrial application?
- No fixed life-held over generations
- Held by communities paralelly-
difficulty of identification

Hence a separate law outside IPR/Patent Laws needed- *sui generis*

TKDL

Traditional Knowledge Digital Library

- An initiative of CSIR and Dept of AYUSH
- Fighting patent cases in foreign courts costly and time consuming besides being fraught with uncertainty
- To protect our documented traditional knowledge from wrong patenting
- Classical text which is in Sanskrit, Arabic, Persian , Urdu and Tamil transcribed in five English, French, Spanish, Japanese and German languages for ease of understanding by the IPOs
- Registration with IPOs for prior art search before a patent application is decided
- Non disclosure agreement to prevent misuse
- So far more than 2.34 lakh classical formulations digitized and transcribed
- Includes Yoga Asanas to prevent wrong patenting of Yoga

Management/Developmental Interventions

- *In situ Conservation through MPCA- Medicinal Plants Conservation Areas*
- *Herbal Gardens*
- *Field Gene banks*
- *Resource augmentation in Forest areas*
- *Cultivation*
- *R&D to promote use of substitute plants or plant parts*
- *Market information to promote cultivation through an informed choice exercised by growers*

R & D to support Medicinal Plants Conservation

- *Developing sustainable harvesting protocols for those species where destructive harvesting resorted(harvest of roots, barks, wood, Panchang)*
- *Identification of alternative plant parts or plants as substitutes and get such substitutes included in Pharmacopoeia- R & D into biological activities for comparative efficacy or otherwise*
- *Development of Agro-techniques to promote domestication through cultivation*
- *Standardization of Post harvest protocols and their dissemination*

What can the Forestry Sector Do?

- *Transit Rules rationalization-HP case (where Rs 7 per kg is charged for Issue of transit pass even for cultivated Chirayita)*
- *Forest (Conservation) Act 1980 needs to permit Medicinal Plants cultivation as a forestry activity*
- *Mainstreaming of Medicinal Plants in Management Plans- Presently these are clubbed under NTFP(In MP 90% of NTFP is Tendu Patta)*
- *Use of ITK in working plans*
- *FDCs being commercial entities can look at Medicinal Plants as a diversification option*
- *Incorporate medicinal plants in forest regeneration programs being closely linked to livelihood as well for sustainability of JFM*

Thank you

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FORESTS AND COMMUNITY: FORESTS AND SOCIETY: FORGING PARTNERSHIPS

Ranjan Chatterjee
PLANNING COMMISSION

1

Forest conservation should be a priority not only to protect our green cover but also to ensure that the rights and interests of communities are protected.

2

Forests : PRE INDEPENDENCE

- The intrinsic relation between natural resources and community had been in great stress.
- Legislations put a restriction on the traditional access to and use of forest produce by the local population.
- Tamar Revolts in Jharkhand (1789-1832), Tribal Movement in Midnapur (1918-1924) were among the many revolts and uprisings against the **Forest Act 1865** and the **Forest Policy 1894**

3

PARTICIPATORY JOINT FOREST MANAGEMENT

- Empowerment of Gram Sabhas and marginalized section of the society.
- The enabling environment for sustainable livelihood option is participation of forest communities .
- Using innovation, local ingenuity and capacity building of stakeholders to achieve the larger goal of poverty alleviation.

4

In order to manage the JFM Programme effectively, we should set our national objectives which should include -

- **Multi-tier plantation,**
- **Promoting markets for NTFP and**
- **Technological inputs (which are low cost and locally adaptive)**

5

NEED FOR FORGING PARTNERSHIP AND INSTITUTIONALIZATION

- Afforestation in non-conventional forest areas like farms, waste lands etc. needs to be promoted.
- **The owners of such land being individuals, community, public authority and the state, afforestation would require forging partnership with farmers, community and different public authorities.**

6

SENSITISING PEOPLE TOWARDS FORESTS

- Sensitising the masses to understand the crucial role that forests and forest dependant communities play as a part of sustenance of ecosystems is important.
- Sensitising students through awareness programmes to channelize their energy towards larger goals of conservation and development.

7

WOMEN ; THE ACTUAL CONSERVATORS

- Gender budgeting can go a long way in providing livelihood and income options to women.
- Gender sensitive policies in areas of forest produce and its marketing, can help women procure their share of deserved incentives.

8

SECURING OUR SACRED GROVES

- The existence of 2 lakh sacred groves provide the much needed relief amidst the dynamics of rapid economic development and extreme scarcity of land resources.
- We would now require legal protection, citizen advocacy and a self-sustaining institutional mechanism to strengthen the community management to conserve them.

9

WAY FORWARD

- Our approach should be -'Care and Share'
- Transform our role from 'Manager' to 'Facilitator'
- Promote people friendly implementation and incentivisation.
- Advocate the necessary change in the mind-set of planners and administrators at all levels.

10

THANK YOU

Be the change you want to see...

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