SAARC

Proceedings of Workshop on Stakeholder Engagement to enhance Development and Productivity of Trees Outside Forests (TOF)



COLOMBO, SRI LANKA
14 - 16 November 2012


SAARC Workshop on Stakeholder Engagement
to enhance Development and Productivity of
Trees Outside Forests
14th –16th November 2012
Renuka Hotel , Colombo 04

Proceedings of the SAARC Forestry Workshop On Stakeholder Engagement to enhance Development and Productivity of Trees Outside Forests.

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Compiled by SAARC Forestry Centre

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Foreword

Approximately one-third of the world's 4 billion hectares are managed primarily for the production of wood and other forest products (FAO 2005). The trees outside forests have been an integral part of daily lives of human from time immemorial. All down the millennia, trees outside forests have been the most reliable source of fuel, food, medicines and several other materials useful in their daily lives. Trees outside forest cover a wide range of species - from fruit trees to trees growing in the agricultural fields and their peripheries.

Although more than 70 percent of timber for construction and over 75 percent of fuel wood comes from trees outside forests in several countries such as Nepal, India, Sri Lanka, etc the real benefits provided by trees outside forests have not been adequately recognized. Further, while forests resources in the State/Government forests are routinely assessed and their status generally well-known, data and information of trees growing in the fields (Trees outside forests) are scanty and sometimes not reliable. To put this scenario in a context, while most of the SAARC Member States have completed national forest inventory, and management plans prepared to ensure sustainable harvesting of forest resources, documentation of ToF at national level is only being carried out on a pilot basis in few of the Member States. Further, in addition to direct cash income, ToF provide substantial ecological services which as of now has not been accounted for or recognized. Such a situation has led to situation where only limited importance is laid on trees outside forests in most of the national forest policies, and subsequently missing out from the priority investment plans of the country.

The diversity/composition of species of trees outside forests is generally high, and therefore, accrues multiple benefits. For instance, in Sri Lanka, trees outside forests or home gardens compose of more than fifteen species, ranging from timber species, medicinal plants, and fodder species. Income from ToF/home gardens constitutes 10 to 75 percent in most of the SAARC Member States. In several Member States, particularly in Sri Lanka, time-tested management practices of ToF have evolved, which have ensured the

ToFs exist at the present state and continue to play a very important role in the lives of the people. However, there are signs that fragmentation of ToF, and conversion of ToF for infrastructural development has started to pose as serious threat.

It has been observed that different Member States apply different management strategies for the management of ToF, reflecting different local socio-economic conditions and biological and climatic variations within the SAARC Region. However, the basic functions of ToF remain constant, i.e. contributing to livelihoods of the local people, and providing ecological services such as water and soil conservation, sequestration of carbon dioxide, etc. Therefore, there is a need to bring together experts on the management of ToF within the SAARC Region, and share the success stories among the Member States desiring to develop ToF. This will help the farmers improve their livelihoods, and at the same time increase the effectiveness of the trees to reduce impact of climate change, and ensure harmonization of government owned forests and private trees to finally have a sustainable environment in the SAARC Region.

This particular workshop was considered important as a follow-up to the Training Workshop on carbon sequestration held in 2010 at Dehra Dunn, India wherein the participants from Sri Lanka reported on the progress of ToF, and role of such forests in the improvement of livelihoods of the local people and the positive impact on climate change. Hence, the SAARC Forestry Centre with the Member States worked on it to organize the SAARC workshop on "*Stakeholder Engagement to enhance Development and Productivity of Trees outside Forests*". Sri Lanka having extensive experiences of management of ToF, and assurance of adequate and appropriate sites for field demonstration, it was decided to have workshop in collaboration with Department of Forest, Ministry of Forest and Environment, Government of Sri Lanka in Colombo, Sri Lanka. The workshop participants benefited from well-prepared and relevant country presentations from Bhutan, India, Nepal and Sri Lanka on the status of forestry in general and ToF in particular. At the end of five-day Workshop, concrete recommendation on "Way-forward" relating to how ToF programme could be moved forward in the Member States emerged. Amongst others, the SFC was requested to organize an Expert Group Meeting on ToF where a General Guidelines on

the Management of ToF could be prepared for use by the Member States. The Workshop feed-back reflected that all the SAARC Member States participants were satisfied with the outcomes of the workshop, and committed for actions to promote trees outside forests in their respective countries.

Dr. Sangay Wangchuk
Director, SAARC Forestry Centre.

Acknowledgements

The SAARC Forestry Centre, Thimphu, Bhutan wish to thank the Department of Forests, Ministry of Environment, Government of Sri Lanka for consenting in hosting the Workshop on Stakeholder Engagement to enhance Development and Productivity of Trees outside Forests from 14 – 16 November 2012, at Colombo and was greatly appreciated.

Sri Lanka was an excellent venue for the workshop on Trees outside Forests. The support of the Conservator General, Department of Forests, Government of Sri Lanka in hosting the workshop was very much appreciated. Staff from Department of Forests, Government of Sri Lanka provided logistical and administrative support to facilitate participants' travel, prepared supporting materials, and coordinated the programme arrangement.

Our contact person, Mr. Anura Saturusinghe, Conservator of Forests, Department of Forests, Government of Sri Lanka had perfectly organized the workshop. The inaugural session was excellent with traditional lighting of oil lamp; field programme was no less good, and over all core workshop sessions were just wonderful.

The engagement of Professors, Dr. Nimal Gunatilleke and Dr. Gamini Hitinapake from the University of Peradeniya, Sri Lanka helped to create a positive atmosphere and more focus discussions. Sharing of their experiences with the participants was invaluable.

The workshop had many stimulating presentations by delegates from SAARC Member states; Bhutan, India, Nepal and Sri Lanka. The SAARC Forestry Centre is impressed by the outcome of the workshop, which was focused and came out with concrete way forwards to promote Trees outside Forests.

Lastly, thanks to Mr. Karma Jigme Temphel, Participatory Forest Management Specialist and Mr. Pasang Wangchen Norbu, Sustainable Forest Management Specialist, SAARC Forestry Centre for organizing the workshop with partners from Sri Lanka. Thanks to Mr. Karma, Finance Officer, SAARC Forestry Centre for sorting out all the financial matters.

Acronyms and Abbreviations

ACU	Adult cattle Unit
CDO	Community Development Organization
CF	Community Forestry
CFM	Collaborative Forest Management
DFDF	Disctrict Forest Development Fund
DFO	Distric Forest Officer/Office
DoF	Department of Forests
FAO	Food and Agriculture Organization
FSI	Forest Survey of India
GDP	Gross Domestic Product
INGO	International Non-governmental Organization
IPM	Integrated Paste Management
LF	Leasehold Forest
LPG	Liquefied Petrolium Gas
LSGA	Local Self Governance Act
MFP	Minor Forest Produce
MoA	Minstry of Agriculture
MoAF	Ministry of Agriculture and Forests
MPFS	Master Plan for the Forestry Sector
NGO	Non-Governmental Organization
NTFP	Non Timber Forest products
PHCB	Population Housing Cencus of Bhutan
PLM	Public Land Management
RGoB	Royal Government of Bhutan
SAARC	South Asian Association for Regional Cooperation
SFC	SAARC Forestry Centre
ToF	Trees outside Forests
TROF	Tree Resources outside Forests
UFS	Urban Frame Survey
VAT	Value Added Tax
VDC	Village Development Committee
WP	Working Policy

Inaugural Session

Lighting of the Traditional Oil Lamp

The workshop was started with lighting of traditional lamp by the Honorable Chief Guest, Deputy Minister, Ministry of Environment and other Guests from Government of Sri Lanka, Director, SAARC Forestry Centre and each delegate from Member States.

Welcome Address by Mr. Anura Saturusinghe, Conservator, Department of Forests, Government of Sri Lanka

Mr. Anura, Conservator, Department of Forests, Government of Sri Lanka delivered a welcome speech. He greeted and welcomed the honorable Chief Guest and all the delegates from Member States, SFC officials, Guests from Sri Lanka. On behalf of the Ministry of Environment, Department of Forests, Government of Sri Lanka wished the participants from Member States a comfortable stay and enjoy the city of Colombo.

Address by Dr. Sangay Wangchuk, Director, SAARC Forestry Centre

His Excellency Alhaj A.R.M Abdul Cardar, Deputy Minister, Ministry of Environment, Government of Sri Lanka; Honorable B.M.U.D Basnayake, Secretary, Ministry of Environment, Government of Sri Lanka; Honorable K.P. Ariyadasa, Conservator General, Department of Forests, Government of Sri Lanka; Delegates from Bhutan, India, Nepal and Sri Lanka; officers from Department of Forests and Ministry of Environment, Government of Sri Lanka.

Ladies and Gentlemen,

On the onset, the SAARC Forestry Centre would like to thank the Ministry of Environment, Government of Sri Lanka for hosting this workshop. I would also like to thank Mr. Ariyadasa, Conservator General of Forests for his support and agreeing to host the workshop on a short notice. I would also like to thank Mr. Anura Saturusinghe and Ms. Uthpala for their tirelessly working and organizing this workshop.

This workshop was first came an idea by Ms. Uthpala when she attended the training workshop on carbon estimation held in Dehra Dunn, 2010. This gave us light to think beyond the state forests. It was also indicated in Dehra Dunn workshop that trees outside forests have significant contribution to meet the demand of woods. A good case was presented by Ms. Uthpala and so the workshop is here today.

If I may highlight the mandates of the SAARC Forestry Centre, it is to promote research, education and extension in Sustainable Forest Management and conservation within the SAARC region; to develop regional information and knowledge based center on forest resources and facilitate dissemination and networking among the SAARC Member States; to enhance management capacity for sustaining mountain forest ecosystems and its environmental services and to promote participatory forestry for improvement of rural livelihoods, and sustainable local forest management.

As we understand that more than 75% of the forest produces are from the outside forests, like farm forestry, agro-forestry, private forests and industrial plantation. Only about a quarter of timber needs are met from the state forests**.** So, it has a huge potential to contribute the woods for the needs of the people and focus the state forest for conservation and environment.

Lastly, I would once again thank Honorable Chief Guest, Deputy Minister, Ministry of Environment, Honorable Secretary, Ministry of Environment, Conservator General, Department of Forests, Government of Sri Lanka for hosting this workshop. I also like to thank Mr. Anura Saturusinghe for his support and excellent arrangements of the workshop.

Finally, I would like to thank the delegates from Bhutan, Nepal, India and Sri Lanka for being able to make it for this workshop. I wish you good luck and fruitful stay in Colombo.

Address by Honorable Secretary, Ministry of Environment, Government of Sri Lanka

Honorable Abdul Cardar, Chief Guest, Deputy Minister, Ministry of Environment, Government of Sri Lanka; Dr. Sangay Wangchuk, Director and other officials of the South Asian Association for Regional Cooperation (SAARC) Forestry Centre; Mr. K.P Ariyadasa, Conservator General of Forests, Ministry of Environment, Government of Sri Lanka; Heads and senior officials of the institutions under the Ministry of Environment, Government of Sri Lanka; participants of the workshop.

Ladies and Gentlemen,

I am very much pleased to be here today, at the inaugural ceremony of the SAARC Workshop on Stakeholder Engagement to enhance Development and Productivity of Trees outside Forests.
The theme of the workshop is very much relevant to us, as larger proportion of our annual wood requirement – both fuel-wood and industrials wood – is met by trees resources, outside our forests.

It also draws our attention on two major areas – **stakeholder engagement and enhancement of development and productivity of trees outside forests** – which are crucial to long term sustainability of these important resources. Specially, considering the heterogenic ownership pattern and the geographical distribution pattern of lands in Sri Lanka, together with socio-economic and cultural parameters, it is essential to consider these aspects to ensure sustainable production from these lands.

Timing of the workshop is also significant to us, as we commemorate our National Tree Planting date tomorrow – the 15th November – which is an annual event, participated by his Excellency, the President of Democratic Socialist Republic of Sri Lanka – symbolizing the high priority of state involvement in development of trees resources outside forests in Sri Lanka.

Considering all these, I would like to express my sincere thanks to the SAARC Forestry Centre, Bhutan for sponsoring this workshop. I also take this opportunity to thank Forest Department for taking the challenges to organize this workshop very successfully within a very short period of time.

Ladies and Gentlemen,

Although Sri Lanka's forest cover is confined to about 30% of the total land area of the island, our tree resources outside forests occupy almost the same extent. They are represented by our home gardens, plantation crops – mainly coconut, rubber and tea and trees along water ways, roads and urban parks etc.

Therefore, further development and improvement of such resources are vital to us as our ultimate goal is to set aside our natural forests for conservation purposes.

Ministry of Environment, together with the Forest Department has launched number of programmes to achieve this goal. Our focus is on two main areas – one is to develop awareness among our young generation at school level – specially the importance of trees to our day to day life and our existence and, is to involve private and public sector institutions.

With its long term experience in planting and managing trees, Forest Department is playing a leading role in this regard. Among the activities carried by the Department, nursery programme, home garden development programme, and miscellaneous planting programmes – which include tree planting in environmentally sensitive areas, along water ways and on road side are implemented with community participation. Our Non-Governmental Organization (NGO) and the private sector are also two important stakeholders active in this area.

I am sure that delegates from other member nations will have similar experiences in this regard.

Ladies and Gentlemen,

As I understand, the workshop aims to produce series of recommendations for future action. I am much interested to see this outcome and its implementation.

With this few words, I would like to conclude my speech and wish all the success to the workshop.

I also wish our foreign delegates an enjoyable stay here in beautiful city of Colombo.

Thank you.

Address by the Chief Guest, Honorable Deputy Minister, Ministry of Environment, Government of Sri Lanka

Dr. Sangay Wangchuk, Director, and other officials of the SAARC Forestry Centre, Mr.B.M.U.D.Basnayake, Secretary, Ministry of Environment, Mr.K.P Ariyadasa, Conservator General of Forests, Heads and senior officials of the institutions under the Ministry of Environment, Participants of the workshop.

Ladies and Gentlemen,

As the Deputy Minister of the ministry of Environment, I am very much pleased to address you at the inaugural session of this workshop.

I understand that this workshop is organized by the SAARC Forestry Centre in with collaboration with the Forest Department of Sri Lanka. I also understand that delegates from Bhutan, India, Nepal and Sri Lanka are participating in this workshop. This symbolizes the good relationship we maintain within SAARC and other member countries in the region.

Ladies and Gentlemen,

As we all know, planting trees is a part of our culture. If you take Sri Lanka, where ever you go you see the greenery. It may be a home garden, government office, a factory premises or a road side. Trees are planted!

I would like to mention here that we are able to protect our forests because of these trees planted outside the forests. But there are important aspects to be considered.

We need people's participation to select and plant suitable trees in their home gardens and other lands. We need research inputs to develop those selected species and improve their productivity. We also need appropriate legislation to utilize them in sustainable manner.

Therefore, it is important to have a long term plan to develop and manage these trees in sustainable manner.

I am sure that findings of this workshop will guide us to develop such plan and implement in the future.

I thank the SAARC Forestry Centre and the Forest Department for organizing this workshop successfully.

I also wish our foreign delegates an enjoyable stay in Sri Lanka.
With this few words, I would like to wish all the success to the workshop.

Thank you,

Vote of Thanks by Mr. Anura Saturusinghe, Conservator Forests, Department of Forests, Government of Sri Lanka.

Mr. Anura, Conservator of Forests thanked the Honorable Chief Guest, Deputy Minister, Ministry of Environment for sparing his invaluable time to come and be the Chief Guest for this important ToF workshop. On behalf of the Department of Forests, Ministry of Environment, Government of Sri Lanka also thanked the Honorable Director, SAARC Forestry Centre and other officials of SFC for choosing the venue in Sri Lanka. It is a great opportunity and privilege for the Department of Forests, Government of Sri Lanka to host the workshop and be able to get opportunity to interact with the delegates from Member States. He also thanked the Director General, Department of Forests for his enduring support for the workshop. He also thanked the participants from Member States for being able to make for the workshop. He also thanked the officials and staff of the Department of Forests for their assistance during preparation of the workshop, it would have been very daunting task without your help and support.

Introductory Sessions

Introduction of Participants

The workshop began with introduction of each Member State delegates, resource persons and SAARC Forestry Centre officials. The delegates were from Bhutan, India, Nepal and Sri Lanka. There were 20 delegates from all four Member States. Immediately, after the introduction of delegates, workshop objectives and three days progamme were presented.

Objectives and Programme of the Workshop

Mr. Karma Jigme Temphel, Participatory Forest Management Specialist, SAARC Forestry Centre presented the objectives of the workshop and three days programme to the delegates.

The main objectives of the workshop are:

- Bring together the Professionals in the SAARC Region who work on the Trees Outside Forests;
- Gather reliable information in the Region of the impacts by Trees outside Forests on the Socio-Economics and Environment aspects for use by Member States; and
- Exchange valuable information among the participants and develop better linkages among them

The workshop programme was presented and sort for suggestions and changes, if needed. However, all the delegates agreed the workshop programme and declared to proceed.

Session 1: Country Presentation on Trees Outside Forests

Status of Trees Outside Forests by Mr. D. B Chhetri, Forest Officer, Department of Forests and Park Services, BHUTAN

Bhutan is endowed with good forest coverage, about more than 70 percent of country is covered with forests. The Forestry constitutes 70.46% and shrub 10.43%, while cultivated agricultural land and meadows account for 2.93% and 4.10% respectively. The snow cover constitutes 7.44% while bare areas constitute 3.20%. Degraded areas, water bodies, built up areas, marshy areas and non-built up areas constitute less than 1% each (MoAF 2010). The broadleaf and temperate forests are the dominance. There are other forest types Fir, Chir pine and Blue pine.

About 69 percent of the population is living in the rural areas of Bhutan (PHCB 2005), who traditionally depends on forests for subsistence goods and services. The pressure is mounting on the forests to provide an increasing range of goods and services. Looking at the trend of forest goods need by the rural people in the country, it is right and important to think beyond the state forests and increase the timber production from Trees outside Forests (ToF).

The actual assessment of trees outside forest in Bhutan is not done yet. However, in the recent national forest inventory design, it is included. This paper is solely based on assessment of trees rights on private land, which was produced by Ministry of Agriculture in 2006 (MoA, 2006).

About 11,553 acres of private lands have over grown trees, which is about 68.4 percent is abandoned shifting cultivation land. Main Reasons for keeping land uncultivated are due to farm labor shortage (rural-urban migration), wildlife damaging the crops (isolation), inconvenient access due to steep slope, soil and water problems(either there is no water or the soil condition is bad).

Irony is that, Bhutanese have traditional practices of planting trees in home stead, in the agricultural field and its field boundaries. However, no proper assessment is done yet, though it has huge potential to produce timber.

The promotion of ToF in Bhutan may have some pertinent challenges. In first place, there is no proper procedure and method to assess trees out forests, however, it may be included in present inventory design of forest resources assessment (2011). Secondly, there is no proper database of ToF and thirdly, a small land holdings of individual may be a killer challenges to promote ToF.

However, there are ample opportunities to promote ToF in Bhutan; there is an enabling policy and legal frameworks in place. The Bhutanese have traditional practices of planting trees in private lands. Promotion of ToF has potential to produce timbers and generate income for private forest owners. There is already high demand and good market for timber.

In all, firstly there should be proper guidelines to assess ToF, and secondly develop clear procedures and guideline to facilitate marketing of timber from private land.

Status of Trees Outside Forests in India by Dr. K. P. Singh, Scientist, Forest Research Institute of Indian Council of Forestry Research and Education, INDIA

Earlier, forests were managed for wood production under the working plans. After independence large scale forest land was diverted to agriculture and other developmental activities. However, the diversion of the forests was restricted in 1980. At present, classification of forest management systems have been changed to planting with harvesting followed by replanting for sustainable management.

The Forest and tree cover of the country is 78.29 m ha. This is 23.81% of the geographical area. This includes 2.76% of tree cover. The forest and tree cover would work out to 25.22% after exclusion of 183,135 km^2 area above

the altitude 4,000 m from the total geographical area of the country as these areas do not support tree growth. There is a decrease of 367 km² in the forest cover in comparison to 2009 assessment. However, after accounting for interpretational changes in the assessment of 2009, there is a net increase of 1128 sq. km in the forest cover as compared to 2009 assessment. In hill and tribal districts of the country a decrease in forest cover of 548 km² and 679 km² respectively has been reported as compared to the previous assessment. Mangrove cover has increased by 23.34 km² during the same period. The total growing stock of India's forest and trees outside forests is estimated at 6047.15 m cum which comprise 4498.73 m cum inside the forests and 1548.42 m cum outside the forests. The total bamboo bearing area in the country is estimated to be 13.96 m ha. The total carbon stock in the country's forests is estimated to be 6663 m tones.

Production and consumption

The annual estimated production of wood from forests is estimated to be 3.175 m cum. The annual potential production of wood from ToF is estimated to be 42.7 m cum. The annual estimated production of fuel wood from forest is estimated to be 1.23 m tones. The potential production of fuel wood from ToF is estimated to be 19.25 m tones. Total annual consumption of wood in household construction and furniture, industrial construction and furniture and agricultural implements is estimated to be 48.00 m cum. The total fodder consuming livestock dependent partially or completely on forest is 38.49%. The adult cattle unit (ACU) completely dependent on forest is 22.63%. The total annual consumption of fuel wood for the country is estimated to be 216.42 m tones out of which 58.75 m tones comes from forests. Of the total population using fuel wood, 23% population is obtaining fuel wood from forests.

Productivity of ToF in India

The total geographical area in India is 3,287,263 km². Out of which the tree cover of physiographic zones of the country has estimated to be 90,844 km², which contributes 2.76% of the country's total geographical area. The tree cover is maximum in East Deccan (10,718 km²), followed by Central Highlands (9,886 km²) and Northern Plains (9,366 km²). Eastern Himalayas have the lowest tree cover of 356 km², as this zone is predominantly forested. West Coast has maximum percentage of Tree cover (7.30%) with

respect to its geographical area followed by Western Ghats (5.64%) and East Coast (3.46%). The growing stock of Forest and ToF in India is 6,047.15 m cum, out of this forest and ToF is 4,498.73 and 1,548.42 m cum respectively.

Land Use Pattern in India

The total land area in India is 328.7 out of which, the forests are 67.0 million ha, under non-agricultural uses 21.8 million ha, permanent pastures & other grazing lands 12.0 million ha, land under misc. tree crops and groves 3.0 million ha, cultivable waste land 6.0 million ha, fallow lands 24.0 million ha, barren and uncultivable land19.4 million ha, cropped area 142.5 million ha and under use not reported is 23.0 million ha**.** The productivity of Indian forests is 0.7 m^3/ha/yr, whereas the world average productivity is 2.1 m^3/ha/yr. The productivity of ToF in India is 20-30 m^3/ha/yr. However, the productivity in some important species under ToF has been enhanced to 50 m^3/ha/yr with improved management practices and insect pest control. The most important ToF species in India are - *Acacia nilotica, Anthocephalus chinensis,* Bamboo species, *Casuarina equisetifolia, Delbergia sissoo, Eucalyptus* species, *Melia composita, populous* species and *Prosopis cineraria.*

Factors affecting the productivity of trees outside forest

1. Proper selection of plant species
2. Quality of planting stock
3. Silviculture practices
4. Harvesting and processing
5. Management of insect pests and diseases

Suggestions for enhancement of productivity of ToF

- Selection of site specific species in ToF.
- Use of certified planting stock.
- Adoption of improved management practices.
- Appropriate combination of tree species and agriculture crops.
- Control of insect pest through IPM.
- Deployment of Insect / disease resistant clones should be implemented.

Part I: General Situation
Status of ToF

Definition
The criteria used to define forests are usually based on the notion of `land cover' or `land use', or sometimes a combination of the two. Forest Resources Assessment 2000 for the first time established consensus on a single definition of forests as land entailing a minimum of 10 percent tree crown cover.

The FAO definition of forest or forest lands is based on tree formation structure, i.e., percentage of crown cover, and height of tree species, plus the area covered. Any land with more than 0.5 ha area with more than 10% crown cover and tree height at maturity is more than 5 meter are generally taken as forest. All other land with trees is generally known as ToF.

In case of Nepal Tree outside forest mainly includes (i) Agro forestry /Farm forestry (ii) Urban forestry (iii) Tea garden (iv) Road side plantation and (v) Canal side plantation. In other side, all private forest of Nepal falls under ToF that may be in the form of agro forestry or urban forestry. This may include agricultural land, including meadows and pasture, built-on land (including settlements and infrastructure), and barren land (including sand dunes and rocky outcroppings).

Status
It is very difficult to get the status of ToF as the analysis of ToF was not made in the earlier inventory reports of Nepal. However some data nearly related to ToF found in literature are presented here. Among the 147,181 sq.km area of Nepal the land use is as follows.

Table 1: Land use pattern in Nepal

Land Type	Land Area (Million hectare)	Percentage
Forest	4.27	29
Agriculture	3.09	21
Grass land	1.77	12
Shrub land	1.62	11
Non cultivated land	1.03	7
Water/Snowland/Rocks/Other	2.94	20
Total	14.72	100

Besides the forest, all land use type has more or less trees in scattered form except snow peaks in Nepal. The non cultivated land has the higher density of trees after forest. Agro-forestry is the most common example of ToF in Nepal. Looking at the ownership aspect, all the private forest, and leasehold forest for poor and public agro-forestry are example of ToF in Nepal. The status of such ToF under record is as follows (Table 2).

About 23% of flat land (suitable for agriculture purpose) are under public land in Nepal and these are and unused/ underutilized have great possibility for promoting ToF

Table 2 ToF status on record in Nepal

ToF type	Land Area (hectare)	Number	HH involved	Remark
Private forest	2,458	2,361	-	DoF record
Leasehold forest	15,787	3,439	31,943	
Public Agro-forestry	1,538	-	-	
Total	19,783			

Source: DoF 2012

1. Government and non-governmental contribution to promote ToF

Department of forest (DoF) is major responsible organization to support for promotion of ToF in Nepal which is supporting through many programs and activities i.e. training, extension, nursery support and free seedling distribution which promotes private plantation, agro-forestry and leasehold forest. Some program like Rastrapati Chure conservation program kept the provision of incentive of two rupees for each plant survived next to the year of plantation.

2. Economic and environmental benefits of ToF

Multipurpose trees having multiple uses are common practice in ToF. The forest plays significant role in the economy of Nepalese people. Forest covers about 9% GDP of Nepal. The rural economy depends on fuel wood, fodder, farming plough etc. There is a triangular relation among the livestock farming, forest and agriculture with respect to each household. The ToF provide more or less similar benefits to our environment and economy as the forests do.

The economic benefit of ToF has been undermined however; timber production from the ToF compared to major forest is highly significant. Analysis of five year data from 061/62 to 065/66 shows that in an average the government forest provides 1.2 million cubic feet (18%), the community forest provides 3.0 cubic feet (45%) and private forest (ToF) provides 2.5 million cubic feet (37%) of timber each year to the market (DoF,2010) . Besides this higher amount of ToF products are consumed by the land

owner himself which does not come in account. The private forest owner provides 13% of his selling price as royalty to government which is significant contribution to the government as well i.e. 4% of total forest products (table 3).

Table 3 Royalty generated in thousands from various sources including private forest/ToF.

Fiscal year	Government managed forest (100% royalty)	Community Forest (only 15% royalty when they sell out of their group member in *Shorea robusta* and *Acacia catechu)*	Private Forest only (only 13% Value added Tax when they sell the timber from their private forest)
061/62	391,960	40,274	3,838
062/63	291,285	8,306	3,486
063/64	380,776	1,453	1,612
064/65	427,086	62,925	26,567
065/66	475,532	65,691	50,875
Total	1,966,639	178,649	86,378
Percentage	88	8	4

The contribution to royalty from Community forest seems low because most of the forest products are consumed within group member which do not generate royalty. Similarly the royalty generated by private forest is also low because it is only 13% of their selling price. The contribution of government forest seems higher because all the income from selling products from these forests goes to royalty to government.

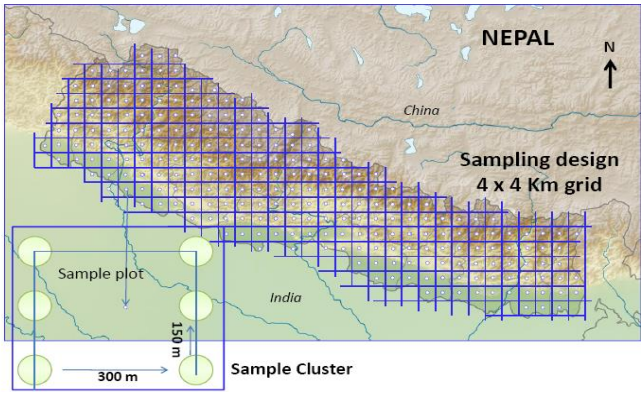
Part II: Resource Assessment

Methodologies used

There is no prescribed method for the inventory of trees outside forest so far in Nepal and also the previous forest resource assessment neglected it. As the form of ToF do not follow the same pattern it is difficult to recommend certain form of inventory method valid to all. One of the basic principles applied is whatever may be the method it should be statistically valid and should represent the population.

Mostly, the form of trees outside forest is found in three forms as in block, linear and scattered (Fig 1). The block form means the feature of trees in clumped in group i.e. homestead, fruit orchard etc (Fig 1a), the linear form means trees distributed in linear form i.e. roadside plantation, irrigation channel etc (Fig 1b) and the scattered trees means trees are found in random manner i.e. trees in agricultural land, trees in urban areas etc (Fig 1c).

Photo 1 (a) block (b) linear and (c) scattered form of trees respectively



Recently Nepal is carrying out its resource assessment in which sample plots are allocated at 4km by 4km interval to cover all the country as in fig 2. It is expected that this method will cover the trees of forest as well as trees outside forest, however the work is still under completion.

Department of forest research and survey center, the leading agency of forest resource assessment of Nepal carried out research in Morang and Nawalparasi Districts. The method applied was stratified systematic cluster sampling in which the area was grouped into block, linear and scattered category as mentioned above and sampling intensity was maintained 0.2 percentages. The stock per hectare was found to be 4 to 5 ton with 10 to 15 trees. The national average in forested area is 178 trees with 101 ton per hectare.

Procedural constraints

There are few researches that were made for inventory of trees outside forest in district level. There is no need of detailed individual farm level inventory as the farmer themselves know each and every tree which they own. The only problem is aggregate data of larger area. The major constraints faced is that there is no uniformity in inventory method and analysis procedure so that the data are not comparable to each other i.e. definition of tree, size of seedling, sapling, distribution of trees with respect to diameter classes which must be clearly defined to be comparable.

Sampling limitation in order to predict population due to unpredictable distribution of the species, their dbh class and types is another constraint. Use of very high resolution imagery could be best method to do inventory but cost could be too high.

1. **Information gaps**

The major information gap is there is no common understanding in definition of forest, Trees outside forest, seedling, and sapling; pole etc. so that the data generated by the different researcher are not comparable to each other in many aspects. Besides these there is gap of easier technology i.e. high resolution imagery and GIS processing for inventory which may be useful for inventory of larger area.

Part III: Policy and Legal aspects
Current policy and legal provision

The current Forest Sector Policy of Nepal focuses on maintaining 40% forest area in the country while we have 39.6% forest area (29.6% good forest and 10% shrub land) with 1.7% average annual deforestation. So that we have to increase 0.6% forest area to fulfill the above target in spite of the deforestation rate. Most of the forest area lies within protected area as well. The Master Plan for Forestry Sector (MPFS) was prepared and implemented for 21 years (1989 to 2010) to meet the basic needs of the people through sustainable forest management. The strategies adopted were people participation, decentralization and capacity building through training and extension. It was the most important document of forestry sector which emphasized community forestry, private forestry and leasehold forestry. Most of the degraded forest land which was handed over to local communities as community forests was recovered to dense forest. The revised forest policy, 2000 of Nepal continued the provisions of previous MPFS for community and private forest. Community forestry and leasehold forestry program are basically concentrated in hilly areas. At present 35% of the total population has been benefitted from forest products obtained from management of 25% of forests of the total forest areas of Nepal through community based management. Besides these livelihood of 4% of the population under poverty line improved through the support of leasehold forestry program for poor.

Forest act 1993 and Forest Regulation 1995 are the major acts/regulation related to forest sector of Nepal. The act and regulation has the provision of private forest in which any land owners can develop, conserve and manage the forest themselves in their own land which can be registered in concerned district forest offices. The products from such forest can be sold or distributed as per their wish.

There are other cross sector policies as Agriculture Policy 2004, National Land Use Policy 2012, and Local Self Governance Act (LSGA) 1999 which addresses ToF. The overall clauses of these policies can be summarized as:

- Maintain or increase existing forest to make it 40% specially for biodiversity, soil and water conservation

- Emphasize sustainable forest management
- Promote private forest, leasehold forest, community forest to fulfill the local needs of forest products and to support to maintain the existing forest
- Maintain minimum greenery in the city area
- Maintain green belt in road side, canal side and pond side.

1. **Policy gaps and contradiction**

Most of the policies are in favor of development of trees outside forest, however there are some gaps and contradictory policies by which the ToF aspect is hindered which can be grouped and discussed as below.

Overlapping authority

The forest act 1993 and local self governance act 1999 have many overlapping authority, roles and responsibility of managing forest as well as ToF.

Ownership of land and ToF.

There is a kind of dual ownership and debate on land and ownership of trees in some areas between Village Development Committee and District Forest Offices.

Regulation of ToF products

The forest regulation 1995 clearly states that all the forests products from private forest can be sold as per their wish but it is not found in reality. There is band to harvest for some trees even in private land. Besides these it is very difficult and lengthy process to certify that the product is from private forest or ToF product.

Improper tax imposition

Value added tax (VAT) was in debate for long time and had hampered to proper management of ToF product from private forest.

The government has realized the importance of ToF but especially there is strong needing feel to easier regulation of forest products which can be supported by developing and implementing appropriate ToF guideline.

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General Status of Trees Outside Forests of Sri Lanka, Professor Nimal Gunatilleke, University of Peridiyani, Sri Lanka (refer annexure – III Presentation Slides)

Status of Trees Outside Forests by Mr. Prabath Nishantha Edirisinghe, Department of Forests, SRI LANKA

"Trees Outside Forests" in Sri Lanka encompass home gardens, rubber plantations, coconut plantations, tea plantations, other agricultural lands, roadside plantations and urban plantations. These land uses occupy around 25% of the total land area of the country whereas land area under forests is 29%. These natural forests are managed to conserve biodiversity, soil & water, cultural, religious and aesthetic values. However, there are limited provisions to provide non timber forest products for adjoining communities from these forests. Felling of trees in Natural Forests for timber extraction was completely band from 1994. Therefore, trees outside forests play an important role in timber production in Sri Lanka. Trees Outside Forests have supplied 71% of the total wood demand of the country in 2006. In addition, this source fulfills around 80% of the fuel wood demand of the country. This shows the significance of the Trees outside forests as a timber and fuel wood source.

Home gardens are traditional agroforestry system in Sri Lanka. Size of the home garden varies from 0.4 to 2 ha and tree density is in between 54 and 419 trees per ha. Recent studied revealed that home gardens occupy 14.3% of the total land area of the country producing 42% of the timber requirement. The tree species such as coconut, rubber, jak, mahogany, areca nut, teak etc are the most common tree species in home gardens. The high plant density in different layers provides ecological, environmental and economic benefits in addition to timber production. The tree and plant density is higher in wet zone especially in Kandyan Home Gardens in Kandy district whereas it is less in home gardens in dry areas. Increasing

population results fragmentation of home gardens and reduction of their productivity.

Rubber plantation occupies 124,000 ha that is around 2% of the total land area of the country. Around 57% of the total rubber plantations belong to estate sector while rest of the area is under small holder sector. Latex is the primary product of the rubber but timber and fire wood is secondary products. Recent studies found out that rubber plantations supply 18% of the timber demand of Sri Lanka. Rubber timber was not popular as other conventional timber species in Sri Lanka but now treated rubber is used for producing furniture. Conversion of rubber plantations to other land uses especially for settlement has declined the extent under rubber plantation over last 15 years.

Coconut is one of the ToF in Sri Lanka that occupy 6% of the total land area of the country. It is well known multipurpose tree that provide food, oil, beverages, animal fodder, charcoal, active carbon, timber. The coconut plantation contributes to supply 11% of the timber requirement of the country.

Above land uses are well distributed in wet zone of Sri Lanka where forest cover is compared to less. The ToF provide some ecological and economic benefits as natural forests so ToF compensate less extent of forests in the wet zone area of Sri Lanka.

Session II: Trees Outside Forests Resource Assessment – Methodologies, Procedural, Constraint and Information Gaps

Resource assessment Methods and Procedures used for over grown trees in Private Registered Land by Mr. D. B Chhetri, Forest Officer, Department of Forests and Park Services, BHUTAN

As I have already stated in my presentation of Status of Trees outside Forests (ToF) in Bhutan that no assessment is done on ToF in Bhutan. However, I can briefly describe the methodology used for assessing the tree rights on private land used by Ministry of Agriculture in 2006.

Since the ToF is multi-functional in nature and any issue related to ToF may be cross-cutting, a multi task force constituting the members from agriculture, forestry, livestock, land records and research have been formed. This is important that the ToF is recognized as multi-functional and all the stakeholders need to be involved.

The study methods included were, firstly the desk research- looking at the policy and legal aspects, reports, records, etc. Secondly was to go in the field and do survey. Lists for private individual (registered) were collected from land records and a rondom sampling was done to do the survey.

The survey was done based on format developed (see annexure).
Information collected were

Village	**Name of the owner**	**Registered Thram No.**	**Land not under cultivation (grown trees)**

Age of trees grown on Private Land	Main present vegetation in the plot	Registered Thram No.	Main reason for not cultivating

ToF Resource Assessment in India by Dr. K. P. Singh, Scientist, Forest Research Institute of Indian Council of Forestry Research and Education, INDIA

The forest resources have an important bearing on the environmental/ecological security and well being of the country and its people. The importance of this natural resource was recognized by our policy makers who placed great emphasis on the conservation and development of this resource as also set a target of bringing one third of the country's land mass under forest and tree cover. India is one of the few countries of the world to have a robust and scientific system of periodic forest cover assessment. Forest Survey of India (FSI), an organization under the Ministry of Environment and Forest, has been carrying out forest and tree cover mapping of the entire country. The forest cover mapping was started over two decades back in the year 1987. Since the year 2001, the assessment of tree cover which includes smaller patches and scattered trees was commenced and is being carried out ever since. The forest and tree cover together give a holistic picture of the forest/tree resources of the country. The forest and tree cover mapping is carried out using remote sensing technology which captures the unique spectral reflectance of the electro-magnetic radiation. This is then used for the characterization of vegetation and other land covers. This technology also helps in providing a synoptic coverage of the country's forests and their status which can be monitored on a periodic basis.

Methodology- The forest cover mapping exercise is primarily based on digital image processing (DIP) technique. The estimates of tree cover at national level are generated using the data gathered during the inventory of ToF in two stages stratified sampling.

In the first stage, the country is stratified into 14 physiographic zones based on physiographic, climate, vegetation etc. A sample of 60 districts is then selected in proportion to area of physiographic zone from the entire country for carrying out a detailed inventory in a two year cycle. The estimation of tree cover of selected districts is carried out using high resolution remote sensing data as well as field inventory data. Thus, the tree cover of a district has two components. The first component consists of block and linear tree patches in rural areas between 0.1 ha and 1.0 ha identified through high

resolution satellite data. **The second component** is the area computed from scattered trees growing in rural areas and trees in urban areas which are not precisely mapped even with high resolution satellite data. To estimate the area of tree cover under scattered stratum, adequate number of sample plots is laid out and crown diameter of each tree is recorded from all such plots. With the help of crown diameter, tree cover of each sample plot is computed, which is then converted into equivalent notional area corresponding to 70% canopy density.

In the urban areas, the sampling units are Urban Frame Survey (UFS) blocks, which are of varying sizes. The areas of selected UFS blocks are computed with the help of GPS. For estimating tree cover, the crown diameter of each tree falling in the selected UFS block is recorded. With the help of crown diameter, the tree cover of each UFS block is computed following the similar approach as in case of scattered stratum.

The total tree cover for the selected district is obtained by aggregating the area of tree cover under block, linear, scattered and urban strata. Aggregation of tree cover of all the physiographic zones leads to tree cover estimate of the country. The present estimate is based on 30, 709 sample plots falling in 178 sampled districts across the country which were inventoried during the period from 2004 to 2010.

Tree cover in the country

The forest cover assessment carried out by using satellite data includes all lands comprising area of one hectare and more, with a tree canopy density of more than 10% irrespective of their land use and ownership. However, there are many small patches of trees which are less the 1.0 ha in extent, such as trees in village woodlots, homestead, urban areas, scattered trees along roads, canals, railway lines and trees in blocks and linear formation with area less than 1.0 ha, that are excluded from the forest cover due to technological limitations. The total tree cover of the country has estimated to be 90,844 km^2, which contributes 2.76% of the country's geographical area. The tree cover is maximum in East Deccan (10,718 km^2), followed by Central Highlands (9,886 km^2) and Northern Plains (9,366 km^2). Eastern Himalayas have the lowest tree cover of 356 km^2, as this zone is predominantly forested. West Coast has maximum percentage of Tree

cover (7.30%) with respect to its geographical area followed by Western Ghats (5.64%) and East Coast (3.46%).

Constraints

The constraints of ToF have been experienced as boundary line plantation is not covered under satellite assessment, requirement of huge capital investment, requirement of more men power, lack of qualified staff for analysis of satellite data and urban area plantation remains unexplored.

Information Gap

1. Unavailability of plantations data. 2. Unavailability of annual production data from ToF. 3. Lack of Market intelligence. 4. Lack of networking at country level for exchange of information.

Assessment of Tree outside Forest in Nepal by Mr. Shree Krishna Gautam, Forests Officer, Department of Forests, NEPAL (Refer Annexure – III: Presentation Slides)

Estimation of Production Capacities of Trees outside the Forests (TROF) in Nuwara Eliya District of Sri Lanka (Pilot Study to Generate Baseline Information by K.T. Premakantha, Forest Department, Rajamalwatta Road, Battaramulla and D. K.N.G. Puspakumara, Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka.

INTRODUCTION

Total extent of Sri Lanka is 6.5 million hectares of which area under natural forests is 2.1 million hectares (Forest Department, 1996). As the forest cover was depleting at an alarming rate, rising environment concern among local and international community had forced to complete stop of exploiting natural forests for forest products in many countries including Sri Lanka. As a result a logging ban was imposed on natural forests of Sri Lanka from year 1997. Current national forest policy formulated in 1995 emphasizes the strict conservation of the remaining natural forests for soil, water and biodiversity conservation while increasing tree cover outside the forest areas to meet the demand for forest products and services.

It is well understood that tree resources outside the forests (TROF which can be refered as ToF) is one of the best alternative for providing forest based products. Development of the resource is utmost important to cater the ever increasing demand for the forest products so that the continuous supply is in terms of quality and quantity is a must in order to improve and manage this valuable resource properly. Although numbers of countries have initiated collection of inventory data on TROF at the regional and global levels are still scarce. In Sri Lanka a very few studies have been carried out on TROF and the information generated are believed to be not sufficient to take decisions. Only if information on TROF is available their impact on economy and ecological processes can be quantified and strategies for sustainable management can be developed.

Objectives of the study

Therefore the research objective was to assess TROF systems to generate information about TROF in study area and thereby to facilitate policy makers to develop favorable strategies to improve the resource base and utilize it in sustainable manner. Specific objective are

- To map the spatial distribution of TROF systems in Nuwara Eliya district
- Estimate production capacities of TROF systems in different agro ecological zones in Nuwara Eliya district (develop a baseline information)

MATERIALS AND METHODS

Study area

The study was conducted in the Nuwara Eliya administrative district in Sri Lanka. Geographical coordination of the study area is latitude 7^0 5' N and longitude 81^0 E. The physiographic of the study area is generally mountainous. The central area is approximately 1,980 meters above sea level. But elevation of the north and north east part of the district is ranging from 500 meters to 1200 meters. The mean annual rainfall varies between 2,500 mm and 5,000 mm.

Medium resolution cloud free Land sat ETM image (path 141, row 55) covering the study area was selected and geometric corrections were carried out. Then it was classified into 5 TROF classes using ground truth data

collected from the field. Maximum likelihood classification algorithm was used in image classification.

To get more homogeneous strata for field data collection, agro ecological region map was overlaid with TROF system map prepared in this study. Total area of the TROF systems is 127,950 ha. Altogether 247 sample locations were selected to collect field data. Plot shape is square and the size is 400 square meters (20 x 20 m). At each location measurements those are needed to evaluate the structure of TROF systems, calculate production capacities and to measure species diversity, and were recorded: date, plot number, GPS locations in XY coordinates, details on locations such as address, range beat etc, slope, elevation, major and other uses of trees and the tree measurements. Diameters at breast height (DBH), height, crown diameter are the main measurements taken from the live trees with the aim of achieving above objectives.

Timber volume calculation

There is very few volume functions developed for species grown in Sri Lanka and most of them are for plantation species. Volume functions cannot be found for majority of species even from other countries. To overcome this problem a basic formula of volume calculation was used in the study. Volume is measured in cubic decimeters and is a function of total tree height, diameter at breast height (DBH) and stem form (or shape).

Individual tree volume formula:

$V = f * \pi / 4 * dbh2 * h$

Where V is Individual tree volume, F is form factor, Π is a constant = 3.141592, dbh is diameter at breast height, h is Tree height.

Biomass and Carbon Content Calculation

Biomass equation relates growth parameters such as DBH, height and crown parameters to biomass. Biomass equation developed by Brown in 1997 was used to estimate biomass of live trees as it was a general equation developed for the areas receiving 1,500 mm to 4,000 mm average rain fall.

General biomass equation

- $Y = \exp(-2.289 + 2.649 \ln dbh - 0.021 \times \ln dbh^2)$

Equation for palms

- $Y = 4.5 + 7.7 h$ (Brown, 1997)

Where Y is biomass (kg), D is diameter at breast height, H is height

Assessment of carbon content is a highly difficult task as the scarcity of research information on carbon content in a kilo gram of wood in different species. The carbon content is surprisingly constant across a wide variety of tissue types and species. Carbon content of biomass is almost always found to be between 45 and 50 % (by oven-dry mass). Therefore the carbon content was considered as 50 percent of biomass.

RESULTS

Extents of TROF systems in Nuwara Eliya district

According to the image classification results, tea based TROF system was approximately 79,182 ha which covers one third of the total land area of the district and is mainly distributed in central and southern part of the district. The estimated area of home garden TROF system in Nuwara Eliya district was 27,440 ha or 22% of total land area. The home garden TROF system is mainly found in north east and western part of the district. Land area under annual crop based TROF system was 10% or 13,154 ha. Grassland TROF system occupies 4,289 ha which is approximately 3% of the total land area of the district. Urban agricultural TROF system is mainly concentrated in major cities and the estimated extent was 3,885 ha which accounts for 2% of the total land area of the district.

Tree Density

Average tree density of home gardens in the district was 388 individuals ha^{-1} while average tree density of tea based TROF systems was 86 individuals ha^{-1}. But tree density was significantly low in other TROF systems. Tree density of urban agricultural based TROF system, grassland TROF system and annual crop based TROF system was 85 individual ha^{-1}, 40 individuals ha^{-1} and 6 individual ha^{-1}respectively.

Biomass and Carbon content of live tree component in TROF

Total above ground biomass and carbon content of the live woody tree component in the Nuwara Eliya district was 8866.49 Giga grams and 4433.25 Giga grams respectively. Highest biomass and carbon content was recorded in the home garden TROF system which was 4428.35 Giga grams and 2214.15 Giga grams respectively. Even thought tea based TROF system was not recognized as a major contributor of biomass it was recorded 3941.1 Giga grams of biomass and 1970.56 Giga grams of carbon.

Species Diversity

Most common species in the home garden TROF system are *Areca catechu, Artocarpus heterophyllus, Mangifera indica, Michelia champaca, Toona sinensis, Cocos nucifera, Sysygium aromaticum, Persea americana, Neolitsea cassia.* Most common species in the tea based TROF system are *Erythrina lithosperma, Gravellia robusta, Gliricidia sepium,Calliandra calothyrsus.* There are exotic as well as endemic species in the grassland TROF system; among them most common are *Calophyllum malkeri, Gravellia robusta, Rukattana, Palaguium grande, Eucalyptus spp.* Most common species in the urban agricultural TROF system are *Artocarpus heterophyllus, Cypresses, Eucalyptus spp, Persea americana, Psidium guajava* while *Gliricidia sepium, Areca catechu, Eucalyptus, Cocos nucifera* are the abundant species in annual crop based TROF system.

Results give an in-depth picture of the spatial distribution, structure and the species composition of TROF systems. So that decisions makers can formulate better policies and strategies on TROF regarding what is the extent of TROF and the potential of wood and biomass production, where and to what extent should TROF be promoted, to what extent more trees be planted and what intervention should be made to improve this valuable resource.

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Outcomes of the Discussions on Roles of stakeholders, Technological barriers and Information gaps for **promoting T**rees **o**utside **F**orests (ToF) **resources in the SAARC Region.**

The workshop had dueled on roles of stakeholders and technological barriers and information ga on ToF. And the house agreed on the following:

Roles of Stakeholders

The workshop defined the roles of different stakeholders to promote Trees outside Forests in the SAARC Region. The Member States must make an effort to accommodate the defined roles within the framework of institutional development and endeavor to promote Trees Outside Forests (ToF). Different roles of government, non-governmental organization and other stakeholders are stated below to promote ToF. This workshop has listed the other stakeholders mean only the farmer and entrepreneur.

Role of Government:

- To formulate appropriate policy and guidelines to promote ToF;
- Eliminate the contradiction/overlaps in between rules, regulation and policies;
- Conducting awareness program to educate the benefits of ToF;
- To provide certificated seed and planting materials to ensure successful plantation ;
- Technical backstopping;
- Market linkage and information sharing;
- Data sharing;
- Co-ordination between Government organizations, NGOs, International NGOs, Community Based Organizations, Civil Society, Private sectors etc.;
- Research and extension; and
- Monitoring.

Role of NGOs:

- Awareness program;
- Conducting research and extension;
- Policy advocacy;
- Distribution of quality planting materials (certified);
- Technical support;
- Market study and linkage; and
- Monitoring.

Role of Other Stakeholders (It refers to only farmer and enterpreneurs:

Farmers:

- Choice of Species as per own need; and
- Planting, conserving and management of ToF.

Entrepreneurs:

- Market needs and information;
- Suggestion to policy level; and
- Monitoring.

Technological barriers and Information gap

The workshop has identified important technological barriers and information gap for promoting the ToF in the SAARC Region.

Technological barriers

- Lack of Sampling Design;
- Lack of Technological tools adopted to National Level;
- Lack of use of Remote sensing for ToF assessment; and
- Lack of modeling (algometric, equations).

Information Gaps

- Lack of clear objectives (strategize);
- Need for assessment of capacity (human, financial, technical, infrastructure and equipment);
- Need for appropriate classifications systems; and
- Lack of Tree model.

To appropriately address the above issues, the Member states could organize the following and make available and share within the SAARC Region.

- Organize stakeholders meetings (decisions and policy);
- Need to conduct resource survey for capacity development in other words human resource needs assessment of each Member state to promote ToF;
- Experts meetings (Inter department, ministries and govt.); and
- Data sharing mechanism and Research (avoid duplications).

Session III: Policy and Legal Aspects for Development of Tress outside Forests

Policy and Legal on Trees outside Forests in Bhutan by D. B Chhetri, Forest Officer, Department of Forests and Park Services, BHUTAN

Bhutan legal for forestry development evolved since the Forest Act of 1969 was the first Act passed by the National Assembly. This Act mandated that all forests belong to the State, and there should be no private rights to any part of them.

The 1969 Forest Act was rescinded in 1995 and replaced with the Forest and Nature Conservation Act of Bhutan 1995. This currently provides the primary authority for forestry activities in the country. This Act has separate chapters on soil conservation, community and private forestry, protected areas, protection of wildlife and a list of totally protected species of flora and fauna (RGoB, 1995).

The 1995 Act recognizes the traditional and cultural rights of local people to access and use forest resources, and this reversed the trend of the earlier 1969 Act. The 1995 Act also makes provision for private forestry to be practiced in privately registered lands and for community Forests to be established on government forest lands, with the communities being granted management and use rights.

The National Forest Policy explicitly states that promotion of private forests through the creation of an enabling regulatory, technical backstopping, extension and marketing framework; encourage agro-forestry, silvi-pastoral practices or any other forms of management in the private forests that would bring economic, social and environment benefits; create enabling environment for providing technical backstopping to promote private forestry, create enabling environment and mechanism for harvesting and marketing of forest produce from the private forest; and support industries to develop commercial plantation forests, including on leased Government Reserve Forest land to produce industrial raw materials.

The Land Act of Bhutan, 2007 "the trees, either grown naturally or planted in a registered land shall belong to the landowner." It also states that "the landowner who planted a tree on the boundary of land shall enjoy its ownership" (RGoB, 2007).

The Forest and Nature Conservation Rules 2006 states that "all trees and plants, within the registered Private Forest shall be property of the landowner."

Since the revision of forestry legal provision in 1995 and Land Act of Bhutan 2007, there is always support to promote Trees outside Forests (ToF). Limitation of expanding and enhancing the trees outside forests is because of limitation of private land holding size. There is a traditional practice of planting trees in home stead and agricultural field boundaries too. This could be one area to look at to enhance timber production from ToF. Though there is an enabling policy and legal provision supporting ToF, there is lack of clear procedure and formalities. At present, many of the trees that are grown in the private registered land are not able to sale timber due to confused and lengthy procedures.

On contrary, to encourage ToF, the Forest and Nature Conservation Rules 2006 states that 'export of timber from private forest is not allowed" (RGoB, 2006). This may apparently have wrong connotation to promote ToF, but nevertheless since there is enough timber demand within the country, this should not impede the promotion of ToF.

Policy and Legal aspects On Trees Outside Forests in India Dr. K. P. Singh, Scientist, Forest Research Institute Of Indian Council Of Forestry Research And Education, INDIA

In Resolution No.13/52/F, dated the 12th May, 1952, the Government of India in the erstwhile Ministry of Food and Agriculture enunciated a Forest Policy to be followed in the management of State Forests in the country. The basic objectives of New Forest Policy 1988 were- i) Maintenance of environmental stability through preservation and restoration of ecological balance. ii) Conserving the natural heritage of the country by preserving the

remaining natural forest. iii) Checking soil erosion in the catchment areas of rivers, lakes, reservoirs in the interest of soil and water conservation. iv) Checking the extension of sand-dunes in the desert areas. v) Increasing substantially the forest/tree cover in the country through massive aforestation. vi) Meeting the requirement of fuel wood, fodder, minor forest produce and small timber for rural and tribal populations. vii) Increasing the productivity of forests to meet national need.

The essential of Forest Management of Policy

a) Existing forests and forest lands should be fully protected and their productivity improved. b) Diversion of good and productive agriculture land to forestry should be discouraged. c) For the conservation of total biological diversity, the network of national parks, sanctuaries, biosphere reserves and other protected areas should be strengthened. d) Provision of sufficient fodder, fuel and pasture is necessary in order to prevent depletion of forest beyond the sustainable limit.

The strategy of Policy

1) **Area under forest**: The national goal should be to have a minimum of 1/3 of total land area of the country under the forest or tree cover. 2) **Afforestation:** A massive need based and time bound programme of afforestation and tree planting with particular emphasis on fuel wood and fodder development on all degraded and denuded land in the country. 3) **Social forestry and farm forestry** programme should be implemented.

The Rights and Concessions

i. Grazing should remain related to the carrying capacity of the forests. ii) The rights and concessions from forests should primarily be for the bonafide use of communities living within and around forest area, especially for tribal. iii) The life of tribal and other poor living within and near forests revolves around forests. Their domestic requirement of fuel wood, fodder, minor forest products (MFP) and construction timber should be the first charge on forest produce. iv) Similar consideration should be given to scheduled castes and other poor living near forests. v) Wood is in short supply,

therefore alternative source like bio-gas, liquefied patrolium gas (LPG) and solar energy should be used as substitute.

The Diversion of Forest Lands for Non Forest purposes

Diversion of forest land for any non forest purpose should be subject to the most careful examinations by specialists from the standpoint of social and environmental costs and benefits.

Wildlife conservation and shifting cultivation

Forest management should special care of the needs of wildlife conservation, and forest management, plans should include prescriptions for this purpose. The shifting cultivation is affecting the environment and productivity of land adversely. Alternative avenues of income should be devised to discourage shifting cultivation.

Forest extension

It can be achieved through the involvement of the educational institutions, right from the primary stage. Farmers and interested people should be provided opportunity through institutions like Krishi Vigyan Kendra, Training Centers etc. Short term training extension courses and lectures should be organized in order to educate farmers.

Forestry education and Research

Forestry should be recognized both as a scientific discipline as well as a profession. The forestry research priorities are- i) Increasing the productivity of wood and other forest produce per unit of area per unit time by application of modern scientific methods. ii) Effective conservation and management of existing forest resources. iii) Research related to social forestry for rural/tribal development. iv) Development of substitutes to replace wood and wood products. v) Research related to wildlife and management of national parks and sanctuaries.

Existing Policies regarding Management of Forests

Existing forests and forest lands should be fully protected and their productivity improved. Diversion of good and productive agricultural lands to forestry should be discouraged in view of the need for increased food production. For the conservation of total biological diversity, the

network of national parks, sanctuaries, biosphere reserves and other protected areas should be strengthened and extended adequately. Provision of sufficient fodder, fuel and pasture, especially in areas adjoining forest, is necessary in order to prevent depletion of forests beyond the sustainable limit. Since fuel-wood continues to be the predominant source of energy in rural areas, the programme of afforestation, especially through ToF should be intensified with special emphasis on augmenting fuel-wood production to meet the requirement of the rural people.

Existing Policies regarding ToF

A massive need-based and time bound programme of afforestation and tree planting, with particular emphasis on fuel-wood and fodder development, on all degraded and denuded lands in the country, whether forest or non-forest land, is a national imperative. It is necessary to encourage the planting of trees alongside of roads, railway lines, rivers and streams and canals, and on other unutilized lands under State/corporate, institutional or private ownership. Green belts should be raised in urban/industrial areas as well as in arid tracts. Such a programme will help to check erosion and desertification as well as improve the microclimate. Village and community lands, including those on foreshores and environs of tanks, not required for other productive uses, should be taken up for the development of tree crops and fodder resources. Technical assistance and other inputs necessary for initiating such programmes should be provided by the Government. Land laws are modified to facilitate and motivate individuals and institutions to undertake tree-farming and grow fodder plants, grasses and legumes on their own land. Wherever degraded lands should be made available for this purpose either on lease or on the basis of a tree-patta scheme. Such leasing of the land should be subject to the land grant rules and land ceiling laws. Recent Green India Mission (implementation under Forest Rights Act, 2006) has a target to increase forest/tree cover on 5 m ha of forest/non forests land and improved quality of forest cover on another 5 m ha (a total of 10 m ha) in it ToF would be a big player.

Policy and Legal aspects of Development of Tree Outside Forest in Nepal, by Mr. Krishna Nuepane, Forests Officer, Department of Forests, NEPAL

In Nepal ToF mainly practiced in private land (own registered land of individuals: home garden, bund plantation of pond, lakes, agro-forestry practices etc.), public land: in Nepal public lands are: "not owned by individuals but are informally used as a traditionally managed land resource: ponds and bunds, grazing fields, Parti Ailani (barren unregistered land), religious and sacred places, temples, memorials, canals, Haat Bazaar (local market sites), playing fields etc., and those lands which are declared as public lands by the Government of Nepal (GoN) from time to time are called public lands" (GoN, 2000) and in other barren forest land (forest land having no forest or less than 10% crown coverage, as FAO definition) as Community Forestry (CF) and Leasehold Forestry (LF) program.

Nepal Interim constitution 2063 has the provision of "sustainable management of forest resources and equitable benefit shearing. Similarly the Master Plan for the Forestry Sector (MPFS) 1988 and Forest Sector Policy, 2000 give emphasis on Community and Private Forestry Program and Leasehold Forestry program for ToF (in barren forest land) management through people participation. CF and LF program are basically concentrated in hilly areas. The main objective of the Master Plan, a strategy for 21 years, is to meet the basic needs of the people by sustainably managing the forest resources of Nepal. Some strategy relating to the ToF identified by MPFS are:

- Peoples participation as a main thrust in forestry;
- Adoption of decentralization policy;
- Empower users by means of training and extension;
- Increase production of fuel-wood, fodder and timber by promoting Community Forestry, Private forestry and Leasehold Forestry;
- Effective harvesting and distribution of forest products;
- Promote private involvement in forestry sector by updating legislation, inducing reduction of land tax on private forests, increasing land ceiling for private forests and supporting private entrepreneurs by providing technical assistance.

Working policy of current 3 years interim plan (2010/11 - 12/13) aims "at least one forest user group in every VDC" and has strategy "to maintain 40% forest area of the national total area" (NPC, 2011). Public Land Management (PLM) program has been launched in the public land of forest-less VDCs of some districts of Terai region. It is the only one viable option to increase forest area as national target maintaining 40% forest of its country land. It is feasible because all public lands are government land. Department of Forest (DoF) have its regular program i.e. nursery establishment, seedling production, seedling distribution in free of cost, plantation etc. that are execute through the District Forest Offices directly or by involving private individuals or institutions. So plantation on private land, public land and barren forest areas is going on.

Forest Regulation 1995 has mentioned the provision that the District Forest Officer (DFO) may grant recognition to public land/planted public land as a Community Forest, on approval of the agency owning the land on the condition that the concerned agency itself retains the land ownership (Clauses 26 (2) of Forest Regulation 1995). The Public Land Management Guideline is under the way of approval in Department of Forest (DoF). So number of such barren public lands has been converted into forested area and ultimately handover as Community Forest. In 3 Terai districts of Western Region's of the country 30 public lands are forested and now managed as community forest (Neupane, 2012).

Forest Act 1993 has stated that the owner of a private forest may develop, conserve and manage the forest in private land. He can use or sell and distribute the products of his land by fixing the prices as he likes. There is a provision to generate a fund in support of forest generation activities (i.e. like afforestation/reforestation activities, plant production, and distribution, protection and awareness activities). For this, in every district there is a District Forest Development Fund (DFDF) where NRs.5 per cubic feet is deposited from trader's side and same amount (NRs.5 per cubic feet) cubic feet from government side in case of timber. But no tax is imposed for the fuel-wood extracted from private forest.

In DFDF, fund NGOs, INGOs, DDC and any other institutions may also deposit any amount as their interest. There is a provision of expenses of that

fund in different forestry related activities. According to the guideline of District Forest Development Fund, 20% fund expense in plant production, 30% in Plantation and protection, and remaining in other forestry activities.

The Collaborative Forest Management Program (CFM) is effective in the productive forest of the Terai district. But the CFM Guideline clearly expel in the role of VDC/Municipality "to provide support to available the public land, unregistered land, private land and institutional land to the poor and ultra-poor on lease to practice agro-forestry activities. The Three Year Plan Approach Paper has some working policy (WP) to "to maintain 40% forest area of the national total area" as a national target. The working policies are as: WP 2.8 Tree plantation in private areas, schools, and public places outside forests area will be encouraged and WP 6.7 Government and public land will be provided on leasehold basis to produce required raw materials to environment friendly enterprise based on forests products.

Similarly some cross sectoral policies are on the support of the development of ToF. Among them Agriculture Policy 2004, National Land Use Policy 2012, Local Self Governance Act (LSGA) 1999 are major. The Agriculture Policy 2004 has commitments on support to reduce the poverty by transferring of degraded forests and unused public land to the target community on leasehold basis. According to the policy such communities have been suggested to plant fodder trees, forage grass, medicinal herbs, sericulture trees, agro-forestry practice and orchard farm. In National Land Use Policy 2012 the following working policy are mentioned to address the promotion of ToF. They are: Minimum greenery should be maintained in city area. (Policy 7.4)

Conducting plantation activities in unused/under utilized Gov./Public land, river belt (Strategy and working policy 8.2.11)

Rehabilitation the HHs from mountain and high hill who settled in between forests and have land of degraded or unused for agriculture and forest will be generated in such land (Strategy and working policy 8.2.13). Conducting "Green City Development Special Program" in collaboration of Local Gov. (Strategy and working policy 8.4.1) Emphasis on green belt development in road side, canal side and pond side. (Strategy and working policy 8.4.4)

Promotion of private forestry on erosion prone areas. (Strategy and working policy 8.4.6)

Local Self Governance Act (LSGA) 1999 also has provision and given the authority and responsibility to generate, protects and inventor of forest resources to the local body within its boundary. As per LSGA 1999 public lands are under the jurisdiction of VDC/Municipality, a local self governance body.

Though policy are in the line of promoting of ToF, many sectoral and cross sectoral policy, rule, regulations have created overlapping authority, roles and responsibility among their authority. The overlapping role and responsibility, authority, own process of respective policy execution certainly hamper the ToF development program. In Nepalese context, some major overlapping and contradiction are:

- Road department has responsibility of road side plantations (GoN, 1974.) and respective VDCs for its care and management. But, the rights of harvesting the products lie with Road Department.
- The conservation and protection of such recorded government and public land shall be the responsibility of the related Land Revenue Office. (GoN, 2001).
- As Local Administration Act 1971, CDO should maintain the record of government and public land under his jurisdiction.
- There is a debate in land ownership and tree ownership on the forest promotion by DFO in VDC owned land (DoF, 2009).
- Overlapping on role and responsibility, so it can be say "everybody's work is nobody's work."
- Trees of Private land considered as Forest products (As definition of Forest products in Forest Act)
- Policy and Program supports for promotion of private forestry but in practice it is more controlling

In addition to contradictory policies, there is a lengthy process for getting permission for marketing the timber from private forests. There are certain conditions and lack of clear direction and process.

- Value added tax imposition
- No official guideline for ToF
- Land ownership vs Tree ownership (in case of forest promotion by DFO in VDC owned land ie. Public land)
- Overlaps/gaps in role and responsibilities of different government institutions.
- Ban on use of certain species.

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Existing Policy Directives their Adequacies and Gaps in Sri Lanka by Mr. E.A.P.N Edirisinghe, Department of Forests, SRI LANKA

Policies of various sectors influence development and utilization of Trees outside Forests. Polices are guiding principles that determine present and future decisions. Therefore, both policies and legislations are necessary in policy implementation. Forest Policy, Wildlife Policy, Agriculture Policy and Plantation Policy and legislations are the important policies related to Trees Outside Forests in Sri Lanka.

National Forest Policy Sri Lanka (1995) recommends conserving of Natural forests for posterity, with particular regard to biodiversity, soils & water and historical, cultural, religious and aesthetic values. In this context natural forests cannot be a source of timber production. Therefore, the forest policy has identified increasing the tree cover outside the forests as an alternative to meet the present and future need of forest products. The Forest Policy emphasize to promote tree growing on homesteads and other agroforestry systems as a main strategy to supply wood and other forest products for meeting household and market needs. In order to facilitate utilization of forest products grown on private lands, the policy proposed to give greater responsibility to local people, organized groups, cooperatives, industries and other private bodies in commercial forest production, industrial manufacturing and marketing of timber and non timber forest product grown on private lands. In addition the policy proposed to facilitate the harvesting and transport of forest products grown on above non forest lands. That shows the positive influence of the Forest Policy of Sri Lanka to promote Trees Outside Forest as a source of timber and other forest products.

Crop diversification policy in Tea Plantation sector aims to increase the profitability of the unit area through product integration. This policy identifies conversion of tea to forestry as a one way of crop diversification. Rubber production policy proposes to increase the production to meet the domestic and global demand through expansion of the area under rubber. In addition, Research and Development Policy of the same sector propose to introduce new technology for rubber and rubber wood base products.

Above shows that policies in sectors such as Forest, Tea and Rubber promote production and utilization of trees outside forests. Institutions that are responsible for policy implementation have done much work in growing trees outside forest but less in product utilization. There are conflicting interests with other sectors in harvesting and utilizing trees grown on non forest lands. In order to ensure protection of natural forests, ecologically important tree species and food producing tree species, some policies and legislations have restricted felling and transport of some tree species. Flora and fauna protection ordinance, Forest Act and Tree Felling Ordinance are some examples for above. Soil Conservation act restricted tree felling in sensitive areas. Timber processing industries specially saw mills are not allowed in close proximity to the Forest Lands in order to ensure the protection of the forest. These restrictions discourage development of trees outside forests.

Outcomes of the Discussions on Policy and Legal instruments for promotion of ToF in the SAARC Region

To promote ToF, certain principles were adopted during the workshop, and are:

Principle of ToF

- Economic and environmental aspects of ToF are vital for its success/ sustainability.

- The natural forest should be conserved or maintained while promoting ToF.

- The promotion of ToF should be compactable with national and local needs to address the existing problems.

The workshop discussed and highlighted the important policy and legal challenges and limitations to promote trees outside forests.

- Lack of separate policy for:-
  - seeds and planting material exchange among SAARC countries
  - attractive incentives policy for farmers for promotion of ToFs;

- crop insurance policy
- research and survey for ToFs

- Complex formalities for extraction, transportation, marketing & export of products of ToF ;
- Uncertainty in market assurance,
- Moratorium on felling of certain ToFs
- Less attention between carbon trading and ToFs
- Land fragmentation
- Unclear property rights & benefits sharing
- Inadequate training and education on Management of ToFs
- Lack of coordination among institution

Session IV: Way Forward

The followings are the way forward on promoting Trees outside Forests (ToF), adopted during the workshop.

- **No proper Guidelines and Procedures to assess Trees outside Forests (Assessment and inventory).**
  India has a manual to assess ToF. Nepal had already in the process of developing guidelines, however it still needs to be tested and validated. The delegates from Member States understood the need of the guideline for assessing ToF, it was agreed that the **SAARC Forestry Centre will initiate the work with experts group (from Member states) and come out with general kind of guidelines.**

- **Inadequate database on Trees outside Forests within the SAARC Member States.** In a phase wise manner, assessment and inventory of ToF will need to be carried out in each of the Member States that will lead to development of Database in respective countries.

- **Reduction of Size (extent)/fragmentation of lands for residential purposes/Small land holdings or loosing land for other developmental activities other than trees.** The Member States need to scale-up present plantation programme. An incentives mechanism for promotion of ToF could be introduced by the Member States, if not already done. Utilization of unused public, private and waste lands e.g. river flood plain for plantation, which would contribute more production of wood needs from ToF. Member States should encourage urban plantation and landscape level planting.

- **No proper management of ToF resources.** In order to contribute the home gardens to over all sustainable ecosystems management, it must be considered to go beyond individual household level home garden management. However, it is very important to make a note of that the management of forest in home garden is not same as other large forest management. ToF has no proper scientific management, nevertheless has traditional management practices. **Therefore, Member States must look into how best both scientific and traditional practices could be juxtaposed and manage ToF**

sustainably. Adoption of improved management practices and appropriate combination of tree species and agriculture crops should also be considered.

- **Lack of harvesting and processing techniques.** Improve harvesting and processing techniques of trees including non-timber forest products (NTFP) and other forest products like spice etc. It has potential to produce timbers and generate income for private forest owners, since there is high demand and good market for timber and NTFPs. (In Sri Lanka, ToF has highly contributed to timber and fuel wood supply)

- **Incompatible sectoral and cross-sectoral policies in Member States.** All the Member States must look into harmonization of sectoral policies with regards to ToFs. Unless this is done, there will always be conflicting within policies, which will restrict promotion of ToF.
- **Lack of enabling environment of policies** (i.e. programs, institutions, guidelines and directives/weak applications of rules, regulations and policies. Complex formalities for extraction, transportation, marketing & exportation of ToF). This is experiencing in all the Member States. Therefore, each Member State must venture to establish simple procedures for extraction, transportation, marketing and export of resources from ToFs, including ToFs for carbon trading mechanism and buyback guarantee policy

- **Lack of Seeds and planting material exchange policy among SAARC countries.** The SAARC Forestry Centre must initiate to develop general policy to share planting material among SAARC countries. The SAARC Forestry Centre could facilitate to initiate regional cooperation on management ToFs (information exchange, education, methodology development, & Trading etc.)

- **Lack of Research and survey policy for ToFs**. Each Member States must look into formulating Research policy for ToFs.

- **Low quality and quantity seedlings distribution**. Each Member States must use the SAARC Mechanism to secure certified planting stock. This will assure the quality of seedlings are maintained.

- **No proper choice of Species** - Selection of site specific species in ToF. Provide appropriate technical backstopping and extension services.

- **Lose of ToF resources by insect, pests and diseases**. In order to increase production of wood from the ToF, those insect pest should be controlled through Integrated Pests Management, deployment of insect / disease resistant clones

SESSION V: CLOSING SESSION

Each Member State delegates commented the workshop in the closing session.

BHUTAN commented that not much to say, but it was good learning and be in Colombo.

NEPAL commented by thanking the SAARC Forestry Centre for providing opportunity to share about ToF among the SAARC Member States. The workshop was organized in friendly manner and good environment. Local Forestry Officials were very friendly and cooperative as well as the hotel staff. The workshop objectives were achieved, which is a big success of the workshop. This workshop has widened horizon of thinking ToF. This workshop had provided a platform for good interaction. At last, we request the organizer to share the proceeding with all the participants.

INDIA commented that this workshop has given a good opportunity to learn from each other. Let us keep in contact and share research works henceforth. Thank you.

SRI LANKA commented that they would like to thank the SAARC Forestry Centre for selecting Sri Lanka as a venue for this workshop. This gives opportunity the host country to participate more participants. We have tried to arrange everything well, but if there are any short comings, we request each and every one to consider.

DIRECTOR, SAARC Forestry Centre thanked the honorable chairperson for organizing plenary and contribution made. At the SAARC, it is a lengthy procedure to organize such workshop, particularly in term of confirming the participants from Member States. We were little scared and unsure whether this workshop could be materialized. To organize such workshop, at least 4 Member States must be presented to complete the quorum. However, finally, this has happened and we thank all the delegates from India, Nepal, Sri Lanka and Bhutan for your participation.

On behalf of the Honorable Secretary General, SAARC Secretariat, Kathmandu and on behalf of the SAARC Forestry Centre thank the

Department of Forests, Sri Lanka for their assistance and cooperation to organize this workshop.

We would also like to thank the Conservator General, Department of Forests, Government of Sri Lanka; also thank Mr. Jai Telakke Chairperson of the Board for SAARC Forestry Centre.

We assure you that we will be sending the document as soon as possible. Thank to Mr. Anura and Ms. Uthpala for organizing the field trip successfully. We would also like to thank Professor Nimal and Gamini for their excellent contribution to workshop.

Chairperson commented that lastly thanks for successful conducting the workshop. Wish you all good luck and safe journey back to your home country.

Annexure – I: Programme of the workshop

SARRC Workshop on Stakeholder Engagement to enhance Development and Productivity of Trees outside Forests

14 – 16 November, 2012

SRI LANKA

Organized by the SARRC Forestry Centre in collaboration with the Forest Department, Government of Sri Lanka

Day 1 (14th November 2012)

08.30 am - Registration of Participants

09.00 am - Inaugural Session
Lighting of Traditional oil Lamp
Welcome address
Address by representative of SARRC SAARC Forestry Centre
Address by Secretary - Ministry of Environment
Address by Chief Guest
Vote of Thanks

10.00 am - Tea break

10.30 am - Introduction to the workshop
Introduction of participants
Objectives and Programme of the workshop

Session I – Country presentations on Present Status of Trees outside Forests

10.45 am Chairman: Prof.Nimal Gunatilleke – Professor of Botany, University of Peradeniya, Sri Lanka

Bhutan
India
Nepal
Sri Lanka

12.05 pm - Discussion

12.30 pm - Lunch

01.30 pm Session II- ToF_Resource Assessment – methodologies used, procedural constraints and information gaps – Country presentations

Chairman: Dr. Matieu Henry – Specialist in , FAO, Rome

Bhutan
India
Nepal
Sri Lanka

02.50 pm - Discussion
03.10 pm - Introduction to group work
03.30 pm - Tea break
04.00 pm - Group Work – 1. Constraints for promoting ToF resources in the SAARC region
1. Role of the governments, NGOs and other stakeholders
2. Information gaps and technological barriers
05.00 pm - Presentation of group findings and recommendations
05.20 pm - Discussion
05.30 pm - End
07.30 pm - Reception Dinner

Day 2 (15th November 2012) – Field visit

6.00 am - Leave Hotel for Kandy

Visit a Kandyan Home garden – a sustainable model of ToF in Sri Lanka
Visit Temple of the sacred Tooth of Lord Buddha
Lunch at Royal Botanic Gardens, Peradeniya
Visit Elephant Orphanage – Pinnawala, Kegalle (Optional)

9.00 pm - Arrive at Hotel

Day 3 (16th November 2012)

09.00 am Session III - Policy and Legal aspects of development of ToF

Chairman: Dr. Sangay Wangchuk – Director, SAARC Forestry Centre
Member country presentations
Bhutan
India
Nepal
Sri Lanka

10.20 am	-	Discussion
10.30 am	-	Tea
11. 00 am	-	Group Work – 2. Analysis of Policy and Legal instruments responsible for Promotion of ToF in the SAARC region and recommended further actions
11.45 am	-	Presentation of group findings
12.20 pm	-	Discussion
12.30 pm	-	Lunch
01.30 pm		Plenary session
02.30 pm		Way forward – recommended actions and agreements
03.00 pm		Closing session
03.30 pm		Tea

Annexure – II: List of participants

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			Moon Plains Nuwara Eliya		
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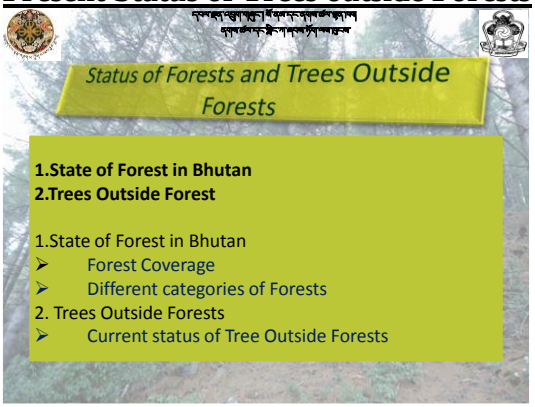
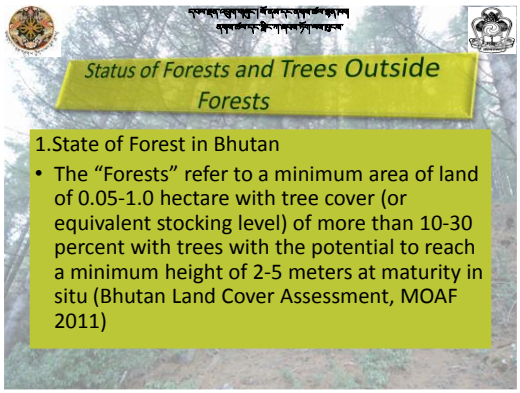
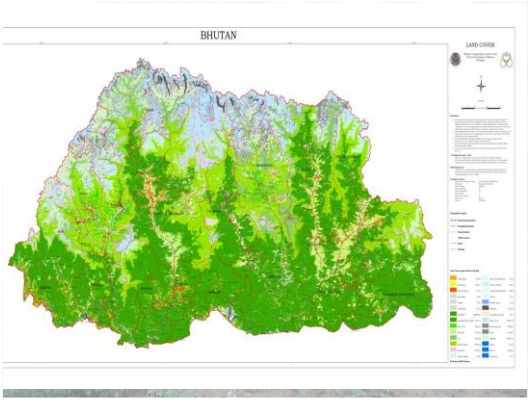
Annexure – III Presentations

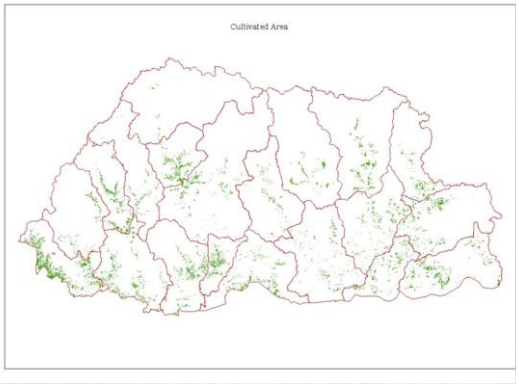
BHUTAN

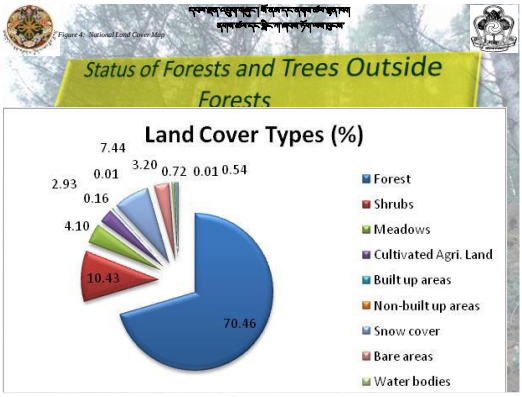
Present Status of Trees outside Forests

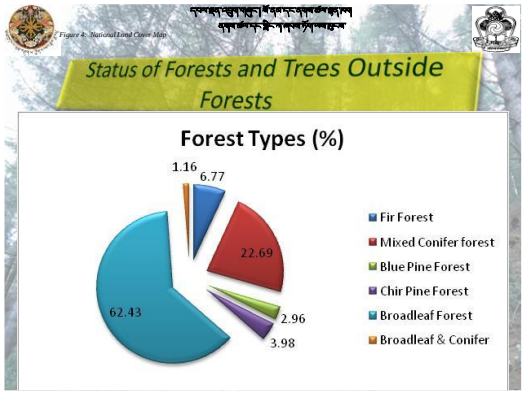




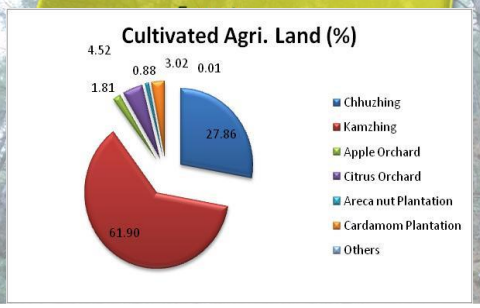








Status of Forests and Trees Outside



Present Status of Trees Outside Forests

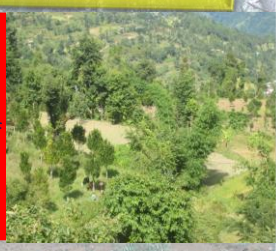
Trees on Private Land

- ✓ As per the survey 2006, about 11,533 acres of registered private lands have over grown trees

Present Status of Trees Outside Forests

Trees on Private Land

- ✓ Density of Trees – about 24% of over grown trees fall under the category of 11-50 trees per acre
- ✓ Most of the trees are of 20-25 years age



Present Status of Trees Outside Forests

Main Reasons for keeping land uncultivated

- ✓ Farm labor shortage (rural-urban migration)
- ✓ Wildlife damaging the crops (isolation)
- ✓ Inconvenient access due to steep slope
- ✓ Soil and water problems(either there is no water or the soil condition is bad)

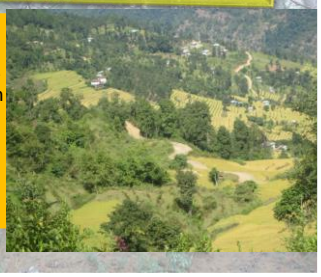
Status of Forests and Trees Outside Forests

Trees Outside Forests

Land Owners

Traditional practice of planting trees on private land – on farm boundaries and home stead

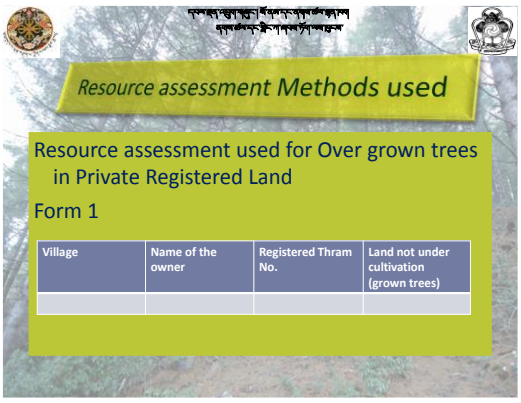
(but assessment is done)

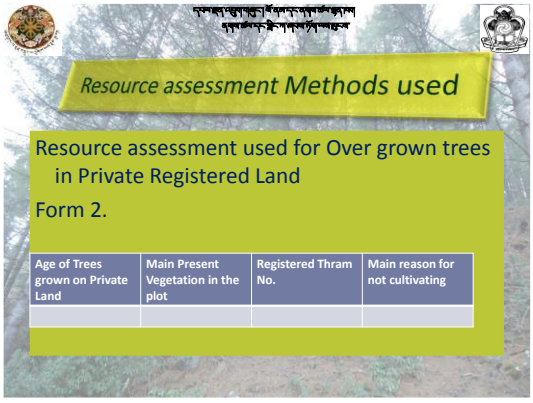


Challenges

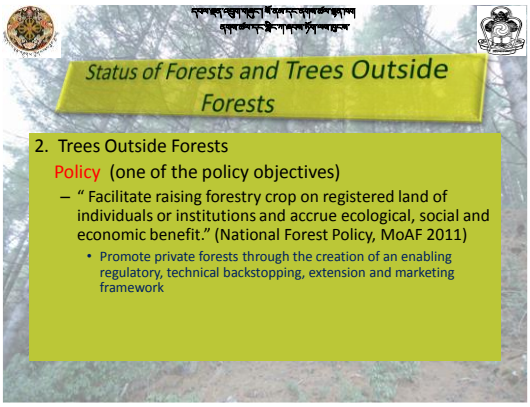
- No Proper procedures and method to assess trees out forests
- No proper database of Trees outside forests
- Small land holdings

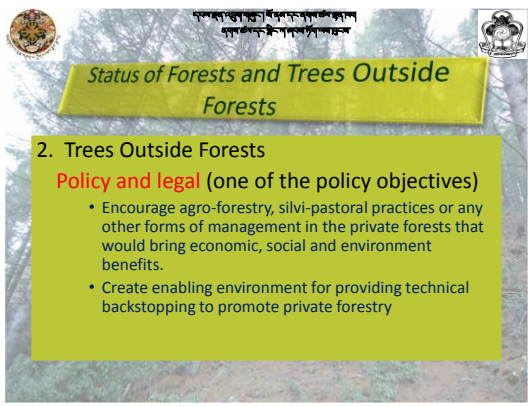
ToF Resource Assessment – methodologies used, procedural constraints



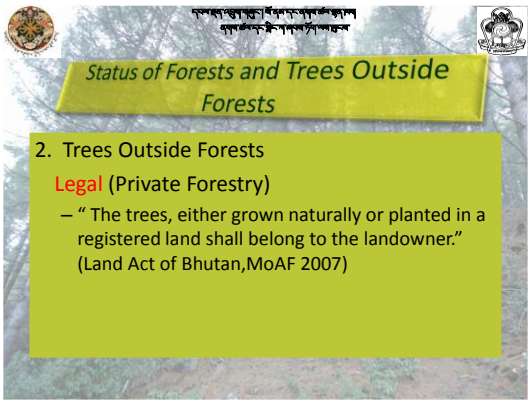


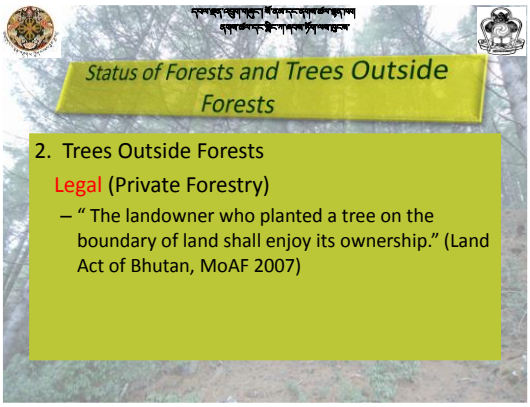
Policy and Legal aspects of development of ToF

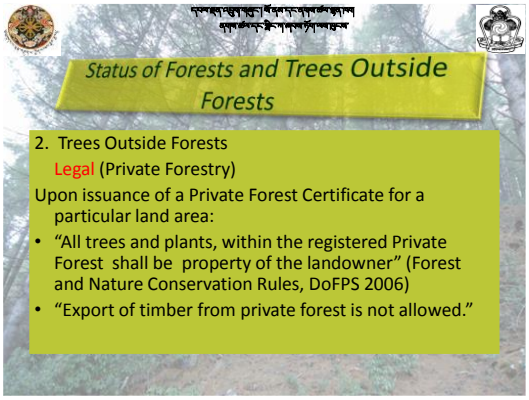


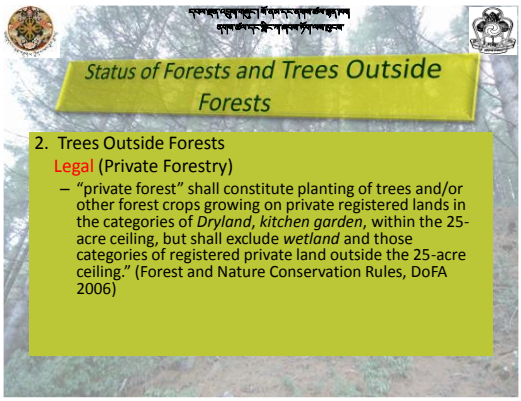



Status of Forests and Trees Outside Forests
2. Trees Outside Forests
Policy and legal (one of the policy objectives)
• Create enabling environment and mechanism for harvesting and marketing of forest produce from the private forest.
• Support industries to develop commercial plantation forests, including on leased Government Reserve Forest land to produce industrial raw materials


Status of Forests and Trees Outside Forests
2. Trees Outside Forests
Legal (Private Forestry)
– " The trees, either grown naturally or planted in a registered land shall belong to the landowner." (Land Act of Bhutan,MoAF 2007)


Status of Forests and Trees Outside Forests
2. Trees Outside Forests
Legal (Private Forestry)
– " The landowner who planted a tree on the boundary of land shall enjoy its ownership." (Land Act of Bhutan, MoAF 2007)


Status of Forests and Trees Outside Forests
2. Trees Outside Forests
Legal (Private Forestry)
Upon issuance of a Private Forest Certificate for a particular land area:
• "All trees and plants, within the registered Private Forest shall be property of the landowner" (Forest and Nature Conservation Rules, DoFPS 2006)
• "Export of timber from private forest is not allowed."


Status of Forests and Trees Outside Forests
2. Trees Outside Forests
Legal (Private Forestry)
– "private forest" shall constitute planting of trees and/or other forest crops growing on private registered lands in the categories of *Dryland*, *kitchen garden*, within the 25-acre ceiling, but shall exclude *wetland* and those categories of registered private land outside the 25-acre ceiling." (Forest and Nature Conservation Rules, DoFA 2006)

INDIA

Present Status of Trees outside Forests

ENHANCEMENT OF PRODUCTIVITY OF TREES OUTSIDE FOREST IN INDIA

Dr. K.P. Singh
Scientist

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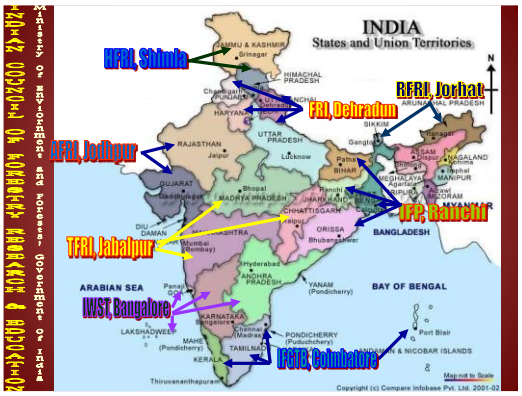


INDIAN FORESTRY IN BRIEF

- Earlier, forests were managed for wood production under the working plans.
- After independence large scale forest land was diverted to agriculture and other developmental activities.
- However, the diversion of the forests was restricted in 1980.
- At present, classification of forest management systems have been changed to planting with harvesting followed by replanting for sustainable management.

LAND USE PATTERN IN INDIA

Land use	Area (million ha)
Forests	67.0
Area under non-agricultural uses	21.8
Permanent pastures & other grazing lands	12.0
Land under misc. tree crops and groves	3.0
Culturable waste land	16.0
Fallow lands	24.0
Barren and unculturable land	19.4
Cropped area	142.5
Use not reported	23.0
Total land area	**328.7**

STATUS OF FOREST COVER IN INDIA
SFR 2011

Class	Area (km²)	Percent of Geographic Area
Forest Cover		
Very Dense Forest	83,471	2.54
Moderately Dense Forest	320,736	9.76
Open Forest	287,820	8.75
Total Forest Cover*	**692,027**	**21.05**
Tree Cover	90,844	2.76
Total Forest & Tree Cover	7,82,871	23.81
Scrub	42,177	1.28
Non-Forest	2,553,059	77.67
Total Geographic Area	**3,287,263**	**100.00**

* Includes 4,662 km² under mangroves

GROWING STOCK OF FORESTS AND TREES OUTSIDE FORESTS IN INDIA

Category	Growing Stock (million cum)
Forest	4498.73
TOF	1548.42
Total	**6047.15**

ZONE WISE TOF IN INDIA

Physiographic Zone	Area of Phy. Zone (km^2)	Growing Stock (m cum)
Western Himalayas	329,255	191.23
Eastern Himalayas	74,618	67.11
North East	133,990	93.67
Northern Plains	295,780	101.96
Eastern Plains	223,339	102.36
Western Plains	319,098	66.10
Central Highlands	373,675	108.52
North Deccan	355,988	83.00
East Deccan	336,289	191.49
South Deccan	292,416	127.59
Western Ghats	72,381	117.47
Eastern Ghats	191,698	67.73
West Coast	121,242	141.98
East Coast	167,494	88.21
TOTAL	3,287,263	1548.42

AGRICULTURAL PRODUCTIVITY

(Yield in metric tone)

ITEM	1950-51	1970-71	2000-01
Rice	20.58	42.20	88.30
Wheat	6.46	23.83	75.50
Pulses	8.41	11.82	13.50
Oil seeds	5.16	9.63	22.80
TOTAL	50.82	108.00	208.80

PRODUCTIVITY OF FORESTRY CROPS

SPECIES	INDIA ($m^3ha^{-1}yr^{-1}$)	WORLD ($m^3ha^{-1}yr^{-1}$)
Eucalyptus tereticornis	4-5 / 16-20	40-50
Tectona grandis	2-3	10-12
Populus deltoides	20-25	45-50

SPECIES

***Tectona grandis, Dalbergia sissoo, Gmelina arborea, Eucalyptus,* Pines, *Acacia, Casuarina,* Poplars**

CURRENT DEMAND OF ROUND WOOD (MILLION M^3)

Demand / y	Availability / y
• 95.00 ✓ 50.18 - Short rotation trees ✓ 44.82- Long rotation species	• 45.949 ✓ 3.175 - Forest ✓ 42.774 -TOF
DEFICIENT = 49.051 (51.63 %)	

However, the methods to fulfill the bridge between gap and supply could be as follows-

- Increase the area under Tree outside forest
- Increase the productivity of Tree outside forest
- Use bamboo as substitute wood
- Import wood

FUEL WOOD IN INDIA

(per year)

- Demand for fuel wood : 216.42 m tonnes
- Availability : 20.48 m tonnes
  - ✓ Forests : 1.23 m tonne
  - ✓ TOF : 19.25 m tonnes
- Deficit for fuel wood : 195.94 m tonnes

TOF IN INDIA

- Productivity of Indian forests : 0.7 m^3/ha/yr
- World average productivity : 2.1 m^3/ha/yr
- The productivity of TOF in India : 20-30 m^3/ha/yr

However, the productivity in some important species has been enhanced to 50 m^3/ha/yr with improved management practices and insect pest control.

Important TOF species

- ✓ ***Populus* species**
- ✓ ***Eucalyptus* species**
- ✓ ***Delbergia sissoo***
- ✓ ***Melia composita***
- ✓ ***Casuarina equisetifolia***
- ✓ ***Acacia nilotica***
- ✓ ***Prosopis cineraria***
- ✓ ***Anthocephalus chinensis***
- ✓ **Bamboo species**

FACTORS AFFECTING THE PRODUCTIVITY OF TREES OUTSIDE FOREST

1. Choice of species
2. Quality of planting stock
3. Silviculture practices
4. Harvesting and processing
5. Insect pests and diseases

LOSSES CAUSED BY FOREST INSECTS

Forest Crop	Percent damage / mortality	Insect pest responsible	Estimated loss Rs. in million per unit area / vol.	Authority
Nurseries	93.5	White grubs	0.45 per ha	Vaishampayan & Bhandari 1981
Forests and Plantations				
Chir pines	05.0	Defoliator and Bark beetles	0.025 per ha	Ent. Div. FRI unpublished data
Eucalyptus	05.0	Stem borer and termites	0.0024 per ha	-do-
Teak	13-65	Teak defoliators	0.05 per ha	Champion, 1934
	44.00	-do-	-	KFRI, 1985
Tree seeds	32.0-100	Seed borers	214.5 for 3000 metric tonnes	Ent. Div. FRI unpublished data
Timber				
Industrial wood	10.0	Wood borers and termites	332.27 for 7.97 millions m3	Purushotham, 1970
Fuel wood	10-40	-do-	54.7	Ent. Div. FRI un-published data
Bamboo	25-40	Ghoon borers	2.81 for 0.15 million koris (20 no.) (worked at 25% loss)	Beeson, 1941 and Present record

Nursery Insect Pests and Management

Primary pests

A. Termites – 2300 spp. in world & 337 in India

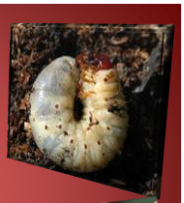
- They are social insects living in colonies.
- They feed on the bark and roots of seedlings.
- Important termite species are: ***Microcerotermes beesoni, Odontotermes indicus, O. distans, Microtermes obesus.***
- Termites are polyphagous and feed on crops as well as forest trees.
- Termites cause severe damage to *Eucalyptus* transplants, seedlings of ***Acacia* spp., *Albizia lebbeck, Azadirachta indica, Casuarina equisetifolia* and various clones of poplar.**

Control:

- Soil treatment – Endosulphan or Chlorpyriphos 0.2 % Chlorpyrifos (20 EC) in 50 lit of water can be sprayed in the nursery bed of 10 x 1 m

B) *White-grubs* (Cockchafers)

(Coleoptera: Scarabaeidae)



- The grubs of the insect are subterranean and root feeders.
- Adults are defoliators.

The white grubs species are:

- *Holotrichia consanguenea*
- *H. insularis*
- *H. serrata*

➢ They cause damage in forest nurseries, plantations as well as to the agricultural crops.

Control:

Folithion 10% dust or Phorate (Thimet) 10 G) @ 200 g per10 x 1 m bed

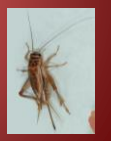
C) Cut-worms (Lepidoptera: Noctuidae)

- Cut worm (*Agrotis ipsilon*) is a polyphagous pest.
- They cause heavy mortality to the nursery stocks of several spp.
- The larvae cut the stems of young seedlings from the collor region.

Control:

- Deep ploughing
- Weedling should be avoided at the time of the emergence of beetles
- Light traps can be used
- Folithion 10% dust or Phorate (10 G) 200 g @10 x 1m per bed

D) Cricket (Orthoptera: Gryllidae)



- It is an important pest of nurseries.
- Its nymphs and adults feed on the root system of seedlings and ultimately kill them.

Control:

- Folithion 10% dust or Phorate (10 G) 200 g @10 x 1m per bed

Insect pests of TOF

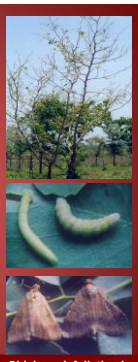
***Dalbergia sissoo* (Shisham)**

Plecoptera reflexa

(Lepidoptera : Noctuidae)

- Shisham is widely distributed in U.P., Haryana and Punjab.
- The young larvae of *P. reflexa* eat lower epidermis and inner tissues of leaves.
- It has 11-13 generations in a year.
- The most severe defoliation occurs from June-August.
- A loss of increment (25%) per annum is caused.

Management: To control *P. reflexa* chemical spray of 0.1 per cent carbaryl or fenitrothion is suggested (Singh & Singh, 1987).



Shisham defoliation by *Plecoptera reflexa*

Comparison of volume of dead and diseased tree with normal tree

Sl. No	DBH (cm)	Volume Chaturvedi (1973)	Vol. estimated from this model (m3)	Difference %
1.	10	0.0600	0.0275	54.17
2.	15	0.1330	0.0411	69.08
3.	20	0.2320	0.0890	61.64
4.	25	0.3590	0.1700	52.34
5.	30	0.5120	0.2870	43.95
6.	35	0.6960	0.4270	38.65
7.	40	0.9060	0.6100	32.67
8.	45	0.1430	0.8125	28.92
9.	50	0.4080	0.0614	24.62
10.	55	0.7700	0.3440	24.07
11.	60	0.1930	0.6410	25.17
12.	65	0.6610	0.9910	25.18

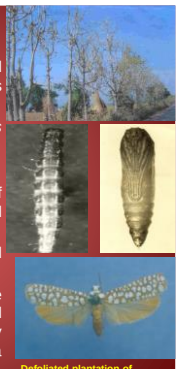
Ailanthus excelsa (Maharukh)

Atteva fabriciella (Lepidoptera:Yponomeutidae)

- *Ailanthus* is grown around the agricultural field. It's Major pest is lepidopterous defoliator (*Atteva fabriciella)* in North India.
- One or two year old plantation of *Ailanthus* may completely wiped off by *A. fabriciella*.

Management:

- Pests can be managed by integration of biological and limited chemical control methods.
- Two larval parasites, *Bessa remota* and *Carcelia* spp. (Tachinidae).
- Spraying of synthetic pyrethroid, fenvalerate (sumicidin) and carbamate (sevin) 0.01 and 0.2 per cent concentrations respectively provide good control of the pest (Misra *et.al.*, 1987).



Defoliated plantation of Ailanthus by *Atteva fabrieciella*

Gmelina arborea (Gamhar)

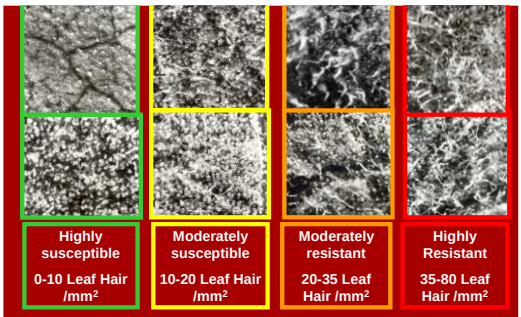
The plant species is attacked by

***Calopepla leayana* (Coleoptera: Chrysomelidae)**

- This plant species is widely grown in Assam and North Bengal.
- Defoliation by *C. leayana* commences in the beginning of rains and continues till October/November.

Management:

- Beetles of *C. leayana* are highly attracted to white colour, the control can be achieved by using white light traps.
- Systematic insecticides *viz.*, monocrotophos (0.03%)
- Synthetic pyrethroids like cypermethrin or fenvalerate (0.003%).



Insect Resistance has direct relation with intensity of hair on ventral side of leaf.

Toona ciliata and *Sweitenia macrophylla* (Toon and Mahagony)

***Hypsipyla robusta* (Lepidoptera: Pyralidae)**

- It is a major pest of toon and mahagony plantations.
- The larvae of *H. robusta* also attack inflorescence and fruits of toon.
- It has 5 generations in a year.

Management:

- Soil application of Furadan 3G @ 5 to 25 g per plant
- Foliar spray of 0.025% monocrophos in water once in two months

Toon shoot borer, ***Hypsipyla robusta***

Bombax ceiba (Semul)

B. Ceiba is attacked by:

Tonica niviferana (Lepidoptera Oecophoridae)

- Larvae bore the young shoots and twigs of the plants and often cause heavy mortality of plants in young stage.
- It has 5-6 generations in Northern India.

Management:

- Spray of Dimethoate 0.02%.
- Carbofuran@ 85g/plant causes effective mortality of pest in young plantation.
- Deployment of disease resistant clones of Semul would be useful against shoot borer.

Semul Shoot borer, ***Tonica niviferana***

Anthocephalus chinensis (Kadam)

***A. chinensis* is attacked by:**

***Arthroschista hilaralis* (Lepidoptera-Pyralidae).**

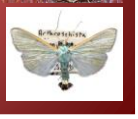
- It is extensively grown in West Bengal Agroforestry system.
- The insect has 8-9 generations in a year.

Management:

Spray of folithion 0.1 -0.2%

or

Cypermethrin 0.001-0.002%



Acacia nilotica –

This species of *Acacia* is widely planted in agroforestry systems of arid and semi-arid zones. It is *is attacked by:*

***Celosterna scabrator* (Coleoptera: Cerambycidae).**

- It is a root and stem borer.
- It also attacks *A. catechu* and *A. tortilis.*

Nature of damage caused: The beetles feed voraciously mainly at night on the bark of young living shoots, scraping it away with the mandibles down to the surface of the wood.

Management:

- The infestation of *C. scabator* can be minimized through silvicultural methods.
- 0.2 per cent fenitrothion/endosulphan at the time of emergence of beetles.

Eucalyptus (*Eucalyptus* spp.)- It is attacked by:

***1. Celosterna scabrator* (Coleoptera: Cerambycidae).**

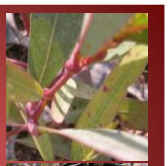
it is a root and stem borer, which is primarily a pest of *Acacia nilotica.*

Management:

- The infestation of *C. scabrator* can be minimized by applying silvicultural methods.
- Its collateral hosts like *Acacia* spp., *Casuarina* etc. should not be planted together with *Eucalyptus.*
- Plantations should be sprayed with 0.2% fenitrothion/endosulphan at the time of emergence of beetles.
- Application of furadon 3 G @ 250g/plant at the beginning of monsoon is also recommended.

2. *Leptocybe invasa*

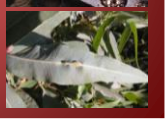
(Hymenoptera: Chalcidoidea: Eulophidae)



- The insect species attack in nurseries and plantations of eucalyptus.
- It is a gall wasp which form the gall on the twig of the seedlings.

Control:

- Remove the infested seedlings and burn.
- Biocontrol: parasite (*Quardra stichus mandili*) brought from Israel and it attacks on the larval stage of green gall former and kill it.



Leucaena leucocephala (Subabul)- It is attacked by

***Heteropsylla cubana* (Homoptera: Psyllidae)**

- It is attacked by *Heteropsylla cubana* (Homoptera: Psyllidae)
- It has threatened subabul cultivation in India.
- This insect has been reported from many parts of south and central India.

Management:

Spray of monocrotophos (0.02%)

Prosopis cineraria (Khejri):

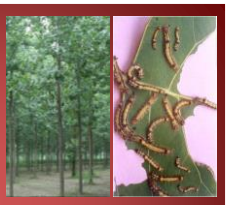
It is attacked by *Celosterna scabrator, Holotrichia consanguinea and a termite species- Acanthotermes macrocephalus*

- The tree species is popular of Arid region.
- Termite species *Acanthotermes macrocephalus* causes damage to roots.
- Beetles of *Holotrichia consanguinea* defoliates during night.
- Occasionally, stem borer, *Celosterna scabrator* attack the trees.

Management:

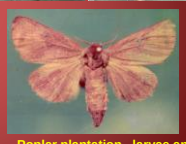
- To control the defoliating beetles, spraying of Carbaryl 50 WP (0.2%) during June-July
- Spraying of folithion 0.25% or endosulphan 0.25% is also suggested (Singh and Bhandari, 1986a).

Populus deltoides-



It is attacked by *Clostera cupreata*, belonging to order Lepidoptera and family Notodontidae).

- There are more than 60 insect species causing damage to poplar. But one of the most important defoliator is *C. cupreata.*
- The larvae defoliate the leaves.
- It has 8-9 generations in a year.
- Several outbreaks reported due to this insect species.
- It can be controlled by aerial spraying of carbaryl 1.0 kg ai/ha. (Singh et.al., 1983).
- Larvae of ***C. cupreata*** *can be* controlled by spraying water suspension containing NPV (Ahmad and Sen-Sharma, 1983).



Poplar plantation , larvae and adult of *Clostera cupreata*

Poplar stem borer

Apriona cinerea

(Coleoptera : Cerambycidae)

It is a serious borer of poplar plantations.

Management:

- *Apriona cinerea* may be controlled by injecting saturated solution of Paradichlorobenzene in kerosene (5 ml/hole) (Verma & Khurana, 1985).

Stem borer of poplar

Bamboo

Bamboo is attacked by more than 212 insect species in the Indian sub-continent. Out of these important borers of green standing bamboos are:

1. ***Phloeobius crassicollis*** **(Coleoptera: Anthribidae)-**

- It damages the ten green standing bamboo species *viz . Bambusa bambos, B. nutans, B. polymorpha, B. tulda, B. vulgaris, B. wamin, Dendrocalamus calostachyus, D. giganteus, D. strictus and Gigantochloa atroviolacea*.
- The life cycle is annual.

Control: Chlorpyriphos or Endosulphan 0.04 and 0.05% through internodal injection.

Estigmina chinensis (Coleoptera: Chrysomelidae

Attacked bamboo culms

Adults of *E. chinensis*

Feeding pattern of larva

Suggestions for enhancement of productivity of TOF

- Selection of site specific species in TOF.
- Use of certified planting stock
- Adoption of improved management practices
- Appropriate combination of tree species and agriculture crops
- Control of insect pest through IPM
- Deployment of Insect / disease resistant clones

Control of poplar defoliator by using plant extracts (*Calotropis procera* and *Plumbago zeylanica*)- A case study of Northern India

Populus deltoides

- The genus *Populus* is widely distributed throughout the temperate and cold regions of the northern hemisphere.
- Poplar cultivation was started in most of the countries to meet the challenge posed by an increased demand of wood.
- There are six species of poplars viz. *Populus alba, P. ciliata, P. euphratica, P. gamblei, P. jacquemontiana var glauca* and *P. aurifolia,* indigenous to Himalayan region of India.
- *P. deltoides* is a fast growing exotic tree species of poplar which extensively planted in India under various forestation/reforestation programmes.
- Poplars especially *P. deltoides* is susceptible to insect attack.
- Over 108 insect species have so far been recorded causing infestation at various stages.

Poplar defoliator-

- *Clostera cupreata* and *C. fulgurita* are are two primary pests of poplar.
- They cause severe defoliation to the poplar in main planting areas of India
- Due to defoliation in large areas on regular basis adversely affected the growth increment and also reduced the quality of the timber.
- Repeated defoliation caused even death of tree.

Calotropis procera

Calotropis procera (family: Asclepiadaceae)

- commonly known as Madar or Aak.
- It is widely distributed as a weed throughout India.
- Local people use its latex successfully to combat some cutaneous fungal infections.

Plumbago zeylanica

Belongs to family *Plumbaginaceae*.

- Commonly known as Chitrak and grows throughout India, especially in Bengal, Uttar Pradesh, South India and Sri Lanka.
- Leaves are pungent and bitter in taste.
- Therapeutic Value -Used in Anticancer, Arthritis, Digestion, Anti diabetic

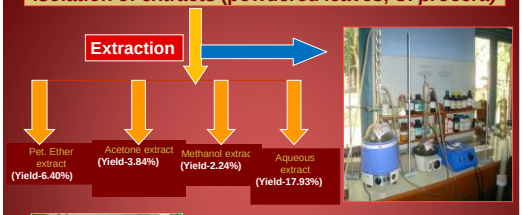
Collection of *Calotropis procera*

Collection of *Plumbago zeylanica*

The leaves were

- ✓ Air dried
- ✓ Ground to powder
- ✓ Extraction was done in different selected solvents and
- ✓ Extractives were prepared

Isolation of extracts (powdered leaves, *C. procera*)



Yield % of *Plumbago zeylanica* in different solvents.

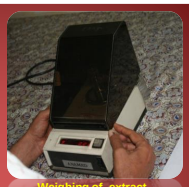
Petroleum ether	1.64
Acetone	2.35
Methanol	3.45
Water or aqueous	10.71

- ❖ Larvae of *Clostera cupreata* defoliator of poplar were collected from the various sites of Dehradun and Haryana for rearing and maintenance of laboratory culture.
- ❖ Rearing of larvae of *C. cupreata* was done in chimney as well as in wooden cages in the laboratory, to lay down the different experiments for testing of different plant extracts of *C. procera* (Aak).


Rearing of poplar defoliator

Larvae and pupae of poplar defoliator


Grinding of *C. procera* leaves


Weighing of extract


Mixing of extract in solvent

Methodology

Experiments were carried out to evaluate the biopesticidal effect on the mortality of immature stages (3rd instar larvae) of *Clostera cupreata* using *Calotropis procera and P. zeylanica* extracts at 1% concentration in 3- replications and a control.

Ten number of 3rd instar larvae of *C. cupreata* were taken from the culture and released in glass jar having fresh twigs of poplar treated with 1% of *C. procera* ***and*** *P. zeylanica* extracts in 3-replications.

Observations on the mortality of larvae were recorded after 24, 48 and 72 hrs. Moribund larvae were considered as dead.

$$\text{Percent mortality} = \frac{\text{No. of larvae dead}}{\text{No. of larvae released}} \times 100$$

Testing results of *C. procera* at 1% concentration

Sl. No	Chemical extracts	Extracted in	Soluble in	Average% Mortality (72 hrs)	Effective or not effective	Control
1	CPPE	Petroleum ether	CCl4	16.67	not effective	nil
2	CPA	Acetone	Acetone/ Methanol	40.00	effective	nil
3	CPM	Methanol	Methanol	50.00	effective	nil
4	CPW	Water	Water	6.67	not effective	nil

Bioassay results of effective extracts of *C. procera* (% of larvae dead after 72 hrs).

Sl. No	Chemical extract	0.0625 %	0.125 %	0.25 %	0.50 %	1.00 %	1.50 %	2.00 %	Control
1	CPA	Nil	6.67	10.00	16.67	43.33	50.00	56.67	Nil
2	CPM	Nil	6.67	10.00	20.00	50.00	56.67	60.00	Nil

Qualitative analysis of *Calotropis procera* leaves extracts

Sl. No.	Plant constituents	Petroleum ether extract	Chloroform extract	Methanol extract	Aqueous extract
1.	Alkaloids	-	-	+	+
2.	Carbohydrates	-	-	-	-
3.	Glycosides	+	-	+	-
4.	Anthraquinones	-	-	-	-
5.	Saponins	-	-	+	+
6.	Phenolic compounds and tannins	-	-	+	-
7.	Flavanoids	-	-	+	+
8.	Sterols	-	-	+	-
9.	Terpenoids	-	-	-	-
10.	Phlobatannins	-	-	-	-

+ indicates the presence of constituents and – indicates the absence of constituents.

Testing results of *Plumbago zeylanica* extract at 1% concentration

Sl. No	Chemical extract	Replication	No. of larvae	Mortality			%Mortality after 72 hrs	Average mortality	Effective or not effective
				After 24 hrs	After 48 hrs	After 72 hrs			
1	PZPE	R1 R2 R3 Control	10 10 10 10	Nil Nil 1/10 Nil	Nil Nil 1/10 Nil	Nil Nil 1/10 Nil	Nil Nil 10.00 Nil	3.33%	not effective
2	PZA	R1 R2 R3 Control	10 10 10 10	2/10 3/10 2/10 Nil	4/10 5/10 5/10 Nil	4/10 5/10 5/10 Nil	40.00 50.00 50.00 Nil	46.67%	effective
3	PZM	R1 R2 R3 Control	10 10 10 10	3/10 3/10 3/10 Nil	5/10 6/10 6/10 Nil	5/10 6/10 6/10 Nil	50.00 60.00 60.00 Nil	56.67%	effective
4	PZW	R1 R2 R3 Control	10 10 10 10	Nil Nil Nil Nil	Nil Nil Nil Nil	Nil Nil Nil Nil	Nil Nil Nil Nil	Nil	not effective

Control with respective solvents were also maintained simultaneously and showed nil results

Bioassay of effective extracts of *P. zeylanica* against the larvae of *C. cupreata* after 72 hrs.

Sl. No	Chemical extract	0.0625 %	0.125 %	0.25 %	0.50 %	1.00 %	1.50 %	2.00 %	Control
1	PZA	Nil	6.66	10.00	30.00	46.66	53.33	60.00	Nil
2	PZM	Nil	6.66	10.00	30.00	56.66	56.66	66.66	Nil

Qualitative analysis of *P. zeylanica* leaves extract

Sl. No.	Plant Component	Petroleum ether extract	Acetone extract	Methanol extract	Aqueous extract
1.	Alkaloids	+	_	+	_
2.	Carbohydrate	_	_	_	+
3.	Flavonoids	+	+	+	+
4.	Glycosides	_	_	_	_
5.	Protein	_	_	_	_
6.	Saponins	_	+	+	+
7.	Terpenoids	+	+	+	+
8.	Tannins	-	-	+	-

+indicates the presence of constituents and – indicates the absence of constituents.

RESULTS

- Out of four extracts CPPE, CPA, CPM and CPW, two extracts namely CPA and CPM gave 40.00 and 50.00% larval mortality after 72 hrs of Poplar defoliator *(C. cupreata)*, at 1% concentration respectively and in case of *P. zeylanica* mortality was **46.67% and 56.67%**.
- The bioassay of effective extracts (CPA and CPM) were carried out with 7 concentrations (0.065, 0.125, 0.25, 0.5, 1.0, 1.5 and 2.0%) and a control against 3rd instar larvae of poplar defoliator.
- Each experiment was conducted with 3rd instar larvae in three replications with a control.
- Average and standard deviation was calculated.
- The data shows that *C. procera and P. zeylanica* methanol extract has got very high variability and found to be most effective at 1% concentration

- The phytochemical analysis of the extract showed the presence of alkaloids in maximum amount in methanol extract of *C. procera* leaves.
- The phenolic contents were also found in methanol extract.
- Flavonoids and saponins were also found to be present in methanol extracts.
- *P. zeylanica* leaves showed the presence of flavonoids, saponins, terpenoids and alkaloids

Qualitative analysis of *P. zeylanica* leaves extract

Sl. No.	Plant Component	Petroleum ether extract	Acetone extract	Methanol extract	Aqueous extract
1.	Alkaloids	+	_	+	_
2.	Carbohydrate	_	_	_	+
3.	Flavonoids	+	+	+	+
4.	Glycosides	_	_	_	_
5.	Protein	_	_	_	_
6.	Saponins	_	+	+	+
7.	Terpenoids	+	+	+	+
8.	Tannins	-	-	+	-

+indicates the presence of constituents and – indicates the absence of constituents.

RESULTS

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ToF Resource Assessment – methodologies used, procedural constraints and information gaps

TOF RESOURCE ASSESSMENT

Dr. K.P. Singh
Scientist

Forest Research Institute
(Indian Council of Forestry Research and Education)
Dehradun, India

FOREST COVER ASSESSMENT:

The Forest cover assessment carried out by using FSI satellite data which includes all and comprising area of one hectare and with tree canopy density of more than 10 % irrespective of their land use and ownership

Methodology:

The estimation of tree cover at National level generated using the data gathered during the inventory of TOF.

Design used:

In first stage the country divided into 14 physiographic zones, based on physiography, climate and vegetation etc. A samples of 60 districts data is then selected in proportion of area of physiographic zone then converted into equivalent National area corresponding to 70% canopy density

IN Urban Area :

The sampling units are Urban Frame Survey (UFS) blocks which are of varying sizes and computed with the help of GPS.

For estimation of tree cover, the crown diameter of each tree falling in the selected UFS block is recorded.

The total tree cover for the selected district is obtained by aggregating the area of cover under block, liner, scattered and urban Strata. On the basis of tree of sample district the tree cover in each physiographic zone is estimated.

ZONE WISE TOF IN INDIA

Physiographic Zone	Area of Phy. Zone (km²)	Growing Stock (m cum)
Western Himalayas	329,255	191.23
Eastern Himalayas	74,618	67.11
North East	133,990	93.67
Northern Plains	295,780	101.96
Eastern Plains	223,339	102.36
Western Plains	319,098	66.10
Central Highlands	373,675	108.52
North Deccan	355,988	83.00
East Deccan	336,289	191.49
South Deccan	292,416	127.59
Western Ghats	72,381	117.47
Eastern Ghats	191,698	67.73
West Coast	121,242	141.98
East Coast	167,494	88.21
TOTAL	**3,287,263**	**1548.42**

Constraints:

1. Boundary Line Plantation is not covered under satellite assessment.
2. Requirement of huge capital investment &
3. Requirement of more men power.
4. Lack of qualified staff for analysis of satellite data.
5. Urban area plantation remain unexplored.

Information Gap:

1. Unavailability of plantations data.

2. Unavailability of annual production data from TOF.

3. Lack of Market intelligence.

4. Lack of networking at country level for exchange of information.

THANK YOU

LET PLANTS LIVE FOREVER

Policy and Legal aspects of development of ToF

POLICY AND LEGAL ASPECTS IN INDIA

Dr. K.P. Singh
Scientist

Forest Research Institute
(Indian Council of Forestry Research and Education)
Dehradun, India

FOREST POLICY IN PRE-INDEPENDENCE :

Forests Act, 1865:

It was first forest act. This Act provided power to the government to declare any land covered with trees as government forests by notification.

The forest in this Act defined as land covered with trees brushwood and jungles.

FOREST ACT 1878:

This Act reversed almost all provisions of Forest Act of 1865 except the provision of arrest without warrant.

This Act empowered the State with strong powers and curtailed the rights of individuals over the forests.

1894 Forest Policy-

This policy resolution made provisions for conversion of forest land for non forest uses like agriculture.

Forest Act 1927:

Under this act, Indian Government redrafting of some clauses of the Forest Act of 1878. One major change is stated to be its reference to individuals and not individuals or communities while referring to right on forests.

FOREST POLICY IN POST INDEPENDENCE"

The Forest Policy of 1952- According to the newly enacted Indian Constitution, forests were placed under the State list on which state legislature have a primary right to make laws.

The National Commission on Agriculture 1976-

NCA recommended that forest corporations should be created to attract institutional finance.

Forest Conservation Act, 1980-

As per this Act, the Central Government re-asserted some of its control over forest based resources because the 1980 act restrict the State Governments power to de-reserve a forest, and it restricts the use of forest land for non forestry purposes without the prior approval of Central Government.

National Forest Policy, 1988-

The 1988 Forest Policy stated forest were not to be commercially explored for industries, but were meant to conserve the soil and environment, and meet the substance requirement of local people prioritizing environmental stability then to earn revenue.

Basic Objectives:

(i) Maintenance of environmental stability through preservation and restoration of ecological balance.
(i) Conserving the natural heritage of the country by preserving the remaining natural forest.
(ii) Checking soil erosion in the catchment areas of rivers, lakes, reservoirs in the interest of soil and water conservation.
(iii) Checking the extension of sand-dunes in the desert areas.
(iv) Increasing substantially the forest/tree cover in the country through massive aforestation
(v) Meeting the requirement of fuel wood, fodder, minor forest produce and small timber for rural and tribal populations.
(vi) Increasing the productivity of forests to meet national need.

Essential of Forest Management-

(i) Existing forests and forest lands should be fully protected and their productivity improved.

(ii) Diversion of good and productive agriculture land to forestry should be discouraged.

(iii) For the conservation of total biological diversity, the network of national parks, sanctuaries, biosphere reserves and other protected areas should be strengthened.

(iv) Provision of sufficient fodder, fuel and pasture is necessary in order to prevent depletion of forest beyond the sustainable limit.

Strategy-

(i) **Area under forest**: The national goal should be to have a minimum of 1/3 of total land area of the country under the forest or tree cover.

(ii) **Afforestation:** A massive need based and time bound programme of afforestation and tree planting with particular emphasis on fuel wood and fodder development on all degraded and denuded land in the country.

(iii) **Social forestry and farm forestry** programme should be implemented.

Rights and Concessions

(i) Grazing should remain related to the carrying capacity of the forests.

(ii) The rights and concessions from forests should primarily be for the bonafide use of communities living within and around forest area ,specially for tribals.

(iii) The life of tribals and other poor living within and near forests revolves around forests. Their domestic requirement of fuel wood, fodder, MFP and construction timber should be the first charge on forest produce.

(iv) Similar consideration should be given to scheduled castes and other poor living near forests.

(v) Wood is in short supply, therefore alternative source like bio-gas, LPG and solar energy should be used as substitute.

Diversion of Forest Lands for Non Forest purposes:

Diversion of forest land for any non forest purpose should be subject to the most careful examinations by specialists from the standpoint of social and environmental costs and benefits.

Wildlife conservation-

Forest management should special care of the needs of wildlife conservation, and forest management, plans should include prescriptions for this purpose.

Shifting cultivation:

Shifting cultivation is affecting the environment and productivity of land adversely. Alternative avenues of income should be devised to discourage shifting cultivation.

Forest extension:

It can be achieved through the involvement of the educational institutions, right from the primary stage.

Farmers and interested people should be provided opportunity through institutions like Krishi Vigyan Kendra, Training Centers etc.

Short term training extension courses and lectures should be organized in order to educate farmers.

Forestry education: **Forestry should be recognized both as a scientific discipline as well as a profession.**

Forestry Research: **The priority area of research are:**

(i) Increasing the productivity of wood and other forest produce per unit of area per unit time by application of modern scientific methods.
(ii) Effective conservation and management of existing forest resources.
(iii) Research related to social forestry for rural/tribal development.
(iv) Development of substitutes to replace wood and wood products.
(v) Research related to wildlife and management of national parks and sanctuaries.

Personnel Management :

Government policies should aim to enhancing professional competence and status of professional foresters and scientists.

Legal support and infrastructural development:

Appropriate legislation should be undertaken, supported by adequate infrastructure, at central and state levels in order to policy effectively.

Financial support for forestry:

The objective of this policy cannot be achieved without the investment of financial and other resources on a substantial scale.

Participatory Forest management in India:
(JFM 1990 Resolution)

Following the mandate of National Forest Policy 1988, the Government of India has issued guidelines for regularization of eligible encroachment and conservation of forest villages into revenue villages in 1990. As per this, Government of India initiated JFM programme in 1990

'That was so called the JFM 1990 Resolution.'

JFM is a concept of developing partnership between fringe forest user groups and forest development based on mutual trust.

Status of JFM Committees-

106000 JFMCs were managing more than 22 million hectare forest with benefit sharing mechanism on the principle of care and share.

Currently, more than 118213 JFMCs are managing 23 million ha of forest in the country (FRI 2011).

NEPAL

Present Status of Trees outside Forests

Status of Tree Outside Forest in Nepal

Session I

Prabhat Sapkota
Regional Forest Training Officer
MFSC/Nepal

Presentation Outline

- ToF Definition and coverage
- Contribution to ToF from Governmental and non-governmental Sector
- Economic and environmental benefits of ToF

ToFs Definition coverage

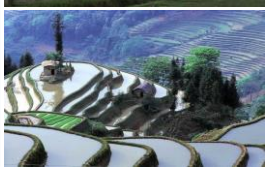
- Any land that fulfills all the following (FAO criteria) is forest
  - more than 0.5 ha area
  - more than 10% crown cover and
  - tree height at maturity is more than 5 meter
- All other trees in land other than forest

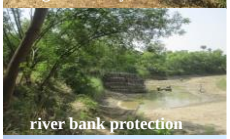
ToFs Definition coverage...

- **Private land as private forest**
  - all Private Forest
  - agro-forestry practices
    - home garden
    - Aqa-silviculture (bund plantation of pond and lakes)

ToFs Definition coverage...

- Trees around agriculture land
- **Public lands**
  - Wastelands/ unused land around, river side, flood plain, canal side, road side etc.
  - institutional plantation (School, Temple, Offices..etc.)
- **Urban forest**

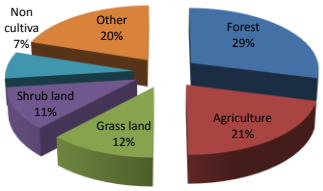




ToF status in the country

a. Based on Land Use

- Total land area 14.7 million ha.
- All land except snow land contains some form of trees



ToF status ...

b. Based on legal registration

Forest Type (legal basis)	Land Area (hectare)
Private forest	2458
Leasehold forest	15787
Public Agroforestry	1538
Total	**19783**

Up to now 23.2% of the National Forest (NF) is managed by 15256 Community Forest User Groups (CFUGs), and covering 42% households (HHs) in the country

ToF status ...

- People residing far from Natural Forest have good interest in ToFs
- Agriculture land, public land and unused/ under utilized have great possibility for promoting ToF in Nepal

Governmental and non-governmental contribution

- Ministry of Forest and Soil Conservation (MFSC) is promoting ToF through various Department (DOF, DFRS, DNPWC, DSCO, DPR)
- Examples:
  - Seedling production and distribution for private plantation
  - Implementing leasehold forestry program in which area having poor crown cover, encroachment evacuated, rehabilitated river banks are specially managed with agro forestry practices focusing the livelihoods of the poor and supply of raw material for forest related industries.

Governmental and non-governmental contribution…

  - Providing incentive for private plantation (Nrs 5 rupees per seedling survived for the private planters in Rastrapati Chure Conservation program)
- DoF has started Public Land Forestry (PLF) program as an option to solve the problem of distant users in supplying forest products like fuel wood, fodder and timber.

Major supporters

  - District Forest Offices
  - Community forestry user groups
  - Projects of forestry sector (BISEP-ST, TAL, LFP) Program)

Thank You!

ToF Resource Assessment – methodologies used, procedural constraints and information gaps

Assessment of of Tree outside Forest in Nepal

S.K Gautam, Research Officer
DFRS/Nepal

Outline of the presentation

- National Forestry Statistics
- Ongoing FRA (Forest Resource Inventory/TOF inventory)
- Tree Outside Forest its importance
- Case study from two districts on survey of tree outside Forest
- Some issues (Technical/Financial Social)
- Recommendation

Introduction

- Forest resources treasure for the people of Nepal 5.4 Million ha forest
- Past NFI 29% Forest Cover & 10% Shrub cover
- Diminishing Forest resource (-1.7% over fifteen years, 1978/79-1994/95)

General about FRA Nepal Project

- A bilateral cooperation between Governments of Finland and Nepal for five years (2010-2014).
- **Objectives**
- Updating forest resource data required for forestry planning, policy formulation and international reporting.
- Institutionalizing FRA & forest carbon monitoring system including MRV.

Key components

- Forest Resource Assessment , Forest cover/change mapping, and establishment of open source data sharing system.

Approach of FRA

Scientific, reliable, robust & stepwise such as:

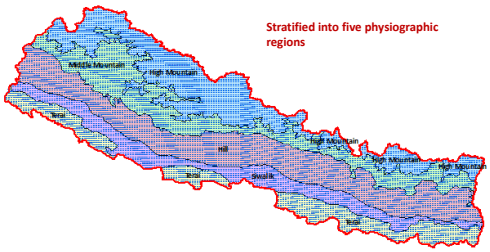
- Analysis of data needs (including REDD+)
- Design of scientific Inventory method: Stratified two phases systematic cluster sampling : "Multisource inventory method"
- Formulation of inventory framework to guide field inventory work
- Forming inclusive team to carry on inventory work.
- Application of high Tec LAMP (LIDAR Assisted Multisource Program) to estimate forest carbon stock
- Data processing (Using GIS solution)
- Building network with data partner
- Results reporting before 5 years

Timeline Distribution (2010-2014)

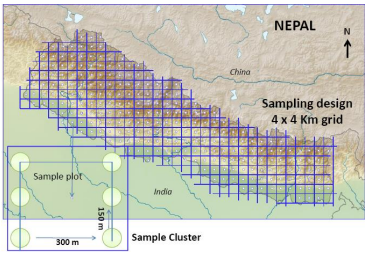
1. First year (2010) planning and organizing phase
2. Second year to fourth (2011-2013) year implementation phase.
3. Fifth (2014) year data analysis, final map and report production.

Mr. Pem Kandel

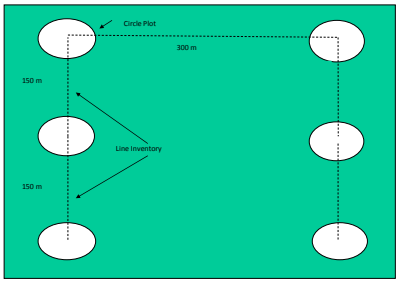
Inventory design: Stratified two phases systematic cluster sampling



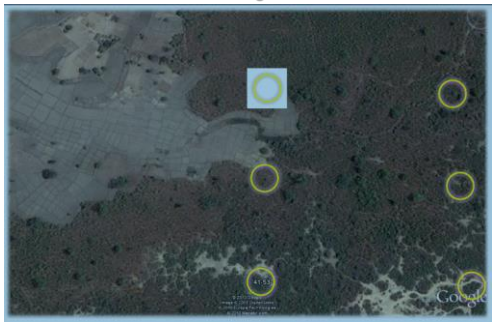
Allocation of systematic sample clusters



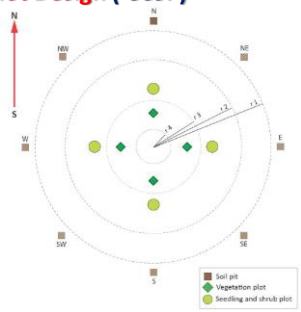
Cluster Design



Cluster Location : Google Earth View 1



Plot Design (CCSP)



Tree outside Forests (ToFs)

- Fulfilling basic need (fuel fodder & fuel wood)
- Also maintain agro-biodiversity
- Contribution of TOF has been realized but not quantified yet
- It is very important not only for rural livelihood but also in terms of local economy, environmental conservation including biodiversity and climate change.

Potentiallity

- Major source of income for rural house holds
- Relieve pressure on Forest
- Supply alternative to meet growing Market
- Additional source on carbon Market
- Improved environment
- Help control floods, soil erosion, and land slides

ToFs Definition coverage

- Private Forest(Home Garden)
- Private Plantation
- Wasteland/Unused land around
- Aqasilviculture (Bund Plantation of ponds and lakes)
- Urban Forest
- Public land Forest
- Institutional plantation (Schools/institution)

Plan of FRA to Measure ToFs in Nepal

1. Shrubland

2. Other lands

3. Farmland, village squares, roadsides, terraces, etc.

Forest patches/tree groups smaller than the defined minimum area for forests. In each stratum, TOFs are classified on the basis of the distribution pattern of trees. They are:

A. Block: Trees are clumped in group. E.g. Homestead, fruit orchard etc.

B. Linear: Trees are distributed in linear form. E.g. Roadside plantation, plantation in irrigation channel etc. and

C. Scattered: Trees are distributed in scattered form. E.g. Trees in urban areas, trees in agricultural land etc.

Methodology

The following methods are used for TOFs inventory in Nepal:

Block: Suitable method for this type of tree distribution is Point-centred Quarter Method. In this method, attributes of one nearest trees between each cardinal direction are measured. The data collected from each point from this method has the same value of that of a quadrate.

Linear: Suitable method includes a transect of 10m x 50m. Attributes of all the trees inside transect are measured.

Scattered: Method is the same as of linear type.

Distribution of ToFs

Linear **Scattered**

Distribution

Blocks

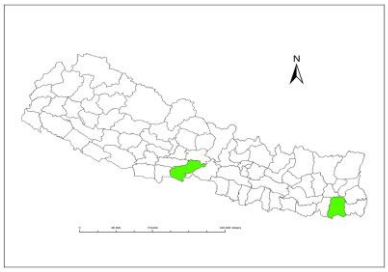
Conversion of Forest into ToFs

In the slope one ha plot difficult to Measure due to steep slope

Distribution of tree in the hill

Farmland trees in the western Nepal

Case study From two districts



Morang District

- Sampling intensity 0.2% at district level
- Stratification (Rural/urban/road and canal)
- D. *sissoo, A. indica, M.indica, F.religiosa, B. ceiba T.grandis, A.catechu, and othermixed*
- Around 45% of the stems are found with in 10-20 cm dbh class
- Only 2% of the total stems are found in more than 50cm dbh class
- 15tree/ha and 5ton/ha

Nawalparasi district

- 671000 trees which is equal to 1600 ha of forest considering 400 stems per ha to be defined as land occupying at least 10% crown coverage in all TOFs areas.
- More than 60% of the total stems were found between 20-50cm dbh class
- 10% tree were found under the dbh class 10cm
- Number: 9.6 tree/ha by
- Biomass : 4ton /ha

Faced problems

- Guideline development
- Effective technical support
- Quality and quantity seedlings distribution
- VAT taxation reduction
- Assessment and inventory
- Lack of systematic MIS

Future priority

- Policy guideline development
- Generate financial resource (GOV and donor agencies) for long term ToFs program
- Massive plantation program
- Incentives mechanism for promotion of ToFs
- Utilization of unused public, private and waste lands e.g. river flood plain
- Encourage urban plantation and Landscape planting

Some Recommendation

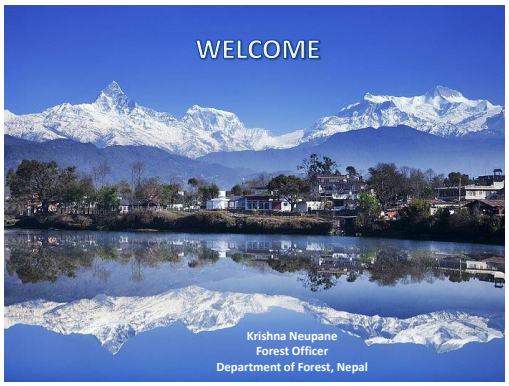
- Methods still need to be tested and validated
- Knowledge on distribution of tree is utmost before stratification,
- Sampling limitation in order to predict population due to unpredictable distribution of the species, their dbh class and types,
- Use of very high resolution imagery could be best method to do inventory but cost could be too high

Recommendation

- Develop biomass and volume model for agro forestry trees
- Pilot project for method development with regional collaboration for assessment of ToFs

Thank You!

Policy and Legal aspects of development of ToF



Outline of the presentation

- **TOF practiced in Nepal**
- **ToF Policy**
- **Related Acts and Regulation**
- **Policy gaps**

TOF Practiced in Nepal

Private Land:

Own registered land of individuals

- Home garden, bund plantation of pond, lakes, agro-forestry practices etc.

Public Land

- Wastelands/ unused land around, river side, flood plain, canal side, road side etc.
- Urban forestry
- Institutional plantation (School, Temple, Offices..etc.)

Policy and Legal Provision Relating to TOF

Constitutional Provision

•Sustainable management of forest resources and equitable benefit shearing

Policy Level Provision (MPFS, Forest Sector Policy, 2000)

•40% forest cover will be maintained

• **A priority program** Emphasized Community Forestry Program for ToF management through people participation in hilly areas

•**Collaborative Forest Management** was emphasized for Terai region

Forest Act 1993:

Private Forest

•The owner of a private forest may develop, conserve and manage himself in private land

Legal Provision ...

- **Use/Sell:**
  - Individuals can use or sell and distribute its products by fixing their prices, as he likes
- **Tax**
  - No tax for fuel-wood
  - In District Forest Development Fund- Rs5/Cft from trader and Rs5/Cft from Gov. side in case of timber.
  - Fund from NGOs/INGOs/DDC/Institutions may also deposit in the District Forest Development Fund (**DFDF**).
- **Expense of DFDF**

  (20% in plant production, 30% in Plantation and protection, and remaining in other forestry activities)

In Collaborative Forest Management Guideline

Role of VDC/Municipality: Provide support to available the Public land, unregistered land, private land and institutional land to the poor and ultra-poor on lease.

Legal Provision ....

In Three Year Plan Approach Paper (2010/11 - 12/13)

Has strategy "to maintain 40% forest area of the national total area." (NPC, 2011).

Working policy 2.8 : Tree plantation in private areas, schools, and public places outside forests area will be encouraged.

Working policy 6.7: Government and public land will be provided on leasehold basis to produce required raw materials to environment friendly enterprise based on forests products.

In Agriculture Policy 2004

- The policy has commitments on support to reduce the poverty by transferring of degraded forests and unused public land to the target community on leasehold basis such communities have been suggested to plant fodder trees, forage grass, medicinal herbs, sericulture trees, agro-forestry practice and orchard farm

Cross Sectoral policy...

In National Land Use Policy 2012

- Minimum greenery should be maintain in city area. (Policy 7.4)
- Conducting plantation activities in unused/under utilized Gov./Public land, river belt (Strategy and working policy 8.2.11)
- Rehabilitation the HHs from mountain and high hill who settled in between forests and have land of degraded or unused for agriculture and forest will be generated in such land (Strategy and working policy 8.2.13).
- Conducting "Green City Development Special Program" in collaboration of Local Gov. (Strategy and working policy 8.4.1)

Legal Provision .....

- Emphasis on green belt development in road side, canal side and pond side. (Strategy and working policy 8.4.4)
- Promotion of private forestry on erosion prone areas.(Strategy and working policy 8.4.6)

In Local Self Governance Act (LSGA) 1999

- As per LSGA 1999, public lands are under the jurisdiction of VDC/Municipality.

In Forest Regulation 1995

- DFO may grant recognition to such public land as a Community Forest, on approval of the agency owning the land on the condition that the concerned agency itself retains the land ownership. (In Clauses 26 (2) of Forest regulation 1995).

Policy gaps and contradiction .....

- Road department has responsibility of road side plantations (GoN, 1974.) and respective VDCs for its care and management. But, the rights of harvesting the products lie with Road Department.
- The conservation and protection of such recorded government and public land shall be the responsibility of the related Land Revenue Office. (DOLRM/GoN, 2001).
- As Local Administration Act 1971, CDO should maintain the record of government and public land under his jurisdiction.
- There is a debate in land ownership and tree ownership on the forest promotion by DFO in VDC owned land (DoF, 2009).
- Overlapping on role and responsibility, So it can be say "everybody's work is nobody's work."

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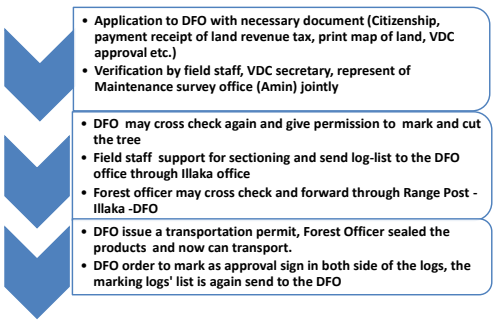
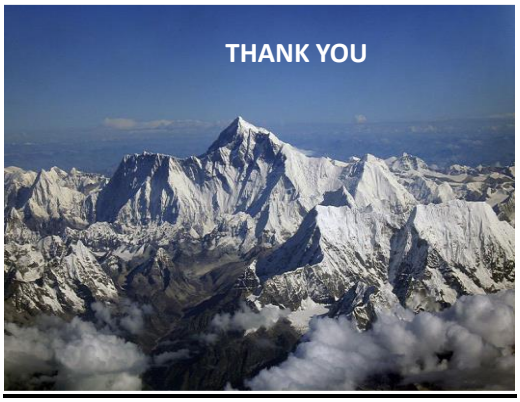
Policy Gaps .....

- Trees of Private land considered as Forest products (As definition of Forest products in Forest Act)
- Policy and Program supports for promotion of private forestry but in practice it is more controlling
- Lengthy process for getting permission for marketing
- VAT imposition
- No official guideline for TOF
- Land ownership vs Tree ownership (in case of forest promotion by DFO in VDC owned land ie. Public land)
- Overlaps/gaps in role and responsibilities of different government institutions.
- Ban on use of certain species eg. Sal, Simal, etc.

Private forestry Policy..

Prevailing process of PF product selling/ marketing



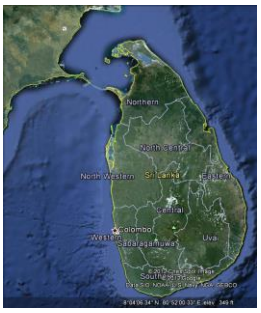

THANK YOU

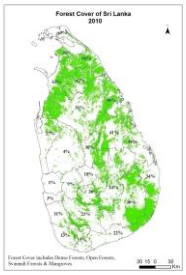
SRI LANKA
Present Status of Trees outside Forests

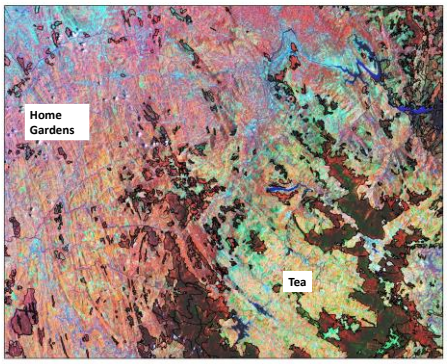
Currant Status of ToF in Sri Lanka

Prabath Nishantha Edirisinghe

Distribution







ToF includes

- Home gardens
- Rubber plantations
- Agro forestry woodlots
- Coconut plantations
- Tea plantations
- Roadside plantations
- Urban Parks

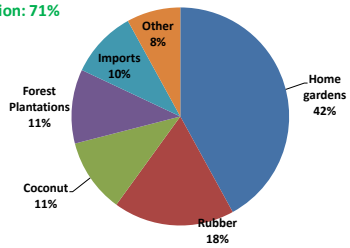
Main ToF extents

Category	Area ha	Percentage of the land area
Homesteads	818,394*	14.3
Rubber	124,000	1.9
Coconut	394,836	6.0
Tea	221,969	3.4
Total		25.6

* Only in 20 districts excluding districts in Northern Province

The share of wood supply by various sources - 2006

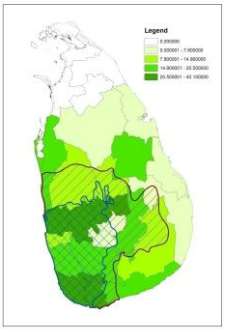
Total supply: 1.24 million m^3
ToF contribution: 71%



Home gardens

- Size: 0.4 to 2 ha
- Stocking of timber trees: 54 – 419 trees/ha
- Supply 41% of the timber demand
- Supply 28% fuel wood demand
- Number of home gardens is rising due to new settlements
- Fragmentation is taken place with the population increase

District wise distribution of Home garden as percentage of the land area



Top ten home garden tree species in order of frequency of occurrence

Common name	Botanical Name	Use
Coconut	*Cocos nucifera*	Timber & Food
Rubber	*Hevea brasiliensis*	Timber
Jak	*Artocarpus heterophyllus*	Food/Timber
Arecanut	*Areca catechu*	Food
Mahogany	*Swietenia macrophylla*	Timber
Havari Nuga	*Alstonia macrophylla*	Timber
Mango	*Mangifera indica*	Timber & food
Albizzia	*Albizzia molucana*	Timber
Eucalyptus	*Eucalyptus spp*	Timber
Teak	*Tectona grandis*	Timber

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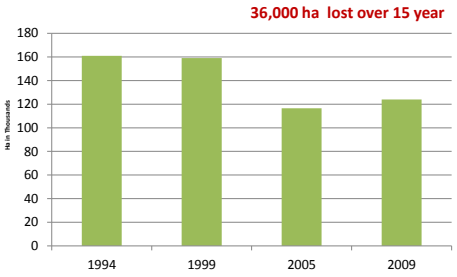
Eucalyptus	*Eucalyptus spp*	Timber
Teak	*Tectona grandis*	Timber

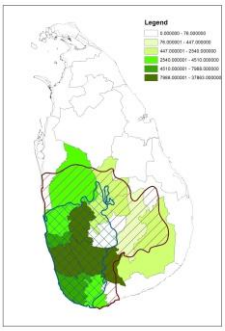
Rubber Plantations

- Belongs to two main sectors
  - Estate sector 57%
  - Small holding 43%
- Raw material for Micro Density Fireboard
- Boron treated rubber is used for manufacturing furniture
- Wood production:
  - Saw Logs : 65 m^3 / ha
  - Fire wood: 127 m^3 / ha
  - At present rubber is mainly used as firewood
  - 5% of the swan wood is treated

Rubber



Distribution of rubber
In Sri Lanka



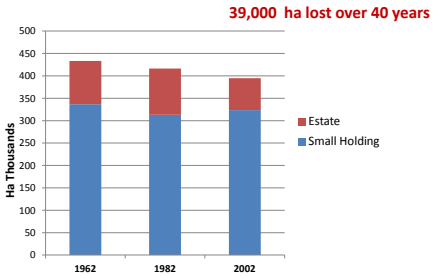
Coconut as ToF

- Well known multi purpose tree (Food, oil, beverages, animal fodder, charcoal, active carbon, timber)
- Two sectors: Estate sector and Small holding
- Around 20% under estate sector
- Saw log production: 49.4 m^3 / ha

Reasons for reduction

- Reduction is high in populated districts (Colombo and Gampaha)
- Fragmentation of coconut lands for residential purposes

Coconut cultivation over time



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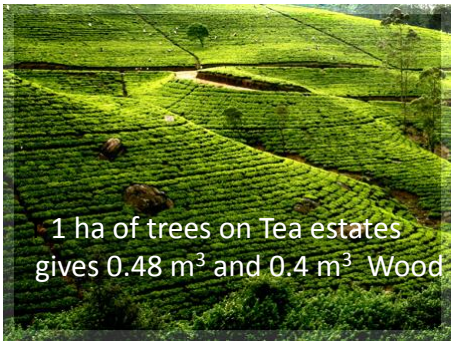
Tea



Conclusions

- ToF highly contributed to timber and fuel wood supply of Sri Lanka
- ToF are widely spread over Wet Zone and Intermediate zones in Sri Lanka
- Extents are reduced due to fragmentation and changing the land use

ToF Resource Assessment – methodologies used, procedural constraints and information gaps

Estimation of Production Capacities of Trees Outside the Forests (TROF) in Nuwara Eliya District of Sri Lanka

(Pilot Study to Generate Baseline Information)

K.T. Premakantha,
D.K.N.G. Puspakumara and N.K.D.Dayawansa

1

DEFINITIONS

Tree Resources Outside Forests (TROF)

FAO (2001) **Trees and tree systems** occupying other than those defined as forests and other wooded lands

Kleinn (2000) **Trees and tree systems** found on agricultural lands and grazing lands, on unproductive lands, along canals, railways, roads and in human settlements

Many more .....!!!

Trees Outside Forests (TROF) Important but not properly recognized

Provide many products and environmental services

In Sri Lanka, main timber and fuelwood source

The country maintain reasonable level of Tree Cover due to TROF Systems

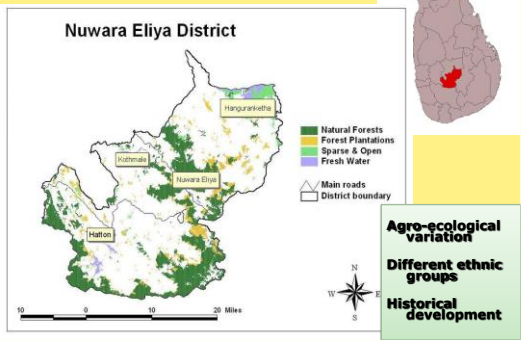
Not adequately recognized...limited studies

District	Area (sq km)	Popn density (per sq km)	Forest cover (%)	Homegarden cover (%)*	Tree canopy cover (%)
Ampara	4,318	143	37.5	4.1	41.6
Anuradhapura	7,034	111	35.0	8.0	43.0
Badulla	2,803	294	19.0	17.7	36.7
Batticaloa	2,686	204	21.0	4.2	25.2
Colombo	656	3,631	2.8	13.1	15.9
Galle	1,635	629	13.0	22.1	35.1
Gampaha	1,386	1,523	0.3	25.2	25.5
Hambantota	2,579	210	20.5	15.1	35.6
Kalutara	1,588	688	13.0	20.1	33.1
Kandy	1,906	704	17.0	30.4	47.4
Kegalle	1,693	468	9.5	23.2	32.7
Kurunegala	4,813	311	5.0	15.1	20.1
Mannar	1,985	50	60.0	2.4	62.4
Matale	1,993	233	40.5	11.7	52.2
Matara	1,282	620	16.0	36.2	52.2
Nuwara Eliya	1,720	423	24.5	5.3	29.8
Polonnaruwa	3,224	117	38.0	10.6	48.6
Puttalam	3,013	245	25.0	21.5	46.5
Rathnapura	3,255	325	20.0	15.8	35.8
Trincomalee	2,631	147	48.0	7.2	55.2
Sri Lanka	**65,610**	**314**	**23.5**	**13.1**	**40.8**

OBJECTIVES OF THE STUDY

- To develop a classification system for Tree Resources Outside the Forests (TROF) for Nuwara Eliya district
- To map the spatial distribution of TROF systems in Nuwara Eliya district
- To Identify the species composition and the structure of TROF in different agro ecological zones in Nuwara Eliya district
- Estimate production capacities of TROF in different agro ecological zones in Nuwara Eliya district (develop a baseline information)

STUDY AREA



Agro-ecological variation

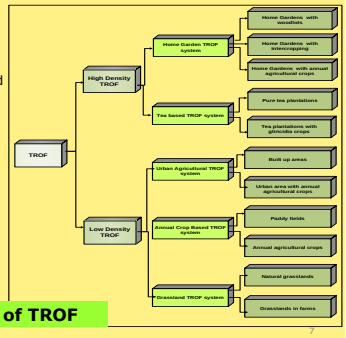
Different ethnic groups

Historical development

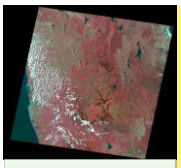
Classification of TROF systems

Based on

- Spatial arrangement
- Lands where it is found
- Production systems
- Revenue
- **Management sector**



5 broad classes of TROF



Landsat 7 ETM

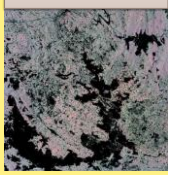
Path 141 Row 55

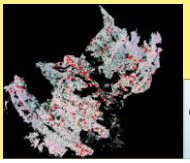
IMAGE CLASSIFICATION

Forest cover map

FRMP maps

Topographic maps (Survey Dept)

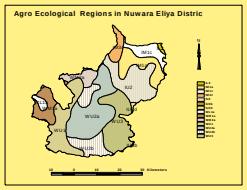


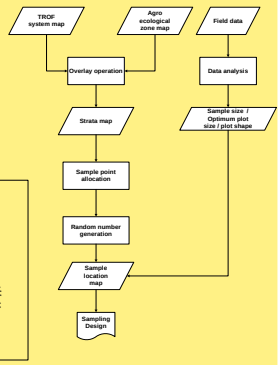


Maximum likelihood Classification algorithm

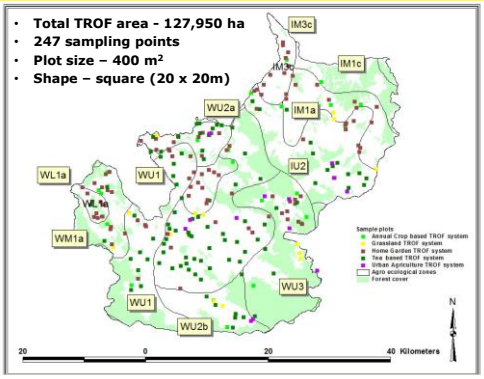
SAMPLING DESIGN

Growth - Elevation
- Rainfall
- Temperature
- Soil type

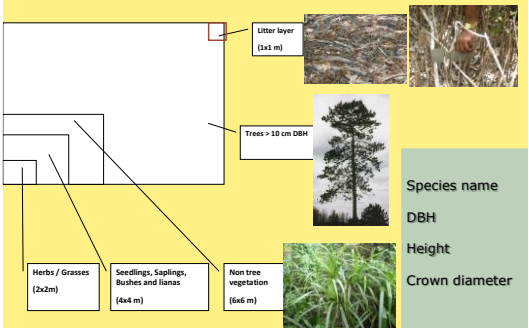




- **Total TROF area - 127,950 ha**
- **247 sampling points**
- **Plot size – 400 m²**
- **Shape – square (20 x 20m)**



FIELD MEASUREMENTS



Species name
DBH
Height
Crown diameter

Tree Volume Formula:

$$V = f * (\pi/4) * (dbh^2) * h$$

Where
- *V* is Individual tree volume,
- *f* = form factor,
- *Π* = constant = 3.141592,
- *dbh* = diameter at breast height,
- *h* = Tree height.

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FORM FACTORS ACCORDING TO THE SHAPE OF THE TREES

Tree species	Form factor
Cocos nucifera, Areca catechu, Caryota urens	0.60
Artocarpus heterophyllus, Mangifera indica, Swietenia macrophylla, Chloroxylon swietenia	0.42
Toona sinensis, Michelia champaca,	0.40
Pinus species	0.37
Madhuca longifolia, Gravillea robusta, Alstonia marcrophylla, Azadirachta indica	0.35
Eucalyptus species	0.33
Persea Americana, Syzygium malaccensis, Citraus spp	0.30

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Biomass and Carbon Content Calculation

- General biomass equation
- $Y = \exp(-2.289 + 2.649 \ln dbh - 0.021 \times \ln dbh^2)$
- Equation for palms
- $Y = 4.5 + 7.7\ h$ (Brown, 1997)

- Carbon content = 0.50* biomass content

- **Y = Biomass (kg)**
- **D = Diameter at breast height**
- **H = Height**

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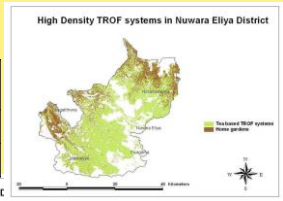
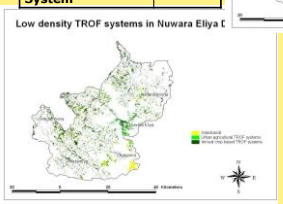
RESULTS

TROF system	Extent (ha)
Homegarden TROF System	27,440
Tea based TROF System	79,182





TROF system	Extent (ha)
Urban Agricultural TROF System	3,885
Annual crop based TROF System	13,154
Grassland TROF System	4,289

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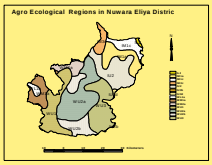
TROF AREA

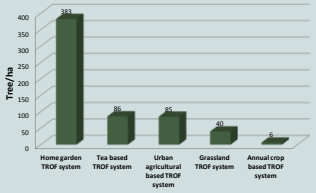
(According to Agro Ecological Regions)



Agro Ecological region	Extent (ha)
IM1a	13,736
IM1c	4,775
IM3c	5,731
IU2	20,310
WL1a	2,001
WM1a	6,616
WM2a	6,910
WU1	15,770
WU2a	29,177
WU2b	12,860
WU3	10,064
Total	127,950

Extents of TROF Systems in Different Agro-ecological Regions

Agro eco zone	Tea Based TROF system (ha)	Home garden TROF system (ha)	Grassland TROF system (ha)	Urban agricultural TROF system (ha)	Annual crop based TROF system (ha)
IM1a	6,474	6,128	103	98	933
IM1c	1,321	3,028	9	4	413
IM3c	2,264	2,338	117	36	976
IU2	15,454	2046	584	629	1,597
WL1a	634	1,282	0	0	85
WM1a	1,702	4,101	80	4	729
WM2a	2,292	2,371	133	1,057	1,057
WU1	9,034	3,210	827	200	2,499
WU2a	23,706	1,508	732	664	2,567
WU2b	9,728	1,262	490	217	1,163
WU3	6,573	166	1,214	976	1,135
Total	79,182	27,440	4,289	3,885	13,154



Tree Density and Species Richness

TROF system	No of Species	No of Genera	No of Families
Home garden TROF system	106	91	42
Tea based TROF system	16	16	13
Urban agricultural based TROF system	17	16	14
Grassland TROF system	9	7	7
Annual crop based TROF system	7	5	6

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MOST COMMAN SPECIES

TROF SYSTEM	SPECIES
Tea based TROF system	*Erythrina lithosperma, Gravellia robusta, Gliricidia sepium,Calliandra calothyrsus*
Homegardens	*Areca catechu, Artocarpus heterophyllus, Mangifera indica, Michelia champaca, Toona sinensis, Cocos nucifera, Sysygium aromaticum, Persea americana, Neolitsea cassia.*
Grasslands	*Calophyllum malkeri, Gravellia robusta, Rukattana, Palaguium grande, Eucalyptus spp*
Urban Agricultural TROF system	*Artocarpus heterophyllus, Cypresses, Eucalyptus spp, Persea americana, Psidium guajava*
Annual crop based TROF systems	*Gliricidia sepium, Areca catechu, Eucalyptus, Cocos nucifera*

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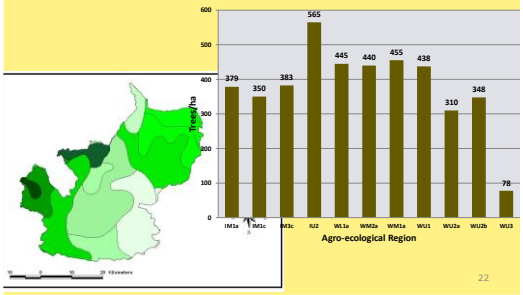
Above Ground Tree Biomass Contents of TROF Systems in Nuwara Eliya District

Agro eco zone	Tea Based TROF system (Giga grams)	Home garden TROF system (Giga grams)	Grassland TROF system (Giga grams)	Urban agricultural TROF system (Giga grams)	Annual crop based TROF system (Giga grams)
IM1a	274.17	965.75	1.43	1.26	18.29
IM1c	23.63	476.13	0.05	0.05	1.03
IM3c	40.50	290.32	0.60	0.46	2.42
IU2	1,522.88	761.56	89.45	8.79	3.97
WL1a	20.81	203.99	0	0	0.21
WM1a	30.45	593.76	0.47	0.05	1.81
WM2a	66.29	322.12	0.69	217.48	2.63
WU1	194.84	483.13	4.26	2.57	6.21
WU2a	1,175.52	157.87	23.29	8.52	6.38
WU2b	236.96	165.00	2.52	2.79	2.89
WU3	355.05	8.72	58.68	27.79	2,82
Total	3,941.10	4,428.350	181,44	269.76	45.84

Above Ground Tree Carbon Contents of TROF Systems in Nuwara Eliya District

Agro eco zone	Tea Based TROF system (Giga grams)	Home garden TROF system (Giga grams)	Grassland TROF system (Giga grams)	Urban agricultural TROF system (Giga grams)	Annual crop based TROF system (Giga grams)
IM1a	137.09	482.86	0.71	0.63	9.145
IM1c	11.82	238.06	0.02	0.03	0.515
IM3c	20.25	145.16	0.30	0.23	1.21
IU2	761.44	380.78	44.73	4.40	1.985
WL1a	10.41	101.99	0	0	0.105
WM1a	15.22	296.88	0.24	0.03	0.905
WM2a	33.15	161.06	0.34	108.74	1.315
WU1	97.42	241.57	2.13	1.28	3.105
WU2a	587.76	78.93	11.65	4.26	3.19
WU2b	118.48	82.50	1.26	1.39	1.445
WU3	177.52	4.36	29.34	13.90	1.41
Total	1,970.56	2,214.15	90.72	134.89	22.92

Home garden TROF system
Tree Density (Trees/ha)



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Highest Contributors to Biomass in Homegarden TROF System

Species in HG	Above ground biomass (t/ha)	Above ground carbon (t/ha)
Artocarpus heterophyllus	33.22	15.28
Mangifera indica	20.71	9.53
Ceiba pentandra	10.98	5.05
Cocos nucifera	9.98	4.58
Michelia champaca	9.21	4.23
Caryota urens	6.55	3.01
Toona cinensis	5.79	2.66
E. grandis	5.52	2.54
Areca catechu	4.23	1.95
Persea americana	3.98	1.83

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Present Stock of Biomass and Timber in Homegarden TROF System

	Present stock of biomass	Present stock of timber	Present stock of carbon
Total volume (million tons)	**4.42**	**2.97**	**2.21**

Amount of carbon sequestrated = 8.11 million tons

Timber, Fuelwood Produced and Permanently Stored Carbon During 60 Years Rotation in Homegarden TROF System in Nuwara Eliya District

	Amount of timber produced during 60 years	Amount of fuel wood produced during 60 years	Amount of timber permanently stored during 60 years
Total volume (Million Tons)	**4.18**	**1.31**	**0.44**
US$ (Millions)	**273.84**	**16.31**	**0.89**
LKR value (Millions)	**35,600**	**2,088**	**115**

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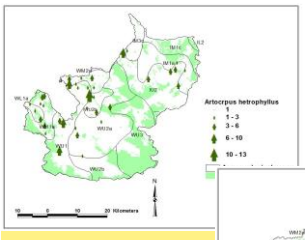
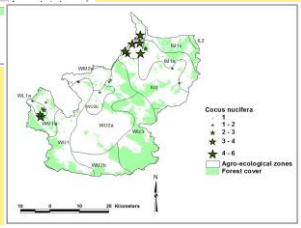


Spatial Distribution of *Artocarpus hetorophyllus* and *Cocos nucifera*



Constraints

- Less priority – less allocation of Resources (Although included in National Forest Policies)
- Information are scattered and sketchy and not reliable
- No globally accepted methodologies (sampling, biomass equations etc.)

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Way Forward

- Develop National Database on TROF
- Improve and manage TROF according to importance to the area
- Develop quality planting material production systems
- Capacity building through training
- Assess other ecosystem benefits of TROF

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Thank you for your attention....

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Policy and Legal aspects of development of ToF

Existing Policy Directives their Adequacies and Gaps

Sri Lanka

Policy

Policy is a definite course or method of action selected among alternatives and in light of given conditions to guide and determine present and future decisions.

(Webster's dictionary)

Policies deal with articulation of courses of actions to achieve specific objectives. They are guiding principles that determine what is to happen.

(Enters et.al. 2003)

FOREST POLICY OF SRI LANKA 1995

National Forest Policy objectives and statements.

There are 7 policy statemnts

1. National Forest Policy Objectives

1.1 To conserve forest for posterity, with particular regard to biodiversity, soils water and historical, cultural, religious and aesthetic values.

1.2 **To increase the tree cover and productivity of forest to meet the need of present and future generations for forest product and services.**

National Forest Policy contd…

1.3 To enhance the contribution of forestry to the welfare of the rural population, and strengthen the national economy, with special attention paid to equity in economic Development

3.Policy on Management of Private Forests and tree resource

3.1 Tree growing on homesteads, and other agroforestry will be promoted as a main strategy to supply wood and other forest products for meeting household and market needs.

3.2 The establishment, management and harvesting of industrial forest plantations by local people, communities, industries and others in the private sector will be promoted

Back

Policy Contd....

3.3 The state will promote tree growing by local people, rural communities, NGOs and other non-estate sector bodies for protection of environmentally sensitive areas.

4. Policy on wood and Non-wood Forest Products, industries and marketing

4.1 Greater responsibility will be given to local people, organized groups, cooperatives, industries and other private bodies in commercial forest production, industrial manufacturing and marketing.

4.2 Efficient forest product utilization development of competitive forest industries based on sustainable wood resource, and manufacture of value added forest will be promoted.

4.3 The state will facilitate the harvesting and transport of forest products grown on private lands.

5.Policy on Institutional Support for Forestry Development

5.2 Legislation will be amended or revised as necessary to support the implementation of policy

5.3 The state will provide full support to the various resource managers for sustainable forestry development.

Plantation Policy – Tea

Policy : Crop Diversification Policy

Policy Objectives:

To increase the profitability of the unit area through product integration.

- **Tea to Forestry**
- **Tea to Spices**
- **Tea to Green house farming**

Plantation Policy - Rubber

R & D and Extension Policy:

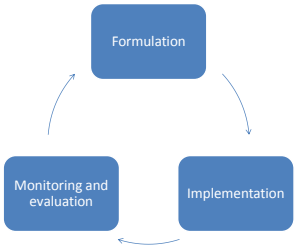
To introduce New technology for rubber and rubber wood base products.

Rubber production policy

To increase the production to meet the domestic and global demand.

Identify areas for new planting

The Policy cycle



Implementation of Policies

Policy Statement 3.1

- Provide seedlings to people to establish in home gardens and other lands free of charge or at low price.
- Provide extension service for tree improvement

Policy Statement 3.2

- **Establish of agroforestry woodlots**. (Similar to taungya)
- **Private sector reforestation**: Lease out degraded lands to private sector under 30 year agreement to establish industrial plantations

Implementation contd....

Policy Statement 3.3

- Conduct tree planting campaigns
- Protective woodlots: Provide incentives and seedlings to plant trees in sensitive areas

Implementation contd....

Policy Statement 4

Contradiction ????

- Restrictions on private timber transport: Imposed by the Forest Act and administrative procedures to save natural forests.
- Restrictions on timber processing and value addition industries.

  Not allowed closer to natural forests

Contradiction ? contd..

- Some trees can not be felled without permission even though they are in a private land: Jak, Bread Fruit, Female Palmyra are restricted under Tree Felling Ordinance
- Trees felling is restricted in environmental sensitive areas: Soil Conservation act.
- Some trees are declared as protected trees:

  Flora and Fauna Protection Ordinance

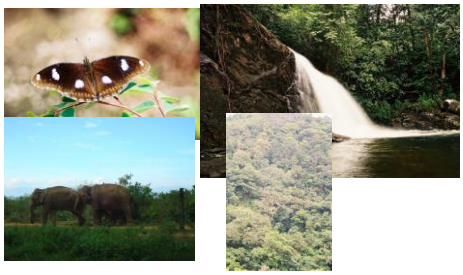
Implementation contd....

Policy Statement 5

It is compulsory to amend regulations.

Standing tree is a product and production unit.

To conserve forest for posterity, with particular regard to biodiversity, soils water and historical, cultural, religious and aesthetic values.



To increase the tree cover and productivity of forest to meet the need of present and future generations for forest product and services.

To enhance the contribution of forestry to the welfare of the rural population, and strengthen the national economy, with special attention paid to equity in economic Development.

Annex II: Programme

SARRC Workshop on Stakeholder Engagement to enhance development and productivity of TREES Outside Forests (TOF) and contribute to meeting market demands for forest products and increasing forest cover in South Asia

14 – 16 November, 2012

SRI LANKA

Organized by the SARRC Forestry Centre in collaboration with the Forest Department, Government of Sri Lanka

Day 1 (14th November 2012)

09.00 am - **Registration of Participants**

09.30 am - **Inaugural Session**

Lighting of Traditional oil Lamp
Welcome address
Address by representative of SARRC SAARC Forestry Centre
Address by Secretary - Ministry of Environment
Address by Chief Guest
Vote of Thanks

10.00 am - Tea break

10.30 am - **Introduction to the workshop**

Objectives of the workshop
Introduction of participants

Session I - Present Status of Trees outside Forests in the SAARC Region

10.45 am Member country presentations on present status of ToF, government and non-governmental contribution to promote ToF and economic and environmental benefits of ToF

- Bhutan
- India
- Nepal
- Sri Lanka

12.05 pm - Discussion

12.30 pm - Lunch

01.30 pm **Session II- ToF Resource Assessment – methodologies used, procedural constraints and information gaps**

Member country presentations

- Bhutan
- India
- Nepal
- Sri Lanka

02.50 pm - Discussion
03.10 pm - **Introduction to group work**
03.30 pm - Tea break
04.00 pm - **Group Work – 1. Constraints for promoting ToF resources in the SAARC region**

1. Role of the governments, NGOs and other stakeholders
2. Information gaps and technological barriers

05.00 pm - **Presentation of group findings and recommendations**
05.20 pm - **Discussion**
05.30 pm - **End**

Day 2 (15th November 2012) – Field visit

6.00 am - **Leave Hotel for Kandy**

Visit a Kandyan Home garden – a sustainable model of ToF in Sri Lanka
Visit Temple of the sacred Tooth of Lord Buddha
Lunch at Royal Botanic Gardens, Peradeniya
Visit Elephant Orphanage – Pinnawala, Kegalle (Optional)

9.00 pm - **Arrive at Hotel**

Day 3 (16th November 2012)

09.00 am **Session III - Policy and Legal aspects of development of ToF**

Member country presentations

- Bhutan
- India
- Nepal
- Sri Lanka

10.20 am - Discussion

10.30 am - Tea
11. 00 am - **Group Work – 2. Analysis of Policy and Legal instruments responsible for Promotion of ToF in the SAARC region and recommended further actions**
11.45 am - **Presentation of group findings**
12.20 pm - **Discussion**
12.30 pm - Lunch
01.30 pm **Plenary session**
02.30 pm **Way forward – recommended actions and agreements**
03.00 pm **Workshop evaluation and closing session**
03.30 pm **Tea**

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