

**International Forestry Working Group Newsletter  
Working Group B3**

**March – 2020**

**Volume: 8**

**Issue: 1**



**Society of American Foresters**

**International Society of Tropical Foresters**

SAF International Forestry Working Group (IFWG) members and ISTF members,

This Newsletter is looking for general articles, announcements, field practices, and research abstracts.

**GENERAL ARTICLES:** If you have a story about an international activity or project for the newsletter please send it along. I am usually looking for a one or two page article, but longer articles will be considered. Color pictures are welcomed and encouraged.

**ANNOUNCEMENTS AND OPPORTUNITIES:** If you have announcements of trainings or educational opportunities, forthcoming meetings, or other international events I will put them in the newsletter.

**RESEARCH ABSTRACTS:** If you have a recently published article you think may be of interest to other IFWG members send the citation, abstract and information on how to obtain the full article if that is available, either online or author contact information.

**FIELD PRACTICES:** Short articles on methods that are useful for foresters working in the field, probably something an academic journal would not publish.

**SUBMISSION INFORMATION:**

- The text should be in a word document.
- We have no required format but beginning with the December 2019 issue we will provide templates with a format for those who wish to use them.
- For figures and photos .jpg is preferred but other formats can probably be converted.
- The manuscripts are sent to [blairorr@gmail.com](mailto:blairorr@gmail.com) only.

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## Content

S.No	Title	Page No
<b>NOTES FROM THE EDITORS &amp; CO-EDITORS</b>		1
<b>CONTRIBUTED ARTICLE</b>		
1.	Payment for Ecosystem Services (Ecotourism) as a financial tool in managing Protected Areas of Bangladesh	2
2.	Are You an Ethnobotanist?	19
3.	Perspectives on National Forest Inventory and Remote Sensing Integration	20
4.	Agroforestry Training for Asian and African Nationals	23
5.	Integrated Farming System for Sustainable Agroforestry	26
6.	Reforestation is not necessarily about planting more trees	29
7.	Pacific Island Tree Nursery Workshop Held in Guam	33
8.	From community of practice to lasting legacy: PARTNERS wraps up key messages for tropical reforestation in an accessible, interactive website	37
9.	An electrifying future for DRC's forests	40
10.	Strengthening forest landscape restoration actions in Guatemala	44
11.	Forestry in Scotland and the UK	48
12.	University Extension	50
13.	University of Viçosa Video	54
14.	New Leadership in IUFRO – John Parrotta Follows Mike Wingfield as President	55
<b>ANNOUNCEMENTS/ EVENTS/ MEETINGS/ OPPORTUNITIES</b>		
1.	Terra Viva Grants Directory funding opportunities	56
2.	Forest Monitoring Funding Opportunity	58
3.	4 <sup>th</sup> Annual National Cohesive Wildland Fire Management Strategy Workshop	59
4.	3 <sup>rd</sup> International Smoke Symposium	60

5.	Joint Meeting Announcement between Society for Economic Botany and International Society of Ethnobiology	61
6.	7 <sup>th</sup> Biennial Conference of the Forests and Forest Products Society	63
7.	II Regional Symposium of Urban Floresta and The I International Symposium of Urban Silviculture	64
8.	CPAM Short Course 2020	66
<b>SAF INTERNATIONAL WORKING GROUP NEWS</b>		68
<b>INTERNATIONAL SOCIETY OF TROPICAL FORESTRY NEWS</b>		69
<b>FROM THE ARCHIVES</b>		
1.	1960 Timber Industry stamp from New Zealand	76
<b>RECENT PUBLICATION AND RESEARCH NOTES</b>		
1.	Agroforestry Systems and Practices in Nepal	77
2.	Sustainable Development Goals: Their Impacts on Forests and People	80
3.	Integrated Land Use Management in the Eastern Himalayas	83
4.	Florestas do Brasilemresumo 2019	84
<b>ABSTRACTS AND KEY MESSAGES</b>		
1.	A global wildfire dataset for the analysis of fire regimes and fire behavior	85
2.	Perception and Motivation of Farmers in the Development of Natural silk Business in Soppeng Regency Sulawesi Selatan	86
3.	Strengthening Gender Role in Managing Private Forest in South Konawe, South East Sulawesi Province	87
4.	Analysis of Biogeophysics Characteristics and Discharge of Lompo Riaja Atas River and Lompo Riaja Bawah River, Ralla Sub Watershed	88
5.	Spatial distribution and impacts of climate change on <i>Milicia excelsa</i> in Benin, West Africa	89
6.	Balancing carbon dioxide: a case study of forest preservation, out-migration, and afforestation in the Pueblos Mancomunados of Oaxaca, Mexico	90

7.	Current perspectives on forest recovery trends in Guanacaste, Costa Rica	91
8.	Matching Site-Suitable Poplars to Rotation Length for Optimized Productivity	92
9.	Effect of logging on tree structure and diversity in tropical forests of Quintana Roo, Mexico.	93
10.	Genotypic and Plant Growth Regulator interaction on propagation of jojoba ( <i>Simmondsia chinensis</i> L.) cuttings in semi-arid areas of Voi, Kenya	94
11.	Some physiological characteristics to estimate species potential as a mine reclamation ground cover	95
12.	Ecosystem Service Values Changes in Response to Land-Use/Land-Cover Dynamics in Dry Afromontane Forest in Northern Ethiopia	96
13.	Differences in tree species diversity along the rural-urban gradient in Bengaluru, India	97
	<b>IMPORTANT URLs</b>	98

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## NOTES FROM THE EDITORS & CO-EDITORS

**Feel free to send this newsletter on to others.**

Many thanks to all the contributors to this issue. The next issue is scheduled for June 2020.

If you would like to be added to the distribution list for the newsletter, send an email to Blair Orr ([blairorr@ymail.com](mailto:blairorr@ymail.com)).

- Blair Orr, IFWG Newsletter Editor

## CONTRIBUTED ARTICLE

# Payment for Ecosystem Services (Ecotourism) as a financial tool in managing Protected Areas of Bangladesh

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### Abstract

Payment for Ecosystem Services (PES) is thought to be a suitable management option for the institutional and financial sustainability of Protected Areas (PAs). This paper presents the potential challenges and strategies to implementing ecotourism as a means of PES in Bangladesh. This study draws on different studies, government records and field surveys. It reveals that all elements of the PES market model are present in the PAs of Bangladesh. Namely, providers (forest department, tour operators, local community) and buyers (tourists and other resource users). Nevertheless, despite the sustained growth of ecotourism, PES-based management schemes are not adopted in institutional and financial mechanisms of PAs. Key informants suggest that current ecotourism management practices can be turned into PES schemes through proper valuation of ecosystem services of PAs and adopting PES-related policy and institutional mandates for stakeholders (public, private and communities). This will need to include improvements in infrastructure, and defining roles of the providers and buyers for ensuring ecotourism services and benefit-sharing. The findings from this study provides new insights for policy makers implementing PES through ecotourism for better ecosystem conservation in Bangladesh.

**Key words:** Ecotourism, Protected Area, Payment for Ecosystem Services, ecosystem conservation

### Background

Ecosystem-based nature conservation efforts are garnering much interest from conservationists around the world. These approaches generally focus on maintaining the functions and services of the whole ecosystem. Conventional practices which generally aimed to maximize economic benefits through resource extraction, are now moving towards sustainable utilization of ecosystem services. This has brought new challenges. In particular, accruing the cost of ecosystem conservation, without harnessing or extracting resources from the ecosystem. In recent years, Payment for Ecosystem Services (PES) has evolved as a promising approach for conserving ecosystems and ensuring sustainable outcomes based on benefits from ecosystem services and the cost of ecosystem conservation (UNECE, 2007). In many places around the world, the PES approach is being endorsed to enhance environmental stewardship in agricultural and forest-based landscapes (World Bank, 2004; World Resources

Institute, 2005), in order to address the imbalances between resource consumption and conservation (MEA, 2005). Several countries have already implemented PES partially in various natural ecosystems, namely Tanzania (Nelson et al., 2010), Australia (Salzman, 2010), USA (Daily and Ellison, 2002) and Costa Rica (Bienabe and Hearne, 2006; Smith et al., 2006). However, adopting PES along with mainstream institutional governance and economic systems remains challenging due to inadequate data and information on the functions and services of different type of ecosystems.

By keeping the sustainability of ecosystem services at the center of a conservation approach, non-extractable resources/services (e.g., cultural services such as ecotourism and educational research) gain higher importance for ecosystem conservation as well as revenue generation. Growing concern about nature conservation has supported increases in nature-sensitive and responsible ecotourism in various countries, demonstrating potential for effectively accruing funding for conservation and sustainable development of ecosystems management (Drumm and Moore, 2005). Therefore, ecotourism can be a promising tool for PES implementation for ecosystem conservation (Boral et al., 2008). However, only a few studies have explored the basic features of ecotourism that can be utilized in the PES system. These studies have been primarily undertaken in USA and Europe where ecosystem conservation practices are well institutionalized (United Nations, 2014; Schomers and Matzdorf, 2013), with some carried out in South-east Asia where ecotourism has been incorporated into developing PES approaches (de Groot, 2011).

In Bangladesh, the conservation of ecologically-important protected areas (i.e., National Parks, Wildlife Sanctuaries, and Reserve Forests) are highly emphasized in the environmental policies and plans. However, institutional and financial frameworks remain within the domain of traditional revenue-generation and the implementation of donor-funded conservation projects rather than self-sustaining management approaches. Ecosystem based management, including adoption of PES, remains outside the scope of institutional practices. Within the current management framework, resource utilization from protected areas is very restricted, although ecotourism facilities have increased with the aim to generate revenues and better educate visitors about nature conservation.

In spite of the significance of ecosystem services and ecotourism potentials, the PES approach has not been incorporated in the protected area management systems in Bangladesh. The potential market for nature-based ecotourism is large, and can be utilized for introducing PES in protected area management in Bangladesh. However, more comprehensive research is required to better explore the linkages between PES and ecotourism in protected areas within the socio-economic and institutional context of Bangladesh.

This study identifies emerging research gaps and needs, drawing on linkages between ecotourism and the PES approach in protected areas of Bangladesh and the implementation challenges in socio-economic and institutional settings. The paper also proposes suitable strategies for sustainably linking ecotourism and PES, with the aim of providing guidance for

the future implementation of ecotourism and PES for ecosystem conservation in protected areas of Bangladesh.

### **Payment for Ecosystem Services: concepts and experiences**

PES is a relatively new concept for nature conservation. PES is based on voluntary payments to service providers on behalf of the ecosystem service beneficiaries (Wunder, 2005; Salzman, 2010). This voluntary payment can create a huge positive impact on the quality of service provisions or in rescuing or regenerating vulnerable ecosystems. The payee (in other words PES credit buyer) can be an individual, group of individuals, or an organization, depending on the ecosystem and services. The payee may or may not be a direct beneficiary; however, there must be a conditional transaction agreement between the service providers and the payee. The formal relationship between the service providers and the buyers could be established through schemes ranging from public, private, public-private to traditional trades (United Nations, 2014). The payment can be monetary or barter-based, and aims to compensate the costs of service provision. PES can be applied in different scales, ranging from pollination of local farms to “shade-grown” coffee beans that are sold half a world from where they are grown. Also, the transaction types of PES may range from one-off payments for a biodiversity offset to arm’s-length market transactions for carbon credits (Salzman, 2010).

Landscape amenities, including ecotourism, are a widely accepted service under PES schemes. Ecotourism has attributes of PES because the service providers (authorities or landowners) and service buyers (tourists) play for voluntary transactions through well-defined institutional mechanisms (United Nations, 2014). Tourism operators/tourists pay the authorities, local landowners or communities to not hunt in certain areas or to engage in particular land management activities. As a byproduct, local communities also benefit from ecotourism through providing facilities and trades. This approach impacts conservation of the natural areas by helping to shift local attitudes from a resource harvester mentality to that of conservationists or environmental stewards. For instance, community-based tourism as part of a PES scheme can also be set up for the conservation of wildlife as well as promoting tourism (established in Tanzania) through engaging local communities with essential conditions of PES (i.e., contractual benefit sharing among providers, receivers and monitors) (Nelson et al., 2010). Costa Rica has implemented PES schemes for watershed protection since the 1990s, with several hotels taking part in the scheme to receive high quality and quantity of water in tourist spots (Pagiola, 2008; McNeely, 2009) without a well-defined payment mechanism for other benefits, such as the provision of scenic beauty and biodiversity conservation in the watershed (Bienabe & Hearne, 2006).

The most common PES-like arrangement is collecting entrance fees to protected areas, which can generate direct payments for conservation through tourism. Theoretically, this is a payment for enjoying the scenic beauty and biodiversity. In such cases, the entrance fee is provided because of the scenic beauty and biodiversity attraction in the area rather than to pay for the provision of added services (e.g. accommodation). A comparison of the tourism

arrangements in the protected areas with the PES criteria, reveals that entrance fees/payments are not passed to the local community, which plays important role in conservation. Moreover, there is no clear conditionality between the providers and beneficiaries ensuring the service, which is a key criterion of PES arrangement. Without a contractual agreement with conditional responsibilities shared between the local community, intermediary (protected area) authority and tourist/tour companies, PES mechanisms cannot be successful. The evidence suggests that communities benefit from conserving protected areas only when there is revenue-sharing by the authority combined with clear conditions and responsibilities for conservation (de Groot, 2011).

## Methodology

A range of methods have been employed in this study, including review of related articles and official documents and informal interviews with stakeholders involved with ecotourism and protected area management in Bangladesh. Official records and reports of the Bangladesh Forest Department and recent articles were reviewed to explore the status of ecotourism as well as overall situation of protected area management in Bangladesh. Three popular tourist destinations that are ecologically-significant protected areas (Lawachara National Park, Satchari National Park and Sundarban reserve forest, see Fig. 1) were selected as case study for in-depth analysis. Informal interviews with officials, local communities, tour operators and tourist guides were conducted to better understand perceptions about ecosystem services, PES, ecotourism, and the potential for implementing PES in the protected areas.

## Results

### Potential for ecosystem services in protected areas of Bangladesh and current management practices

Ecologically-important protected areas have been established in Bangladesh in alignment with international conventions over the last several decades. There are 17 National Parks and 20 Wildlife Sanctuaries (Fig. 1), covering approximately 266,000 hectares (nearly 10.7% of the total forest land of the country); 45,745 hectares are National Parks and 220,253 hectares are Wildlife Sanctuaries (BFD, 2014). Most National Parks and Wildlife Sanctuaries are in the southeastern hill forest areas, with a few in coastal areas (including the largest mangrove forest, marine and riverine ecosystems). Some are also in low hills and plains in central, north-western part of Bangladesh (Fig.1) (Chowdhury and Koike, 2010).

The ecosystem services of National Parks and Wildlife Sanctuaries can be categorized as provisional, cultural, regulatory and supporting ecosystem services, with the components of each category defined by natural ecological conditions. Protected areas in coastal regions are mainly dominated by mangrove ecosystems and estuarine habitat (e.g. Sundarbans) that host typical forest products (timber, fuelwood) and NTFPs (honey, medicinal plants, thatching materials) as well as a large stock of fisheries (Uddin et al., 2013). The protected areas in the Southeastern hill forest provide provisioning services (forest products), such as

timber, fuel wood and NTFPs (e.g., bamboo, cane, honey, medicinal plants and sun grass). Some agricultural products are also cultivated by local people inside or near the protected areas.

Although the commercial harvesting of forest products is not permitted by the forest department in protected areas, the forests are nevertheless threatened by illegal encroachment and the collection of forest products as well as agricultural cultivation by people from neighboring towns and laborers from nearby tea estate gardens. Tea Estates near protected areas increase accessibility to the forests. Timber and fuel wood are collected for household cooking and boat construction, and a number of NTFPs are collected for subsistence consumption. Moreover, although hunting is not permitted, local tribes depend on hunting wildlife to add meat to their diet. People from neighboring towns also depend on protected areas for supplementing their livelihoods, largely through selling illegally felled timber and fuel wood (IRG, 2006; NSP, 2006).

Protected areas also provide important non-monetary or market-oriented provisioning services. Cultural services, such as tourism, sacred areas for worship, and traditional habitats for indigenous tribes and endangered wildlife are important ecosystem services. Tourism, in particular, is a main focus in the management of almost all protected areas in Bangladesh (IRG, 2006; NSP, 2006). And the protection of habitats for threatened and endangered wildlife has been the primary principle underpinning the declaration of certain areas or ecosystems as protected areas. Moreover, regulatory services provided by protected area ecosystems are apart of the geophysical system of climate regulation and nutrient cycling (Uddin et al., 2013).

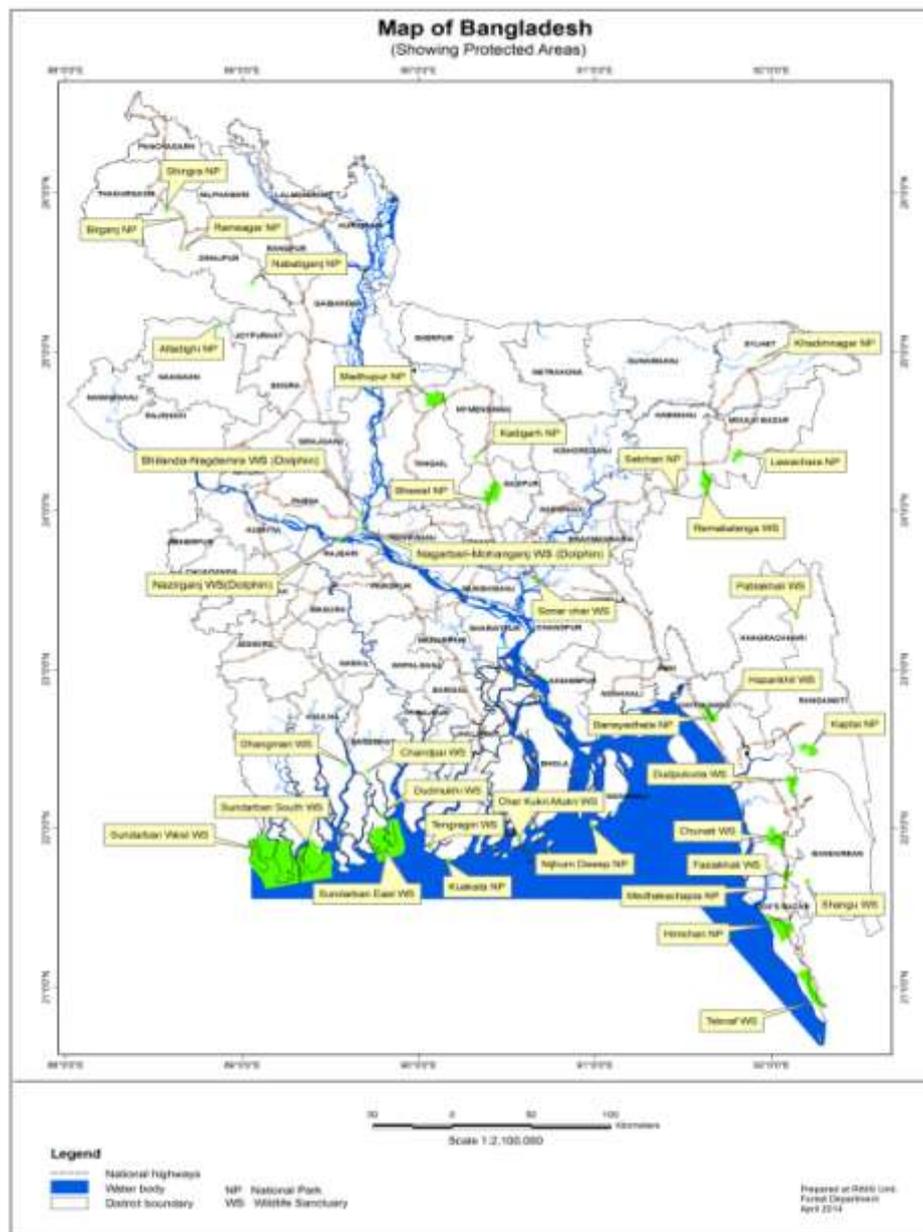
All protected areas have been controlled and managed by the Bangladesh Forest Department with partial support from other government departments since the 1870s. In general, protected area management has prohibited the commercial harvesting of forest and wetland resources, enhanced tourism activities and facilities, and introduced tree plantation schemes. However, illegal encroachment and resource extraction by local people and traders remain a great challenge for protected area management.

In 2004, co-management (a collaborative approach to management) was introduced in five protected areas (Lawachara National Park, Chunati Wildlife Sanctuary, Teknaf Wildlife Sanctuary, Rema-Kalenga Wildlife Sanctuary and Satchari National Park) on a pilot basis by the Nishorgo Support Project of the Forest Department. In those five protected areas, Co-Management Organizations (CMOs) were formed with participation of all stakeholders; namely, resources users, Forest Department officials, and local government representatives. CMOs responsibilities include forest and wildlife conservation, patrolling protected areas to deter illegal encroachment and extractive practices of poor and resource-dependent forest users.

CMO members work on a voluntary basis, although they receive funds for operational costs through Forest Department projects and NGOs, and by operating micro-credit programs

as well as receiving a share of tourist entry fees. Engaging local communities in protected area management has increased focus on the importance of nature conservation by local people and the potential opportunities that can be generated without destroying the ecosystem or natural resources.

Ecosystem services and their valuation are not accounted in the management of protected areas. As a result, there is a lack of understanding of the potential economic value of protected areas' natural resources and how those can be managed to generate optimum benefits from conservation. The concept of PES is neither applied in management practices nor at the policy level. This is a missed opportunity.

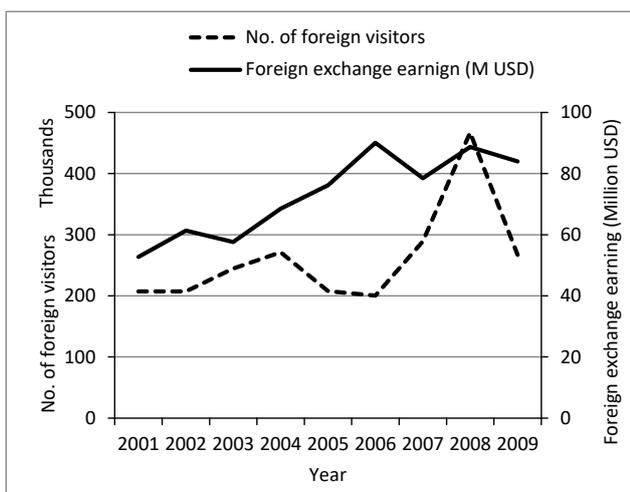


**Figure 1: Protected Areas of Bangladesh**  
(Source: Bangladesh Forest Department, 2014)

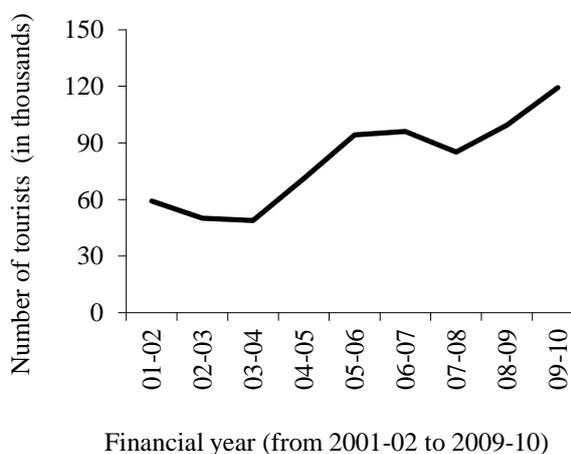
### Value of ecotourism and its contribution to ecosystem services

Increasing tourism activities in protected areas has become more important in protected area management policies (USAID, 2012). Tourism has grown significantly in recent years, dominated by domestic tourists and an increasing number of international visitors. The World Travel and Tourism Council (WTTC) expects the contribution of travel and tourism to gross domestic product in Bangladesh to rise from 3.9% (reported in 2010) to an estimated 4.1% by 2020. Recent data from the Bangladesh Tourism Board (BTB) show that Bangladesh has received around 0.25 million foreign visitors on average each year from 2000 to 2009 (Fig. 2). Foreign exchange earnings from tourists and other travelers also increased gradually over the same period (Fig. 2) (BTB, 2014). The number of domestic tourists is unaccounted, as these numbers are only recorded where entry fees are collected and no specific studies or surveys have been undertaken or published.

Some protected areas charge entry fees for tourism activities. For instance, ecotourism is promoted in the Sundarban reserve forest (including three wildlife sanctuaries), Lawachara National Park and Satchari National Park. The Sundarban, being the world's largest mangrove forest, has attracted tourists for a long time. However, insufficient facilities for tourists has slowed the growth of visitors to the area (Khanom et al., 2011). From 2001 to 2010, on average 80,375 tourists visited the Sundarbans each year and revenues collected this was estimated to be US\$42,000 per year (BFD, 2010). Nearly all of these tourists (98%) were domestic tourists, with the remaining 2% from foreign destinations. The total number of tourists doubled over this 10-year time frame (Fig. 3), with annual revenue from tourism quadrupling mainly because of a five-fold increase in



**Figure 2.** Foreign visitor arrivals and revenue earnings for recent years in Bangladesh (Source: Bangladesh Tourism Board, 2014)



**Figure 3.** Number of tourists visiting the Sundarbans from 2001-02 to 2009-10.

(Source: BFD 2010)

the number of international tourists. These statistics suggests that there is a high potential to harness economic benefits from tourism in the Sundarban.

Lawachara National Park and Satchari National Park were established in 1996 and 2005, respectively. Tourism began in these areas in 2009, initiated by the Nishorgo Support Project (USAID, 2012). The major source of revenue collection is entry fees, as well as charges for parking and picnics. In last financial year (July 2013 – June 2014), 123,000 tourists visited Lawachara National Park and 45,000 tourists visited Satchari National Park. This brought in revenues of around US\$31,700 and US\$9,500, respectively. The number of visitors has increased compared to previous years (Fig. 4) (BFD, 2014).

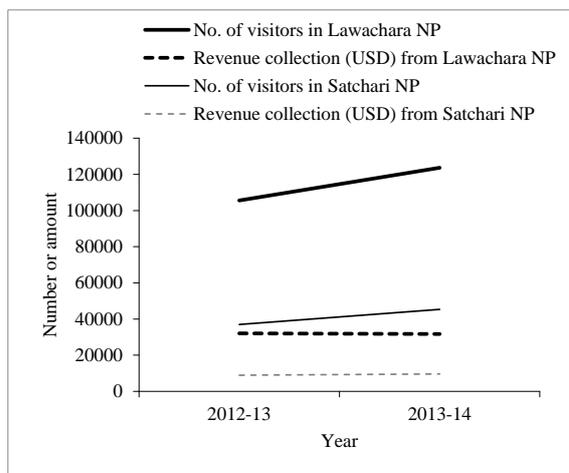


Figure 4. Number of visitors and revenue collection in Lawachara National Park and Satchari National Park in recent years (Source: BFD, 2014)

Three other piloted protected areas initiated under the Nishorgo Support Project have also received a significant number of tourists, depending on their natural attractions and site accessibility. Other protected areas have a huge potential for ecotourism development. However, despite the large and increasing demand and clear government policies, tourist-friendly infrastructure is lacking and this has affected ecotourism.

The Nishorgo Support Project facilitated the establishment of CMOs that have been partly involved in developing facilities for tourists (e.g., accommodations, restaurants, souvenir shops, and tour guides). The lesson learned from this project was that communities and CMOs are interested in promoting ecotourism in protected areas in order to receive benefits generated by entry fees and local business with tourists, even if they have had no previous experience working with tourists. In addition, private entrepreneurs are getting involved with ecotourism in protected areas as visitor numbers grow (USAID, 2012).

Ecotourism has been valued largely in terms of protected area management and socio-economic development, with its contribution to overall ecosystem services poorly understood. More holistically learning about the significance of ecotourism for ecosystem services should generate increased interest from policy makers.

This study estimates the proportional economic value of ecosystem services of the Sundarbans, mainly provisioning and cultural services (including ecotourism), based on the annual production of services and revenue collected by the Forest Department in recent years. Ecotourism contributes to about 5% (approximately US\$43,000 per year) of annual total economic value (revenue) of all provisioning and cultural ecosystem services of the Sundarban (Fig. 5). Although commercial timber and fuel wood collection has been banned

since 1989, illegal felling is often done by the fishers or other encroachers, and this is included under revenue. If the revenue from timber and fuel wood was excluded, the contribution of tourism would be much higher (about 13%). Since the Sundarban is a Reserve Forest, including three wildlife sanctuaries, resource extraction and tourism are strictly controlled by the Forest Department. Therefore, the potential amount of services from the forest controlled by the Department is considered here only. If the potential value of all types of ecosystem services, including regulatory (e.g. coastal flood regulation and protection from cyclone, nutrient cycling) and supporting services (e.g. habitat for wildlife, fish nursery ground) were included, this figure would be much higher. Similar valuations of ecosystem services for other protected areas could also reveal the potential contribution of ecotourism to overall ecosystem services.

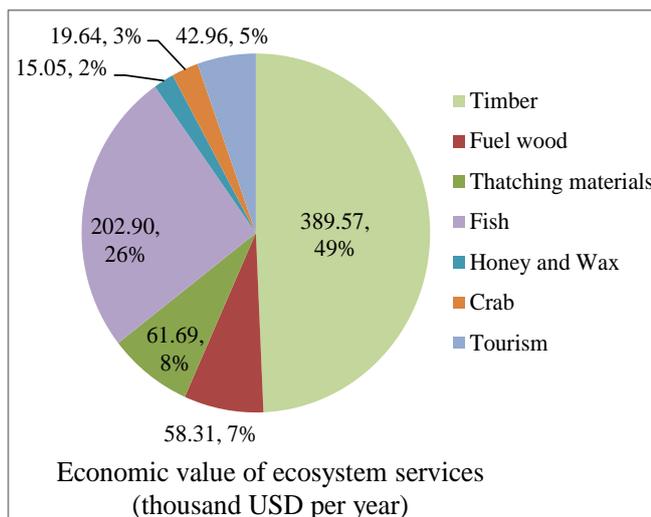


Figure 5. Economic value of ecosystem services in Sundarbans (Source: BFD, 2013)

### Linkage between ecotourism and PES in Pas of Bangladesh

A holistic view of ecotourism reveals that there are various dimensions or values related to ecological, socio-economic and institutional aspects (Fig. 6). In particular, the natural and ecological aesthetics of those areas (such as, forests, plants and wild animals) which attract tourists. Socio-economic and institutional aspects relate mostly to the management of the protected area and ecotourism activities. The Forest Department has been administering ecotourism services in protected areas with limited infrastructural facilities. The Department collects revenue from tourists for entry, guides and security services. Government tour operators (Bangladesh Parjatan Corporation), private tour operators, community-based tour organizations, individual small business related to ecotourism are delivering commercial tourism services to domestic and international tourists, mainly providing transportation, accommodation, communication and guide services. The basic ethics for responsible ecotourism and values of the ecological services of protected areas and tourist awareness are not reflected in tour operator or Forest Department programs. Other institutions like local police stations and local government authorities are responsible for ensuring the security of tourists and tourism-related businesses.

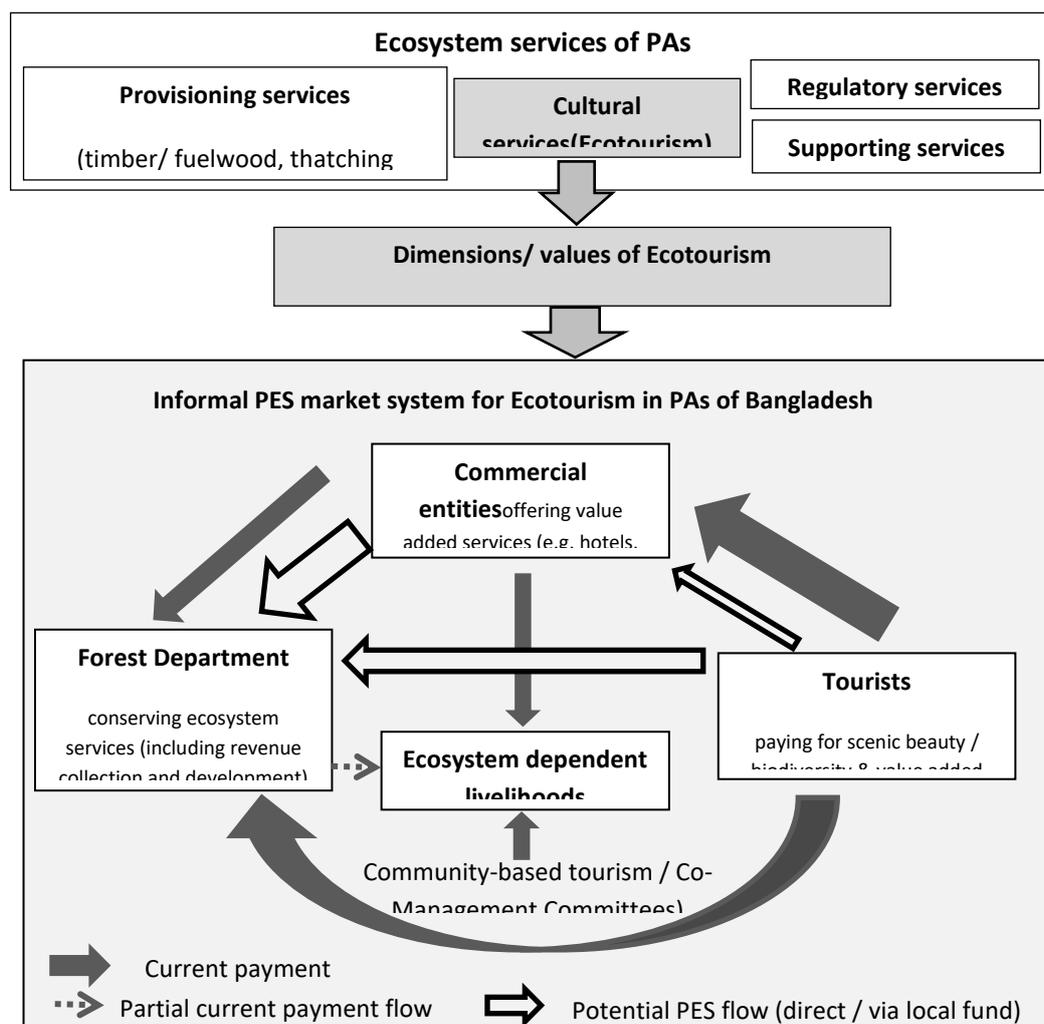
Local and national socio-economic drivers also influence ecotourism and ecosystem conservation in the protected areas. As observed in the case study sites, poor forest-dependent communities are threatening the conservation of forest resources through illegal encroachments, often in collusion with the forest guards and local elites. However, some local people are getting new job opportunities through ecotourism small businesses (e.g., in

souvenir shops, restaurants, and hotels, as well as transportation providers or tour guides). In recent years, CMOs formed in some protected areas (including the case study sites) have been involved with ecotourism services, introducing a more systematic approach to community participation in ecosystem conservation.

Considerations for an informal PES market for ecotourism in protected areas are outlined in Figure 6, based on the PES market model developed by Landell-Mills & Porras (2002). From this model, it is apparent that both the service providers (Forest Department, tour operators, and local communities) and buyers (tourists) have distinctly identified roles and contributions. Government revenues and other financial transactions for ecotourism services focus on the cost of employees and goods, rather than payments for the aesthetic value and preservation of an ecosystem. However, there are no contractual arrangements between the services providers and the buyers of ecotourism services, which is a major requirement for a PES market (Wunder, 2005; Salzman, 2010).

We have examined the policy, financial and institutional context of ecotourism in protected areas of Bangladesh to determine the potential for implementing PES mechanisms. Tourism has been emphasized in the existing national forest policy of Bangladesh, with the objective of promoting ecotourism as a forestry activity within the carrying capacity of nature (Ahsan, 2007). The Tourism policy of Bangladesh also recognizes the importance of ecotourism for natural areas in Bangladesh (BTB, 2014). However, there are severe inter- and intra-policy conflicts in these different sectors, limiting effective government coordination (Chowdhury and Koike, 2010). Hossain (2008) offers that Forest Department initiatives to involve local people in conservation are impeded by, and sometimes contradictory to, national laws and policies. These findings suggest a need to review and redesign government policy for a PES program approach that aligns with international policies and best practices to improve conservation.

Financially, sustainable revenue generation through ecotourism remains crucial. Therefore a clear account of ecosystem services, including ecotourism with monetary and non-monetary values, is essential for determining prospective and sustained revenue-generation and implementation of PES. However, only a few studies have attempted to determine economic valuation of ecosystem services, mainly on Sundarban Reserve Forest (Uddin et al., 2013; USAID, 2010) and these have not assessed opportunities for implementing PES. In the analysis of a Sundarban reserve forest, it was revealed that there were large gaps between the annual expenditure for management of the Sundarban and the total annual revenue from all types of resources of the Sundarban and tourism (Fig. 7). This was not unexpected as resource extraction and tourism in the Sundarban is limited in scale, and regulated by permits. It is clear that the revenue of resources is not rationally set (considering the market price of products) and, therefore, does not reflect the value of the resources. On the other hand, protected areas are managed by central government agencies, which has partial management role among other jobs. So the cost of managing the protected area could have been over or under-estimated. Similar observations also apply for other protected areas in Bangladesh.



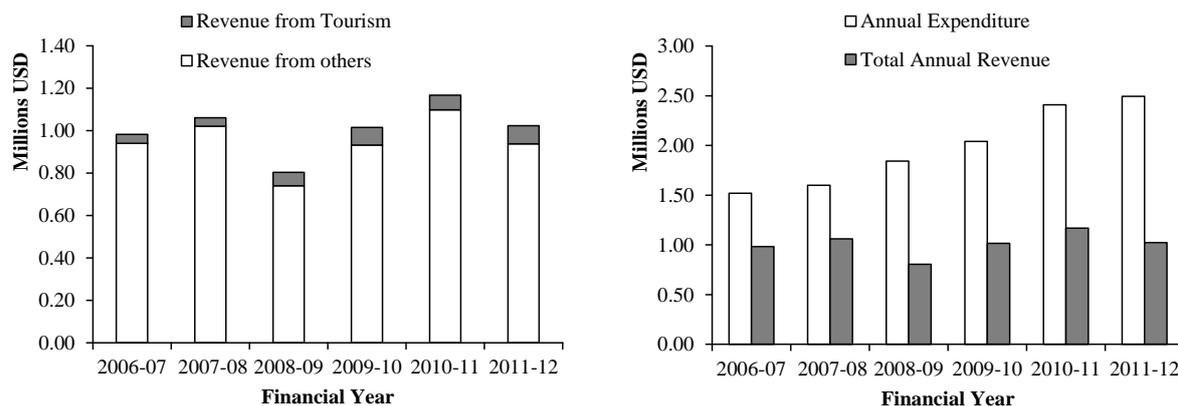
Officials and local people also reported that ecosystem services which are marketable/sellable to users are not clearly defined, since resource harvesting is restricted in protected areas. As observed in other countries (United Nations, 2014; Schomers and Matzdorf, 2013), the intrinsic functions of natural ecosystems (e.g., carbon sequestration, nutrient cycling, and air and water purification) are not valued and therefore not redeemed from local and global users and put back to into management costs.

In addition to revenue generation, ecotourism can create mass awareness among local and global users about the important services produced by protected areas. This can, in turn, shift the perspectives of local resource users and managers towards protected area conservation rather than resource exploitation. Greater understanding of the importance and value of the ecosystem services of protected areas could lead to full-scale implementation of the PES approach.

This study reveals that the lack of integration and cooperation among the institutions (e.g. forest department, local government) is impeding PES implementation in Bangladesh. Stakeholders offer that tourism-related facilities should be provided by different institutions,

other than forest department or tourism department only. This includes facilities for improved transport and communication, security, accommodation, health and safety, and information technology. Clearly defined roles of all the stakeholders (both providers and buyers), including forest department, resource users, local communities and tourists are required to implement successful ecotourism-based PES in protected areas of Bangladesh, as per the tourism-related PES-market model given by Landell-Mills & Porras (2002).

**Figure 6 Linkage of ecotourism with informal PES system in PAs of Bangladesh**



**Figure 7.** Annual revenue and expenditure for the Sundarban

(Source: Bangladesh Forest Department, 2014)

The CMOs established in protected areas in Bangladesh have already begun pursuing conservation efforts. These pilot approaches could be strengthened through improved profit-sharing and well-defined conditionality for managing the protected areas and implementing the PES approach. Though the engagement of local people in ecotourism has been emphasized, it is not considered as an attractive employment opportunity because of the seasonal nature of ecotourism (mainly from October to February), and the lack of job security and variable income (e.g., between USD 65 – 500 per month for tourist guides). Thus, a PES approach is also needed. Above all, a wider awareness program through formal and informal education and in-depth research on the ecosystem services and PES approach is necessary to change policies and implement institutional reforms. This will provide critical information about valuations of ecosystem services and restore the intimate relation of local people with their cultural heritage and resource management.

### Discussion and conclusions [need to reflect on some results in discussion]

There is a wide scope for ecotourism development and the implementation of PES in the landscape and biodiversity of protected areas and other natural ecosystems of Bangladesh. The basic elements for PES are present in the ecotourism sector for protected areas of Bangladesh, as observed in other countries (Nelson et al., 2010; Pagiola, 2008; McNeely, 2009). Even the provider and buyers of the PES market (Landell-Mills & Porras, 2002) are

distinctly defined here, as these are controlled by government agencies. However, only economically marketable goods and services are well defined in the protected area management, particularly ecotourism. Other ecosystem services should be explored and evaluated in economic terms in order to truly reflect values and maximize the potential benefits of protected area conservation through PES. This remains problematic because of insufficient data and the non-existence of a market for all ecosystem services (Salzman, 2010). The service providers and buyers should be more clearly defined as should all ecosystem services. This would help to establish transparent and effective contractual agreements between the providers and buyers. The illegal encroachers and resource harvesters could be included as stakeholders, on either the provider or buyer side (depending on their role in protected area management). This would enhance biodiversity conservation, ecosystems protection, and the maintenance and regulation of ecological processes as well as contribute to sustainable development and poverty reduction (Neto, 2003; Scherl et al., 2004; Rogerson, 2006).

Protected areas provide critically important resources, habitats, and services. However, most protected areas lack sustained financial support and, therefore, are unable to fulfill either conservation or development objectives (IUCN, 2005). It is clear that sustainable mechanisms for financing protected area conservation are imperative, although the means for doing so can be debated (Munasinghe and McNeely, 1994; IUCN, 2005; Emerton et al., 2006). A number of potential mechanisms for enhancing the financial sustainability of protected areas has already been tested and implemented. These include: foreign financing, domestic financing from national budget or in country NGOs, private sector support through the market based provisions of goods and services compatible with protected area management objectives, leveraging local support through cost and benefit sharing, and/or market based strategies implemented by the protected area management, including tourism charges, resource user fees, bio-prospecting charges and payment for ecological services (Emerton et al., 2006).

The growing number of tourists and revenue in protected areas in recent years suggests a promising future for the tourism sector and increasingly significant financial contributions to protected area management in Bangladesh. Though the revenue from ecotourism is still too little a share of the total revenue and expenditure of protected area management in places like the Sundarban mangrove forest (where a large amount of forest resources is harvested), it appears that this scenario is much better for those protected areas where forest resource harvesting is insignificant (e.g., Satchari national park). More detailed studies could reveal the revenue – expenditure potentials of protected areas. By orienting protected area management towards conservation (with less resource extraction) would help to shift the focus of management on maximizing benefits from non-extractable resources or services like ecotourism. In the current context, increasing benefits from ecotourism demonstrates high potential for contributing to the sustained financing of protected area management in Bangladesh and should be incorporated into a PES approach for protected area management and conservation.

A comprehensive and strategic approach is necessary for promoting ecotourism and PES in the protected areas of Bangladesh. Although ecotourism is well recognized in forest and tourism policies, it is not well-integrated into the broader legislative context and should be incorporated in other local and national development policies. Enhancing ecotourism in protected areas needs support and advocates at all levels. Tourist attractions and facilities are important factors and influence tourist's perceptions of and preferences to enjoy the destination. The natural areas, especially remote areas that are rich in biodiversity, have not been developed for tourism and do not receive tourist expenditures. This constrains the income generation opportunities of the local population and reduces their incentive to support nature conservation (Hearne et al. 2005). Tourism opportunities need to be developed that (i) attract tourists and tourist expenditures to otherwise unvisited natural areas, especially those under threat from competing economic activities; (ii) complement nature conservation; and, (iii) support the income-generation and development needs of the local population.

Tourism opportunities that meet the needs of natural area managers, tourists, and locals, need to be based on the preferences of the tourists and locals as well as the physical characteristics of the area. Research on the analysis of tourists and locals preferences towards the development of natural areas and tourism services should support the decision making process of protected area managers, government agencies, and entrepreneurs at the national and local levels (Hearne et al., 2005). Also, new methodologies to analyze these preferences need to be developed and adopted to the needs of protected area managers and decision-makers. Choice experiments over contingent valuation method (CVM) and econometric modeling can be applied for analysis of substitution and trade offs in preferences of tourists and other stakeholders (Hearne et al. 2005) in protected areas of Bangladesh. 'Willingness to Pay (WTP)' method should be applied to determine whether higher entry fees are feasible (Baral et al., 2008). Calculations also need to be done for socioeconomic and trip characteristics, expected gross local economic impact of candidate entry fees and recommended options for restructuring the present entry fee to determine the standard fee for the PES mechanism to be sustained (Baral et al., 2008).

The importance of effectively engaging local communities in ecotourism is a growing concern worldwide. Bangladesh's co-management strategy combined with income-generating activities (IGA), including tourism-related activities, has had a positive impact on livelihoods and conservation, as observed in several studies (e.g. NSP, 2007; USAID, 2012). The impacts are visible, particularly in terms of biodiversity conservation, decreased dependency on forest resources, poverty reduction in local communities, women's empowerment, and self-reliance (Chowdhury and Koike, 2010). Subhani (2008) reported that a majority of the female members of the Forest User Group (FUG) stopped collecting and selling fuel wood after becoming involved in co-management activities in Sathchari National Park. Moreover, nearly half of the women living near Lawachara National Park are now earning their income independently of extractive practices since their participation in the CMO. However, the influence of local elites and local governments in administrative bodies of CMO often disempowers local people from attending to important administrative concerns of protected areas that ultimately negatively affect the forest protection (Chowdhury and Koike, 2010).

The PES approach should be integrated into national and local development policies, with concrete guidance, mandates, action plans, and annual development programs for the relevant institutions, including the Forest Department and Tourism Board. The integration of ecotourism into other sectoral policies and institutional programs should not be too difficult as it is well accepted and understood by government planners. To effectively introduce PES, a broad implementation framework linking policies, institutions and, most importantly, financial accounting system would need to be developed. This requires further study on valuation of ecosystem services of protected areas and how to institutionalize PES in these areas. This might take several years to gain more widespread acceptance as a solution to the management and conservation of protected areas. In the meantime, ecotourism should be promoted as partial form of implementing PES, with a focus on fostering awareness among tourists and other stakeholders for understanding the concept and purpose of PES. Where CMOs are engaged in protected areas, ecotourism-based PES can be established by formalizing the roles of the Forest Department, local communities and tourists in protected area management and ensuring ecotourism services. This will be a useful start for visualizing the implementation of PES mechanisms, setting an example of PES for other protected areas and natural sites that are attracting more and more tourists in Bangladesh.

### Acknowledgement

The study was undertaken as research for USAID's Climate-resilient Ecosystems and Livelihoods (CREL) Project. This Project is being implemented by Winrock International in association with other partners. The views and interpretations in this publication are those of the author(s).

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## Are You an Ethnobotanist?

Blair Orr

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Ethnobotany is the study of the interaction of plants and people. Most foresters are ethnobotanists without necessarily thinking of themselves as one. Ethnobotany is often viewed as a narrow and obscure field by people from outside the field. They tend to think of collecting uncommon plants for medicinal purposes. The true definition of ethnobotany is much wider. Plants and people are perpetually linked to each other. Uddin's article in this newsletter is a great example of the link. Protected areas, with their rich botanical heritage, are preserved by people for the services they provide. Agroforestry, widely practiced by tropical foresters, is the integration of trees into human agroecosystems. Urban forestry is another large and obvious field within the world of forestry where people influence plants and plants influence people.

The largest professional ethnobotany organization is the Society for Economic Botany (<https://www.econbot.org/>). Their 2019 meeting at the University of Cincinnati was titled "The Future of Forests: Perspectives from Indigenous People, Traditional Practices and Conservation". Paper topics presented at the conference included resource tenure in cocoa agroforestry in Trinidad, Appalachian forest medicinal plants, the emotion of the forest in central Europe, and forest management of a sacred landscape in Nepal – a wide geographical spread with a little of something for everybody.

The 2020 meeting of the Society for Economic Botany will be held from **May 31 to June 4 at the University of the West Indies in Mona, Jamaica. This year's theme is "Out of Many, One People: Biocultural Diversity Across Borders". Foresters have much to contribute to this discussion. Information on the conference can be found at <https://www.econbot.org/home/meetings/economic-botany-2020.html>.**

Whether you like it or not, as a forester, you are probably an ethnobotanist.

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## Perspectives on National Forest Inventory and Remote Sensing Integration

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The United Nations' Reducing Emissions from Deforestation and Degradation (REDD) program has a goal of promoting sound natural resource management and fewer carbon emissions through reduction of deforestation and degradation of forest resources. The REDD program promotes this by supporting the development of scientifically-sound forest monitoring strategies, or Monitoring, Reporting and Verification (MRV) systems. MRVs have certain requirements like using a combination of remote sensing (for example, satellite imagery) and ground inventory data to report on changes in carbon stocks. At times, there is tension between proponents of remote sensing-based methods and ground-based estimation methods. The two methods are not mutually exclusive, but sometimes they are pursued in parallel without a clear vision of how results obtained from both methods will be integrated and used for management or reporting. When this occurs, the result is that two approaches compete for limited resources when they could have been combined to meet monitoring goals.

There are two paradigms for how remote sensing and ground inventory data can be combined and used for MRV:

- 1) The remote sensing data form the basis of the estimation, and ground data are simply used to help calibrate and verify the maps. For example, on a group of ground plots, the "true" values for carbon stocks are recorded. These ground data are intersected with remote sensing data in a GIS to make a mathematical model of the relationship between the true data and the remote sensing information, and then this model is applied to every pixel in the study area to predict carbon. A subset of the plot data are then used to validate the carbon map and produce uncertainty estimates.
- 2) Plot data form the basis of the estimation, and remote sensing data are used to improve estimates of carbon stocks or distribute the estimates across the landscape in a meaningful way. For example, a grid of forest inventory plots are chosen to cover a study area either uniformly, or with plot density based on categories from a remote sensing map, and then traditional inventory estimates are calculated using remote sensing as part of the estimation procedure via techniques like post stratification or model assisted regression estimation.

Both of these methods can have serious weaknesses. To begin, one common view is that MRV uncertainty should be quantified using an index of uncertainty that is based on sampling theory, like 95% confidence intervals. However, the statistician community is not in agreement about how to create meaningful confidence intervals using map-based estimates. There are several approaches that have been proposed, but they can be computationally

complex and rely on the assumption that the model training and validation data adequately represent reality. For example, if the data used to build the model were to come only from areas near roads, the model will be incapable of describing and effectively predicting new information in areas far from roads if these areas are unique. If the training and validation data are chosen in a probabilistic way such that each part of the study area has a chance of being chosen for a ground visit, the ground data collection effort can be nearly as costly as conducting a traditional forest inventory. Finally, complex, data-intensive remote sensing methods can require a lot of foreign intervention in the form of technical support or data, creating a dependency on external assistance that can lead to a variety of institutional problems. On the other hand, the advantage to the map-based approach to MRV is reduced cost relative to a detailed national forest inventory. Map products can also be used for other management applications and landscape-scale assessment like forest fragmentation analyses that are difficult to conduct with ground data.

Correctly-designed ground-based inventories that are supported by remote sensing do not have the theoretical problems that the pure remote sensing methods have. Hundreds of years of experience in the use of probability theory and decades of inventory experiences from many countries can make results of forest inventories more easily understood and accepted by users. Ground-based inventories also have the advantage of not being limited by what can be modeled using satellite imagery. Examples of data types that can be collected on the ground but not with remote sensing include understory, forest health, forest floor, soil, social and detailed species information. Finally, because forest inventory-based monitoring systems require a much lower level of foreign intervention, problems with dependence on external partners are lessened. The biggest problem with ground-based data collection, however, is the cost relative to remote sensing-based monitoring: forest inventories can require a large logistical support network and long-term staff capable of repeating the inventory methods consistently through time.

There are many considerations for policy makers who would like to participate in REDD. In many countries, the rate of change in carbon stocks is relatively low, and it is therefore difficult to achieve desired confidence intervals for estimates. If the pure mapping paradigm is pursued, inaccuracy of carbon change maps can be greater than the amount of change that actually is occurring on the landscape, making it difficult or impossible to confidently state that emissions have been reduced. Similarly, if the ground plot-based paradigm is followed, the required number of plots needed to get acceptable confidence intervals is often prohibitively large. The question thus needs to be asked: “Does the cost associated with demonstrating with adequate confidence that carbon emissions have been lowered outweigh the economic benefits that would be received by participating in the REDD program?”

Another approach is to ask the question: “What forest information does my country need to inform a natural resources management system that will meet the goals of a healthy, sustainable ecosystem and improved human life?” If that is the true motivation leading to decisions on investment in forest monitoring, participation in REDD can be seen as a vehicle

to achieve that goal, and methodology choices should probably rely on ground inventory, with remote sensing support, to answer questions beyond carbon stock change. Countries like Mexico could consider a focus on monitoring efforts that improve their national forest inventories, with investments in remote sensing monitoring technologies aimed at providing useful decision support tools and improving the economic feasibility of ground inventories.

**Originally in Spanish:** Lister, A.J. 2016. Perspectivas en la integración del inventario nacional forestal y los sensores remotos. (**Perspectives on National Forest Inventory and Remote Sensing Integration**)

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## Agroforestry Training for Asian and African Nationals

### International Training Program on Agroforestry: Policy, Practice and Impact

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The Forest College and Research institute, TNAU, Mettupalayam has successfully completed the International training program on “Agroforestry- Policy, Practice and Impact” during 20-24<sup>th</sup> October. The training programme was attended by 26 International participants representing 10 countries namely Bangladesh, Botswana, Cambodia, Myanmar, Malawi, Tanzania, Kenya, Uganda, Nepal and Sri Lanka. The major focus of the training was to inculcate the knowledge on value chain developments in Agroforestry through technological, organizational and marketing interventions made in Tamil Nadu for successful adoption and replication in their respective countries.

**Feed The Future**  
The U.S. Government's Global Hunger & Food Security Initiative

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**MANAGE**  
मनज

**Feed The Future India Triangular Training (FTF ITT) Program**

**International Training Program**  
on  
**“AGROFORESTRY: POLICY, PRACTICE AND IMPACT”**  
(10<sup>th</sup> -24<sup>th</sup> October, 2019)

Forest College and Research Institute (TNAU)  
TNAU, Mettupalayam – 641 301

& World Agroforestry Centre (ICRAF)  
New Delhi, India

**Venue: Conference Hall**

**Date: 21<sup>th</sup> -24<sup>th</sup> October, 2019**

**Training Inauguration****International Participants****Certificate Distribution by Vice Chancellor, TNAU, India**

The participants are exposed to hands on training, field and industrial visits which benefitted skill and expertise development on various technologies like miniclonal technology, multifunctional agroforestry briquetting, pelleting and activated carbon technology besides gaining knowledge on Consortium and Business developmental activities. The program was funded by International agencies like Feed the Future, USAID, ICRAF in association with Government of India. The training programme concluded on 24.10.2019 and the Vice Chancellor, TNAU Dr.N.Kumar felicitated the delegates in the presence of Dr.S.K.Dhyani, Agroforestry Specialist of ICRAF. The training program was coordinated by Dr.K.K.Suresh, Dean(Forestry) and Dr.K.T.Parthiban Professor & Head (Agroforestry). This training helps to disseminate the technologies developed in Tamil Nadu across the Asia and African region to create sustainable livelihood, nutritional and environmental security.

### Training Album



**Visit to Farmer's Field and Industrial Field**



**Hands on Training at FC&RI Campus**



**Wood based Industrial Visit – Bharathi Packing Cases, Coimbatore**

## **Integrated Farming System for Sustainable Agroforestry**

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### **Introduction**

The Indian economy is predominantly rural and agricultural oriented. More than 70% of the Indian population depends or involved in agriculture and allied activities. Nearly 40% of the net national produce is from agriculture sector. Approximately 35% employment is generalized from agriculture, out of which 75% is found rural areas either directly or indirectly. In India, 80 million farmers are holding less than one hectare of farmland out of 105 million farmers, nearly 85 percent of farming population is marginal sized farmers (FAO STAT, 2013). Over all food grain production increased almost four fold from about 50 million tonnes at Independence to more than 291 million tonnes in 2019-2020. It is necessary to produce about 350 and 420 million tonnes of food grain to meet the projected population of 1.37 and 1.6 billion in 2030 and 2050 AD, respectively.

In the present scenario, farmers are difficult to meet farming activities due to rising population, industrialization and climate change. Unfortunately, In India the food producing enterprises like agriculture and its allied activities namely livestock farming, horticulture, floriculture, aquaculture etc. have been dominated by the small and marginal farmers. Hence, they are unable to invest more capital for doing intensive farming activities to produce more and meet the requirement. In this situation, Integrated Farming System (IFS) plays an imperial role for maximizing their profit and production to meet the nutritional requirement with food security with less investment. Further in IFS it is more advantageous that the farmers can able to produce more by using optimal resource utilization and recycling of waste materials and family labour employment.

The integrated farming system is defined as resource management strategies to achieve economics and sustain productivity to meet the diverse requirements of house hold while preserving the resource bases and sustain high environment quality. It consists of four different sub system viz., cropping, livestock, aquaculture and agroforestry. The choice of components in the farming system and their management must ensure that interaction between components should be most complementary with least competitions IFS approach is not only a relative way of obtaining fairly high productivity with considerable scope for

resource recycling but also a concept of ecological soundness leading to sustainable agriculture.

### **Objectives of IFS**

- To maintain production of food and other goods and services that contribute to food security and income generation to the rural poor.
- Important for achieving environmental and ecosystem services and ensures agricultural sustainability.
- An alternative to commercial farming systems which helps to preventing resource degradation and stabilization of farm income of the marginal land holders.

### **Integrated Farming Systems focuses**

- The interdependencies between components - control of household Components interaction
- Farm household is the basic unit of farming system
- Farmers - subjected to many socio-economic, bio-physical, institutional administrative and technological constraints.

### **Need of Integrated Farming Systems**

- To protection and conservation of natural resources
- Protection from environment and climate change
- Protection and conservation of biodiversity
- Food and nutritional security
- Restoration of soil fertility
- Provision for sustainable rural livelihood security

### **Benefits of Integrated Farming Systems**

- Increase income and employment generation of farming community
- Ensure food security by integrating different components viz., crops, livestock, fishery, poultry and duckery.
- Environmental protection and carbon storage
- Integrated farming system and biodiversity

### **Different components of Integrated Farming Systems**

- Field crops
- Vegetables and Fruit crops (Horticulture)
- Live stock farming

- Aqua-culturing
- Apiculturing
- Agroforestry
- Mushroom cultivation
- Biogas and Vermicomposting

#### **Different agroforestry models in Integrated Farming Systems**

- Silvi-Horti System – Teak, Rosewood + Mango, Banana, Sapota
- Agri-Silvi System – Pulses, Oil Seeds, Paddy + MeliaDubia, Teak, Gmelina
- Aquaforestry – Fish farming + Multipurpose trees
- Silvi-Seri System – Pulpwood trees + Mulberry

#### **Constrains in Integrated Farming Systems**

- Availability of improved breeds of livestock
- Timely availability of fish seed and fish feed
- Credit support from financial institutions
- Information about improved technologies
- Awareness about Government schemes on various inputs
- Effective extension services for technology transfer upto farmers field level

#### **Conclusion**

An integrated farming system is important for the marginal and small farmers under the changing scenario of global climate. In this context, better understanding of the nature and extent of the interactions among various enterprises and natural resources is essential for the economic benefits as well as livelihood security. Agroforestry based IFS are capable of producing diverse social, economic and environmental benefits besides, ensuring food security, employment opportunity.

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## Reforestation is not necessarily about planting more trees

A much less costly way to regenerate our forests and decrease carbon levels is to assist nature to do its job.



Nikola Alexandre

Last year, the journal *Science* published a study that made a bold - and elegantly simple - claim: To mitigate climate change, plant a trillion new trees.

Authored by a team of scientists from various research institutions in Europe and the Food and Agriculture Organization of the United Nations, the study attracted considerable mainstream media coverage.

Soon after, tree-planting initiatives across the globe bloomed. Ethiopia announced it would plant 350 million trees in a single day and India promised to plant 220 million. The US unveiled a plan to establish forests in Asian and African cities. Companies ranging from Biocarbon Engineering to EasyJet to Warner Music turned the spotlights on their tree-planting initiatives.

The excitement was understandable. The idea that we could negate the effects of centuries of deforestation and keep the planet cool enough to survive simply by planting some trees sounded really good.

The study found that a trillion new trees could store 205 billion metric tonnes of carbon - the equivalent of 25 percent of the current atmospheric carbon pool and enough to help keep us under a 1.5-degree Celsius global temperature rise. Climate action, meet your magic bullet.

Yes, we need to plant trees. Close to one billion hectares (2.5 billion acres) globally is estimated to be available for some kind of forest restoration. If only it were that simple.

To succeed in the fight against climate change we have to do two big things: Stop emitting carbon dioxide and remove the excess carbon dioxide we have already emitted. Restoring forests is the best way to do that second part - but not all restoration is created equal.

In the buzz surrounding the study published in *Science*, what got scant attention was the cost of planting a trillion trees. With conservation needs already facing a \$350bn annual gap between what we are spending and what is needed to secure ecosystems, planting and stewarding a trillion new trees will require mobilising huge amounts of money - something the world does not seem brave enough to do. According to the paper, we would have to reforest approximately 0.9 billion hectares (2.2 billion acres) of land - an area the size of China - to reach their magic number, and at an average cost of \$3,000 per hectare, the invoice for this gardening project is prohibitively expensive.

But there is a more realistic way to replace the trees we have destroyed: Help nature run its course.

It is a real, science-based strategy known as assisted natural regeneration. It is low-tech, high-yield, highly scalable, and 70 percent cheaper than planting new saplings.

The premise of assisted natural regeneration is that the most economical way to restore and protect forests is to acknowledge nature's resilience, remove barriers to natural regeneration and - where necessary - accelerate it. Given time, trees regrow and forests come back. Assisted natural regeneration simply supports and accelerates the process. What does it look like in practice?

Examples include stopping fires from burning young trees that are naturally regrowing, dispersing seed mixes in degraded areas close to intact forests, and developing national policies that incentivise intensifying agriculture in some areas in order to let others naturally regenerate.

One of the most exciting assisted natural regeneration strategies is called applied nucleation, also known as "tree islands", which involves planting only a very small number of trees that attract birds and other seed dispersers, which can spread seeds around the tree islands. Gradually, these tree islands turn into intact forests.

If it is such an obvious and effective tactic, why has it not caught on yet? First, it does not have the PR appeal of a person lowering a young sapling into the ground. Second, until recently, assisted natural regeneration was not seen as a solution that could work on a large scale. But advances in our ability to model and predict natural processes - and an unlikely and unexpected test case in Brazil - showed otherwise.

Brazil's Atlantic Forest stretches across 34 million hectares (84 million acres) of the country's coastal southeast. As large as it is, it is a fraction of what it used to be, having lost nearly three-quarters of its original extent to deforestation.

Over the past two decades, though, rural populations there thinned, with people in farming communities abandoning their land to move to cities to find work, while well-organised local groups ensured enforcement of a Brazilian law aimed at curbing deforestation.

What happened next was remarkable: Between 1996 and 2015, nearly three million hectares (7.4 million acres) of the area was found to have regenerated naturally - without a single sapling being planted.

This did not escape the notice of conservationists. Researchers from the International Institute of Sustainability (IIS) in Rio de Janeiro analysed this regeneration and found that one-third of the degraded Atlantic Forest - some 21.6 million hectares (53.4 million acres) - could eventually be restored if assisted natural regeneration is applied. It was the first real evidence that this method could be scaled up.

Seizing on these findings, Conservation International launched what is on track to be the largest tropical restoration project in history in the Brazilian Amazon. Working with local and international partners, the organisation helped protect and nurture a portion of the Amazon rainforest so it could rebound without interference - and it has started to do so.

Now, Conservation International and IIS are leading efforts to identify other areas of the world where assisted natural regeneration is likely to be ecologically and socially feasible, and it is now estimated that, of the billion or so hectares of forest around the world that have been destroyed or degraded, fully one-third is suitable for assisted natural regeneration.

What that means is that all that land, if protected around the edges from logging, fires, farming and grazing, then left to its own devices, could come back to life - bringing with it all the benefits that forests provide, from water filtration to biodiversity to climate regulation. And that is without threatening food security - critical to our exploding world population - or sticking a single (expensive) sapling in the ground.

So what needs to happen now?

First, the research community must pay closer attention to what nature has been doing for millennia to focus its efforts on actions that support that process.

Second, science and indigenous knowledge must be brought together to show governments where assisted natural regeneration is possible, and inform policies to unlock it.

Third, banking and development communities need to create financial incentives to spur investment in reforestation.

Fourth, corporate actors should put protection above profit so that mistreated land is given space to recover - which in the long run is good for their bottom line.

Let us be clear: Assisted natural regeneration is not the only way forward. We still need to plant new trees where it is necessary, and in ways that respect local ecology and local cultures.

But if we can see to all of the above, Mother Nature will have a much easier time doing what she does best - naturally.

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## Pacific Island Tree Nursery Workshop Held in Guam

Diane L. Haase, J.B. Friday and Katie Friday

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The USDA Forest Service State and Private Forestry (S&PF) Program provides support to forestry programs in the American-affiliated Pacific Islands. Within S&PF, the Reforestation, Nurseries, and Genetics (RNGR) Team provides technical expertise to forestry and conservation nurseries throughout the United States and its affiliated islands. This includes consultation and assistance via onsite visits, phone, and email; production of online and printed resources; and organization of technical workshops, conferences, and meetings.

In 2019, Diane Haase (RNGR's Western Nursery Specialist), J.B. Friday (Extension Forester, University of Hawaii), and Katie Friday (SPF's Forest Stewardship Program Manager for Forest Service Region 5) organized a workshop for Pacific Island foresters and nursery managers. The workshop was held July 31 through August 2 at the University of Guam. Participants attended from eight Pacific islands: Guam, Palau, Yap, Chuuk, Pohnpei, Rota, Saipan, and the Marshalls.

The nursery workshop was designed to help nurseries produce healthy seedlings for watershed protection, native forest restoration, agroforestry, riparian/coastal land stabilization, and urban beautification. Topics covered in the workshop were aimed toward assisting nurseries with meeting short- and long-term goals for environmental, economic, and social benefits. Each attendee received a copy of *Tropical Nursery Manual: A Guide to Starting and Operating a Nursery for Native and Traditional Plants* (Wilkinson KM, Landis TD, Haase DL, Daley BF, Dumroese RK, eds. 2014. Agriculture Handbook 732. Washington, DC: U.S. Department of Agriculture, Forest Service. 376 p.; available online at <https://rngr.net/publications/tropical-nursery-manual>).

The group discussed nursery mission and needs and developed a sample matrix that can be used as a tool for determining the appropriate plant species to grow in a given nursery based on its intended use (e.g., shade, erosion control, cultural products, etc.) and the conditions of the designated out planting site (e.g., savanna, forest, urban, coastal, etc.). This exercise helps nursery growers and land managers to make decisions based on the Target

Plant Concept. Determining the target plant is based on project objectives, limiting site factors, nursery stocktype, genetic source, and planting window. The quality of the seedling depends on how well it performs at the planting site. Thus, it is important to select the right plant (size, species, genetics) for the specific site conditions.

Over the three days, the workshop included a comprehensive overview of nursery operations. Specific topics covered included nursery design and environment; seed collection, processing, and storage; containers; growing media; plant propagation and culturing techniques; seedling quality and outplanting; planting in degraded soils; integrated pest management (IPM) – invasive species, pests, and diseases; and record keeping and project evaluation. In addition, local experts were brought in to give presentations. Jim McConnell (University of Guam) and his staff spoke on the Guam Plant Extinction Prevention Program (GPEPP); Christine Fejeran from Guam Forestry spoke on protecting trees from wildfires, and Roland Quitugua from the University of Guam spoke on the coconut rhinoceros beetle and little fire ant.

In addition to classroom presentations and discussion, participants visited the GPEPP rare plant nursery and the Guam Forestry nursery. These visits gave an opportunity for onsite discussions about nursery design (ventilation, irrigation system, resistance to hurricane damage, shading, etc.) and daily operations (selection of growing medium, fertilization, containers, pest management, etc.). The group also visited restoration, agroforestry, and urban planting sites on island where they reviewed results of research projects and discussed various strategies to optimize field growth and survival given challenges at each planting site (erosion, poor soil nutrition, fire, etc.)

At the conclusion of the workshop, participants generated goals for their respective islands based on material learned in the workshop and the specific needs for their nursery and outplanting programs. More information about RNGR and many resources for tropical nursery production are available at: <https://rngr.net/>.

## Workshop Photos



Figure 1. The nursery workshop was held at the University of Guam and included classroom presentations and discussions on a wide range of topics.



Figure 2. The workshop included a visit to Guam Forestry's nursery for hands-on evaluation of nursery operations.



Figure 3. Dr. J. B. Friday discusses container types and seedling root development with workshop participants.



Figure 4. Nursery workshop participants visited an urban park where seedlings from the Guam Forestry nursery had been planted.

## **From community of practice to lasting legacy: PARTNERS wraps up key messages for tropical reforestation in an accessible, interactive website**

Robin Chazdon

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As tropical forests around the world go up in smoke, giving way to crop fields, pastures, and single-species tree plantations, the urgent need to stop deforestation is a growing global concern. Despite the critical importance of efforts to halt deforestation, reduce forest degradation, and protect intact forests, these actions alone are not sufficient to reduce biodiversity loss, mitigate climate change, and improve sustainable land use and livelihoods for millions of people whose lives directly depend on forests. Reforestation and restoration are essential actions that complement conservation and sustainable forest management activities. The urgency of reforestation in tropical regions has never been more urgent or more aligned with global goals of sustainable development, climate mitigation and adaptation, and biodiversity conservation. But bringing back forests or other forms of tree cover requires overcoming biophysical and socio-economic barriers and understanding how these barriers can be turned into opportunities.

In 2014 a group of the world's top researchers began a 6-year journey to generate ideas, knowledge and collaborations to understand the socioecological drivers of tropical reforestation. Nearly 200 people participated in 12 workshops generating publications linking across disciplines and continents; from seeds and soils to global forums. Tropical reforestation is on the global stage like never before, and ambitious national commitments need robust research outcomes to guide them. To meet this need, and provide a resource for the next generation of research, scholarship, and practice in tropical reforestation, we synthesized our findings using an innovative website structure. Read on for our story.

The idea for a research network on tropical reforestation emerged at a conference in October 2009 in Morelia, Michoacán, Mexico. As the 60+ forest ecologists in attendance discussed the need to better understand how, where, and why reforestation is happening across the tropics, we realized natural scientists work alongside social scientists, policy specialists, and restoration practitioners was key. Tropical reforestation issues – and solutions – involve all of these dimensions, but these groups were not talking, much less working together.

So, in 2010 we submitted a proposal to the U.S. National Science Foundation, with Robin Chazdon as principal investigator and Michael Willig and Tom Rudel as co-investigators. After two more attempts we finally received funding from the NSF Coupled Natural and Human Systems Program in September 2013 to form PARTNERS (People and Reforestation in the Tropics, a Network for Education, Research and Synthesis). The project was funded through the University of Connecticut for 5 years, with an additional 1-yr extension.

Over six years, The PARTNERS network took on a life of its own, creating links with many individuals, organizations, research groups, and networks. The network addressed major deficits in our understanding of the social and ecological drivers and consequences of reforestation in the tropics. We made strong progress, producing over 60 peer-reviewed publications. But in addition to these concrete outcomes, PARTNERS functioned as a true “Community of Practice”, influencing the way many of its members work within their own institutions. Many PARTNERS participants have been forever changed by the experience of working in interdisciplinary groups and stepping outside of our comfort zones in a safe space.

Communities of Practice often produce great work but fail to synthesize their collective work. The PARTNERS leadership team worked to produce accessible summaries of our work, and used these to develop eight key messages housed on a new [Key Message website](#). We hope this website will serve as a resource for educators, policy makers, researchers, and practitioners in the emerging decade and era of restoration.

Each of the eight key messages is supported by a set of publications and other works developed by PARTNERS:

- Tropical Reforestation Should Complement and Enhance Local Livelihoods, Needs, and Cultures
- Local Decision-making is Essential for Effective and Long-Lasting Tropical Reforestation
- Effective Ecological and Social Outcomes Require Attention to Local Context and Seed Sources When Planting Trees
- Natural Regeneration is a Cost-effective Approach to Recover Biodiversity, Ecosystem Services, and Biocultural Values in Many Contexts
- New Forests are Arising in Diverse Socio-ecological Contexts, with Important Consequences for People, Biodiversity, and Ecosystem Services
- Beyond Carbon: Interactions Between Tropical Reforestation and Climate Change Encompass Multiple Socio-ecological Dimensions

- Effective and Long-lasting Tropical Reforestation Requires Holistic Vision and Innovations that Incorporate Social and Ecological Systems
- Guiding Principles are Needed to Avoid Negative Consequences and Reach the Scale and Potential of Forest and Landscape Restoration

We invite you to explore the website, learn more about how we worked together and who we are, read our key messages, summaries of publications, view our policy briefs and educational modules, and download PDFs. All is open access. Please publicize our website within your own networks to spread the word far and wide.

We will continue to sponsor our Twitter Feed (@partnersrcn) and our [Facebook Partners Member Discussion Group](#) as well as our [email](#) account.

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## An electrifying future for DRC's forests

Nils Bourland



Acacia being planted in Yangambi, Democratic Republic of the Congo.

Photo: [Axel Fassio/CIFOR](#).

Yangambi, in northern Democratic Republic of the Congo (DRC), was once known as the cradle for the study of tropical agriculture and forestry. Its research center, which was a bustling scientific hub throughout the mid-century, produced Central Africa's most important advances in the fields of botany, forest ecology, tree physiology, climatology, tropical agronomy and silviculture.

But subsequent political instability, conflict, and budget cuts led to the center's progressive decay. And in tandem with the research activities, Yangambi's local economy also declined. What were once productive rubber, oil palm, banana, and coffee plantations, have now become degraded land.

These days, for the 150,000 people living in the Yangambi landscape, there are few livelihood opportunities beyond the exploitation of forest resources. Widespread poverty, regular food insecurity, and rampant unemployment are everyday struggles shoving rural dwellers to unsustainably use natural resources.

This conflicting reality represents a real threat to one of DRC's most important forests, the Yangambi Biosphere Reserve. This protected area contributes to biodiversity

conservation, carbon storage and mitigates the effects of climate change. But it is slowly gnawed away by a growing population and demand for natural resources and farmland.

In an attempt to address these issues, the Center for International Forestry Research (CIFOR), the Royal Museum for Central Africa (RMCA) and Resources and Synergies Development (R&SD) are creating tree plantations in Yangambi's degraded land. These plantations will produce biomass to supply electricity to the neighboring communities, create new business opportunities and provide much needed jobs for local people.

This initiative is a win-win for the population and the environment, as the project is supporting the local economy by using degraded land to meet the energy demand and reduce pressure on the surrounding primary forests.

Since 2018 around 300 hectares of land have already been restored. It is expected that by 2021, 1.5 million trees will have been planted, including both indigenous and non-indigenous species.



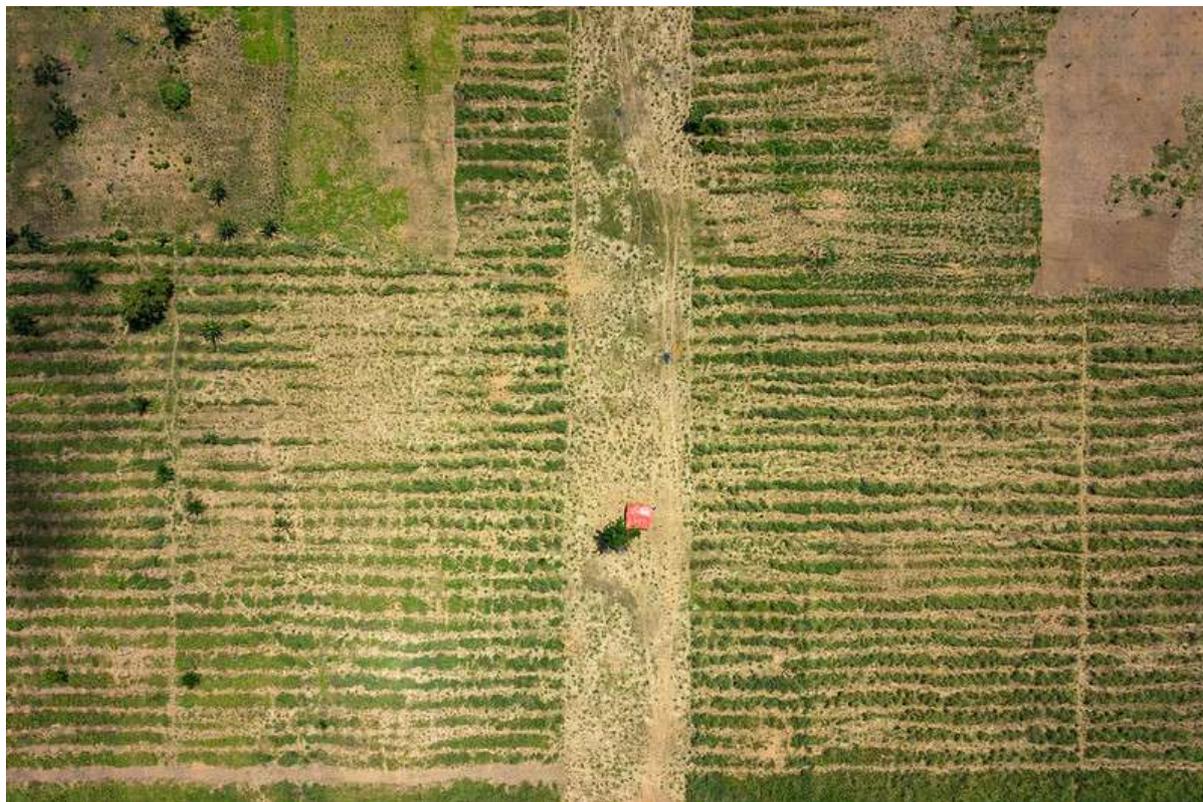
### **Power to change**

DRC has one of the lowest electrification rates in the world, and only 1% of rural households has access to electricity. In Yangambi, families instead rely on firewood and to meet their domestic energy needs.

The problem is that this is putting a huge pressure on forests. In fact, the World Bank estimates that around 84% of all harvested wood in the country is used for domestic energy production, and demand is only expected to increase as population grows.

A study conducted in Yangambi shows that biomass is the most efficient and viable option to meet the local energy needs. This is mostly because it requires a relatively low initial

investment, and there is widespread availability of raw material in Yangambi. For example, old oil palms and rubber trees can be used to produce electricity. There are also some old industrial sites that can be repurposed to produce biomass, reducing the costs.



Areal view of the plantations.

Photo: [Axel Fassio/CIFOR](#).

### Tree purposes

To be able to generate electricity, most of the trees planted are acacias (*Acacia auriculiformis*), a fast-growing species that has an outstanding calorific value. We are also trying local species that could have potential for energy production.

Other trees will also be available for the local community to produce woodfuel, which should reduce pressure on the neighboring forests. Even if there is electricity available, families will very likely still use charcoal for cooking, thus it is better if they produce it with the trees from the plantations instead that from the forests.

Finally, the plantations are integrating agroforestry systems, meaning that families are cultivating their crops between lines of trees, which is expected to help restore soil fertility. Some trees will also be used to collect caterpillars and honey, helping improve the food security and nutrition of local communities.



A local team takes care of the nurseries, creating job for Yangambi locals.

Photo: [Axel Fassio/CIFOR](#).

### Reactivating the local economy

Perhaps the most important benefit of this project is the creation of jobs and opportunities for locals. From gathering seeds, to planting and taking care of trees, these plantations require manpower at all levels, and until now 400 direct jobs have already been created. For many people, this is the first time they have had a salary in their lives.

However, despite the good spirits, a few challenges remain. While access to electricity and job creation are essential to rural development, the region's economy remains precarious and poor infrastructure limits its potential. This is why we are also working to attract private and public investment and to kick-start other income-generating activities in the fields of agriculture, fishing and logging. These plantations are the first step towards a better future in Yangambi. But we still have a lot of work to do.

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*English version*

## **Strengthening forest landscape restoration actions in Guatemala**

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Guatemala has been categorized as a megadiverse country due to its high endemism, biodiversity, and cultural heritage. Although this statement should promote the conservation and integrity of natural forests in order to maintain ecosystem services, most of the forest has been degraded and/or replaced by extensive agriculture fields, cattle raising, and urban expansion, among others. Even though a reduction in deforestation annual rate has been reported for the country (<http://www.sifgua.org.gt/Cobertura.aspx>), this tendency does not necessarily represent natural forest gain. In the tropics, commercial forest plantations (i.e., Teak, Rubber, Melina, Eucalyptus) are responsible for a gain in forested area (Guerra-De la Cruz and Galicia, 2017), and this trend seems to be happening in Guatemala, mainly with coniferous species. These forest plantations are cultivated and intensively managed to produce timber or raw material for industry and trade (Guerra-De la Cruz and Galicia, 2017), yet, this traditional way to recover degraded lands focuses in only one service (timber production), and this vision must change for the benefit of human population. Nevertheless, there is still hope and new collaborations have arisen to recover degraded lands with a more comprehensive approach. The National Forest Institute (INAB, Spanish acronym), with the support of local and international organizations, is leading restoration processes in different ecosystems in the country. One of the main mechanisms to accomplish this goal is the PROBOSQUE<sup>#</sup> program which pays incentives to owners of degraded lands in exchange for the implementation of restoration projects to recover the structure and functionality of the forest landscape. However, the information to sustain these restoration actions is still needed, such as: which tree or shrub species use, sowing and management parameters, surveys, among others. Through a cooperative agreement with The International Tropical Timber Organization (IITO, PD 765/14 Rev.4 (F)), INAB intends to improve the actions for forest landscape restoration and to fill the existing gaps in national programs where restoration techniques are required. Usually, the restoration actions requires the use of native species of high value (ecological, commercial, social and/or cultural), nonetheless, some of these species are not available at local nurseries, so in many regions other species traditionally promoted to establish forest plantations are used (i.e., Pine, Cedar, Melina, Mahogany). Although monocultures may be considered as a restoration technique, we are not fully accomplishing the main goal, that is, to recover the structure and functionality of

degraded forests to preserve multiple ecosystem services used by humans (genetic resources, food, water, wildlife, soil formation, flood control, carbon sequestration, climate regulation, landslide control, erosion control, groundwater recharge) . Through this OITT agreement we focus on strengthening the technical resource and updating restoration criteria at INAB. Since 2019 we have trained more than 60 technicians from INAB and other institutions (i.e., municipalities, academy, NGOs, communities); we have contributed to the development of restoration management plans in the following provinces: Alta Verapaz, Baja Verapaz, Peten, San Marcos, Totonicapán, Quetzaltenango, El Progreso and Santa Rosa. In addition, collaborative agreements have been signed to provide technical support on restoration issues with municipalities, communities, and the academy. Eight students have been funded to develop restoration projects in Pine-Oak, Conifer and cloud forest ecosystems, which have focused on identifying the tree/shrub species that can be used in active restoration processes by testing germination rates, survival and growth. In fact, some of these species have already been suggested to recover three degraded areas in the Verapaces region (32 ha in total), projects that were entered under the PROBOSQUE program and that are pending evaluation by INAB to be approved. Although there is much to do, we believe that multilateral efforts will strengthen local capacities to restore the country's degraded land in order to conserve and preserve the goods and services generated by forests. Additionally, we expect that this line of work allows the implementation of actions agreed in the National Strategy for Landscape Restoration (Mesa de Restauración del Paisaje Forestal de Guatemala, 2015), as a mechanism of country coordination and effort to restore degraded lands.

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*Spanish Version*

## **Fortaleciendo las acciones de restauración del paisaje forestal en Guatemala**

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Guatemala ha sido categorizado como país megadiverso por su alto endemismo, biodiversidad, y patrimonio cultural. Aunque esta declaración debería de promover la conservación e integridad de bosques naturales para preservar los servicios ecosistémicos, la mayoría de los bosques han sido degradados y convertidos en grandes extensiones agrícolas, potreros, expansión urbana, entre otros. Si bien la tasa de deforestación anual se ha reducido en el país (<http://www.sifgua.org.gt/Cobertura.aspx>), esta tendencia no necesariamente representa una ganancia de bosque natural. En el trópico, las plantaciones forestales (ejemplo, Teca, Hule, Melina, Eucalipto) son responsables de la ganancia de áreas con cobertura forestal (Guerra-De la Cruz and Galicia, 2017), en el caso de Guatemala este patrón se evidencia con especies de coníferas principalmente. Estas plantaciones son cultivadas y manejadas intensivamente para producir madera o materiales crudos para la industria y el comercio (Guerra-De la Cruz and Galicia, 2017), sin embargo, esta manera tradicional de recuperar tierras degradadas se enfoca en un solo servicio (por ejemplo, producción de madera), una visión que debe de cambiar para beneficio de la población humana. Pero, aún hay esperanza y nuevas colaboraciones han surgido para restaurar tierras degradadas con una visión más inclusiva. El Instituto Nacional de Bosques (INAB), con apoyo de organizaciones de cooperación, lidera procesos de restauración en diversos ecosistemas del país. Uno de los mecanismos principales para cumplir con este objetivo lo constituye el Programa de Incentivos Forestales PROBOSQUE<sup>#</sup>, el cual paga incentivos a propietarios de tierras degradadas para que, a través de distintos proyectos de restauración de tierras forestales degradadas, se restaure la estructura y funcionalidad del paisaje forestal. Sin embargo, aún es necesaria la generación de información que sustenten las acciones de restauración implementadas en campo, tales como: especies arbóreas o arbustivas a utilizar, parámetros de siembra y manejo, monitoreos, entre otros. A través de un acuerdo colaborativo con la Organización Internacional de Maderas Tropicales (IITO, PD 765/14 Rev.4 (F)) se pretende complementar y fortalecer el trabajo que se realiza en el marco del Programa de Incentivos Forestales. Usualmente, las acciones de restauración requieren de especies nativas de alto valor ecológico (comercial, social, y/o cultural), pero de algunas especies no existe disponibilidad en viveros locales, por lo que en muchas regiones se utilizan aquellas que tradicionalmente son promovidas para el establecimiento de plantaciones (ejemplo, Pino,

Caoba, Cedro, Melina) contribuyendo parcialmente al objetivo principal de la restauración, que es, la recuperación de la estructura y funcionalidad de bosques degradados para preservar múltiples servicios ecosistémicos utilizados por humanos (recursos genéticos, alimento, agua, vida silvestre, formación de suelo, control de inundaciones, secuestro de carbono, regulación del clima, control de deslizamiento, control de erosión, recarga de agua subterránea). A través del presente acuerdo con la OITT nos enfocamos en fortalecer el recurso técnico y actualizar los criterios de restauración del INAB. A la fecha hemos capacitado a más de 60 técnicos del INAB y otras instituciones (ejemplo, municipalidades, academia, ONGs, comunidades); se ha contribuido a la generación de planes de manejo con fines de restauración para Alta Verapaz, Baja Verapaz, Petén, San Marcos, El Progreso, Santa Rosa. Se han firmado convenios/cartas de colaboración para proveer soporte técnico en temas de restauración con municipalidades, comunidades y la academia. Ocho estudiantes han sido financiados para desarrollar proyectos de restauración en ecosistemas de Pino-Encino, Coníferas y Bosque Nuboso, tales investigaciones se han enfocado en identificar las especies arbóreas o arbustivas que puedan utilizarse en los procesos de restauración activa evaluando tasas de germinación, sobrevivencia y crecimiento. De hecho, algunas de las especies identificadas han sido sugeridas para restaurar tres áreas degradadas en la región de las Verapaces, proyectos que fueron ingresados bajo la modalidad de restauración y que están en espera de ser evaluados por INAB para aprobar los incentivos correspondientes. Pese a que hay mucho por hacer, creemos que los esfuerzos multilaterales fortalecerán las capacidades locales para restaurar las áreas degradadas del país, a fin de conservar y preservar los bienes y servicios generados por los bosques. Además, se espera que esta línea de trabajo permita implementar las acciones consensuadas a nivel nacional y plasmadas en la Estrategia Nacional de Restauración del Paisaje de Guatemala, como un mecanismo de coordinación y esfuerzo nacional.

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## Forestry in Scotland and the UK

As Reported in *Scottish Forestry* (SF), the journal of the Royal Scottish Forestry Society (www.rsfs.org), Carol Crawford, Editor (editor@rsfs.org.uk)

Compiled by Richard Reid, SAF, Clarkston, WA

From the Autumn 2019 issue, Vol. 73, No. 2

### Research Articles

Shelterbelt trials in the Outer Hebrides after fifty years: a study in competition, survival and succession. Paul A. Smith, University of Southampton, p.a.smith@soton.ac.uk

### Abstract

Shelterbelt trials were established in North Uist and Lewis in the Outer Hebrides in 1963 as part of a programme to evaluate the suitability of a wide range of species to grow in extremely exposed conditions. They were supplemented by further planting in the first few years, and evaluated in 1972, 1973 and 1990. The sites were revisited in 2016-18 and the survival and conditions of species were evaluated. The planting plans are partly reconstructed from the surviving specimens. All plots were very densely planted, suffered from windthrow and did not provide a timber crop, but some species had reasonable survival rates, provided shelter and have acted as nurse areas for a range of self-seeded species.

The Outer Hebrides have been largely treeless in modern times, with native trees largely restricted to cliffs, islands and loch margins, where they are protected from muirburn and grazing.

Scotland's native wild apple--*Malus sylvestris*: genetic issues and conservation. Rick Worrell, Markus Ruhsam, James Renny, Will Jessop and Graeme Findlay. Lead author contact rick@thinkingtrees.co.uk

### Summary

Wild apple trees (*Malus sylvestris*(L.) (Mill.) have been "off the radar" for foresters and ecologists, to the extent that they generally go unnoticed and many professionals are unsure how to identify them. This paper confirms that wild apple is a natural component of ancient woodland and wood pasture across much of Scotland and northern England. Wild apple has been unobtrusively hybridizing with domestic apple such that 27% of apparent wild apples are in fact hybrids. There are still relatively pure populations of wild apples in several upland regions, with strongholds in the Southern Highlands, Galloway and the Lake District; in lowland, populated areas of Scotland where domestic apples are common about 50% of the trees are hybrids. Asiatic apples have also been planted in forests, and are now naturalising and starting to hybridise with other apples. The paper gives guidance on how to identify wild apples and how to organise genetic conservation measures by using appropriate rare seed sources.

## Feature Article

### Future for red squirrels

(Note: The importation of grey squirrels into Scotland from North America has been a nightmare for the native red squirrels. During a visit to Scotland years ago your editor suggested that perhaps a solution would be to allow hunting of greys, noting that they can be tasty and that the tails are useful in tying fishing flies. The idea was not well received. -- RR)

The article introduces key organisations aiming to protect red squirrels and is followed by sections on red squirrel conservation, grey squirrel management, and potential for pine martens to suppress grey squirrel numbers in some areas.

The Saving Scotland's Red Squirrels (SSRS) project aims to protect red squirrels in the only region of mainland UK where it remains the only resident squirrel species: Grampian, Argyll and the Highlands.

A second aim is to protect red squirrels in a number of large landscapes across southern Scotland. Here populations of the native species are mostly intermixed with the invasive grey squirrel, but are still widespread and contiguous with the largest English red squirrel populations.

### Travel Opportunities

The Royal Scottish Forestry Society has regularly scheduled field trips to various locations in Scotland, elsewhere in the UK and Europe. This is an opportunity to meet your professional counterparts and forest owners.

### For details

Visit the web site [www.rsfs.org](http://www.rsfs.org).

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*English Version***University Extension**

Successful closure of the “Ecological Sidewalks” extension project.

The Federal University of Mato Grosso-Sinop campus present in the extension activities in the municipality of Sinop. Mato Grosso, Brazil.

Pastor Amador Mojena<sup>1</sup>; Leni Zilioto<sup>2</sup>

<sup>1</sup>. Forest Engineer. Ph.D in Forest Sciences. Professor at the Federal University of Mato Grosso, President of the urban forest-Sinop Association.

<sup>2</sup>. Project Coordinator at Escola Regina Pacis. Synopsis Mato Grosso. Brazil.

Attended by representatives of the Federal University of Mato Grosso-Campus Sinop, the Sinop Urban Forest Association, and the Regina Pacis Lobo Guar Ecological Patrol held its last activity of the year, December 7, with a celebration at the College, followed by tree planting in Bible Square, downtown Sinop, Mato Grosso, Brazil.

The Ecological Sidewalks Project, linked to the Arborization and Landscaping group of the Federal University of Mato Grosso-Campus Sinop, Brazil, had as objectives:

- Analyze, through the application of a questionnaire, the perception of the inhabitants of the city in relation to the ecological sidewalks: their conception, their relation with the environment, their needs and desires.
- Aid to students from Regina Pacis school of Sinop municipality in the qualitative and quantitative diagnosis of ecological sidewalk as a sustainable drainage system
- Assist the students of Regina Pacis School of Sinop in the preparation of didactic works on the ecological sidewalk.

The monthly meetings during the year 2019 yielded several campaigns, a lot of study and significant environmental actions, promoting the human formation of young people towards an environmental and solidary awareness.

At the time, I was stressed the importance of Extension Projects developed by students of the Forest Engineering course coordinated by Professor Ph.D Pastor Amador Mojena with the Patrol “Lobo Guar” of the referred school, the academic activities and field research aimed to awaken in the future. social and environmental managers the feeling of care for the environment and its neighbor, necessary posture for the sustainability of the planet and for the health of society. Representatives of each entity expressed interest in staying for 2020 by the positive results of each Patrol action.

In this activity, the “Lobo Guair” patrols received the certificates for their participation in the Academic Week of the Federal University of Mato Grosso-Campus Sinop for the banner presentation of ecological sidewalks.

To end the afternoon activities, patrollers, members of the Forest Engineering course and the Urban Forest Association headed to the Bible Square where 70 trees were planted, an action coordinated by Mr. Gabriel Pasin, a member of the Urban Forest Association.



*Spanish Version*

## **Extensão Universitária.**

### **Exitoso fechamento do projeto de extensão “Calçadas Ecológicas”.**

A Universidade Federal de Mato Grosso- campus Sinop presente nas atividades de extensão no município de Sinop. Mato Grosso, Brasil.

Pastor Amador Mojena<sup>1</sup>; Leni Zilioto<sup>2</sup>

1. Engenheiro Florestal. Doutor em Ciências florestais. Professor da Universidade Federal de Mato Grosso, Presidente da Associação Floresta Urbana-Sinop.
2. Coordenadora de Projetos na Escola Regina Pacis. Sinop. Mato Grosso. Brasil.

Com a presença de representantes da Universidade Federal de Mato Grosso-Campus Sinop, da Associação Floresta Urbana-Sinop, e a Patrulha Ecológica Lobo Guará do Colégio Regina Pacis realizou a sua última atividade do ano, dia 7 de dezembro, com uma confraternização no Colégio, seguida de plantio de árvores na Praça da Bíblia, centro de Sinop, Mato Grosso, Brasil.

O Projeto Calçadas Ecológicas, vinculado ao grupo Arborização e Paisagismo da Universidade Federal de Mato Grosso-Campus Sinop, Brasil, teve como objetivos:

- Analisar, por meio da aplicação de questionário, a percepção dos habitantes da cidade em relação às calçadas ecológicas: sua concepção, sua relação com o meio ambiente, suas necessidades e anseios.
- Auxiliar aos alunos da escola Regina Pacis do município de Sinop no diagnóstico qualitativo e quantitativo da calçada ecológica como sistema de drenagem sustentável
- Auxiliar aos alunos da escola Regina Pacis do município de Sinop na preparação de trabalhos didáticos sobre a calçada ecológica

Os encontros mensais durante o ano 2019 renderam várias campanhas, bastante estudo e ações ambientais significativas, promovendo a formação humana de jovens no sentido de uma consciência ambiental e solidária.

Na oportunidade, foi ressaltada a importância de Projetos de Extensão desenvolvidos por estudantes do curso de Engenharia Florestal coordenada pelo Professor Dr. C Pastor Amador Mojena com a Patrulha “Lobo Guará” da referida escola, as atividades acadêmicas e pesquisa de campo visaram despertar nos futuros gestores sociais e ambientais o sentimento de cuidado com o ambiente e com o seu próximo, postura necessária para a sustentabilidade do planeta e para a saúde da sociedade. Os representantes de cada entidade demonstraram interesse em manter-se para o ano de 2020 pelos resultados positivos de cada ação da Patrulha.

Na referida atividade os patrulheiros “Lobo Guairá” receberam os certificados pela sua participação na Semana Acadêmica da Universidade Federal de Mato Grosso-Campus Sinop pela apresentação em banner de pesquisa sobre calçadas ecológicas.

Para encerrar à tarde de atividades, patrulheiros, membros do curso de Engenharia Florestal e da Associação Floresta Urbana, se dirigiram à Praça da Bíblia na qual foram plantadas 70 árvores, uma ação coordenada pelo Sr. Gabriel Pasin.



## University of Viçosa Video

The University of Viçosa in the State of Minas Gerais has one of the best forestry schools in Brazil. The university has a long tradition in forestry education, In the 1960s the first forestry school in Brazil was established at the University of Viçosa.

A video on the current forestry work at the University of Viçosa can be found at:  
<http://www.orrforest.net/saf/Vicosa.MP4>

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## Press Release

International Union of Forest Research Organizations

### New Leadership in IUFRO – John Parrotta Follows Mike Wingfield as President

(Curitiba, 5 October 2019) As of today, the International Union of Forest Research Organizations (IUFRO) has a new President. Dr. John Parrotta, National Research Program Leader for International Science Issues with the U.S. Forest Service, has assumed office for the term until the 2024 IUFRO World Congress in Stockholm, Sweden. He is joined in this leadership role with the new Vice-Presidents Prof. Daniela Kleinschmit, Freiburg University, Germany, and Prof. Shirong Liu, Chinese Academy of Forestry.



Dr. Parrotta follows Prof. Mike Wingfield, FABI Professor and Advisor to the Executive of the University of Pretoria, South Africa, who served IUFRO as President for the past five years, and under whose Presidency the organization celebrated its amazing 125<sup>th</sup> anniversary. During his term Prof. Wingfield has strongly promoted the great responsibility of IUFRO to provide solid and reliable data that will underpin some of the most important decisions relating to forests and natural resources for a sustainable future. He has also placed special emphasis on strengthening the involvement of young forest scientists through close cooperation with the International Forestry Students' Association (IFSA), which has now also been provided with full representation on the IUFRO Board.

At the closing ceremony of the 25<sup>th</sup> IUFRO World Congress in Curitiba, Brazil, incoming President Dr. Parrotta made an enthusiastic acceptance speech, in which he particularly stressed the important role that the forest science community has to play in the world. "The world needs what IUFRO has to offer," he said. "However, the sustainable development challenges we face are multi-faceted, and extend beyond the traditional and even current scope of forest science. The good news is that we are not alone. IUFRO can multiply its impact by expanding our collaboration in research, science synthesis and communications well beyond the boundaries of our current network."

During his five year term Dr Parrotta wishes to especially focus on fostering collaboration with scientists and research networks with whom IUFRO is not sufficiently engaged. This may include, for example, fields such as agriculture, human health, spatial planning, environmental engineering, environmental education, the arts and humanities. "Diversity is IUFRO's strength," he said, "The productivity, health, and the many benefits we derive from forests are underpinned by biodiversity. Similarly, IUFRO's scientific excellence and value to society depend on engaging the diversity of disciplinary perspectives, knowledge, experience, and cultural values among our scientists and member organizations."

Dr. Parrotta has engaged in various areas of forest science research worldwide for over 30 years, and has a particular interest in tropical forest ecology, the ecology and management of planted forests, forest restoration, and traditional forest knowledge. He has conducted research in Puerto Rico and Brazil, worked collaboratively with many colleagues from around the world on a variety of science syntheses and other projects. He is the author of over 175 scientific publications on these and other topics, and a member of the editorial board of several international forest science journals. He has been active in IUFRO since 1993 and has served as Vice-President for Task Forces, Special Programmes, Projects and IUFRO-led Initiatives for the last five years.

**Media contact:** Gerda Wolfrum, International Union of Forest Research Organizations (IUFRO), wolfrum@iufro.org

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The **International Union of Forest Research Organizations (IUFRO)** is the only worldwide organization devoted to forest research and related sciences. Its members are research institutions, universities, and individual scientists as well as decision-making authorities and other stakeholders with a focus on forests and trees: <https://www.iufro.org/>

**ANNOUNCEMENTS/ EVENTS/MEETINGS/OPPORTUNITIES****Terra Viva Grants Directory funding opportunities**

The Terra Viva Grants Directory is an online information service. We share funding opportunities for the developing world in the subject areas (1) Agriculture, Fisheries, Forestry; (2) Biodiversity, Conservation, Wildlife; (3) Energy, Climate Change; (4) Water Resources; and (5) Cross-Cutting Subjects.

**Funding News**

Our Funding News is a blog of open calls for proposals that we update several times per month. The grant opportunities contain application deadlines by months, subject areas, and forms of grant support.



## Grant Maker Profiles

We publish short profiles of international grant makers. This section is a guide to the world's principal grant makers by subject areas. Profiles are updated once a year. You can browse through over 800 grant programs with regional coverage for the developing world. Some grant makers post regular calls for proposals, others accept applications on a rolling basis.

The funding news and profiles of grant makers are available for free on our website. If you want to save time, need email alerts and, or want access to a searchable database with multiple filter options. We offer memberships at a micro-price with access to:

### Searchable Database

The database helps you filter large amounts of grants data in a short time. You can search grants and other funding opportunities by subjects, world regions, application deadlines, countries of the grant makers, and when to apply.

### Funding Alerts

Funding alerts are grant opportunities and scholarships from the funding news sent to your email inbox. You can sign up to receive newsletters from any of our main categories and for as many subject areas as you want.

### Monthly Updates

The monthly updates give you a summary of all grants posted in the previous 30 days. This newsletter is sent to your email inbox and contains grants posted in the Directory during the previous 30 days. The monthly update is organized in calendar format and shows profiles of grant makers that were updated and added during this period.

Learn more at: [www.terravivagrants.org](http://www.terravivagrants.org)

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## **Forest Monitoring Funding Opportunity**

Global Forest Watch (GFW) is pleased to announce a call for applications for the 2020 Small Grants Fund. The Small Grants Fund awards up to \$40,000 (USD) and technical assistance to civil society organizations seeking to use satellite-based early warning systems to combat tropical deforestation through forest monitoring and enforcement, advocacy and community engagement. The application is open from January 15<sup>th</sup> – March 31<sup>st</sup>, 2020, and projects will run from August 2020 to July 2021. More information, including eligibility criteria and a link to the application, can be found on the Small Grants Fund webpage.

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## **4<sup>th</sup> Annual National Cohesive Wildland Fire Management Strategy Workshop**

4<sup>th</sup> Annual National Cohesive Wildland Fire Management Strategy Workshop, October 26-30, 2020.

The International Association of Wildland Fire is presenting this workshop in partnership with the Wildland Fire Leadership Council (WFLC) and the Western, Southeast and Northeast Regional Strategy Committees.

<https://www.iawfonline.org/event>

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### **3<sup>rd</sup> International Smoke Symposium**

3<sup>rd</sup> International Smoke Symposium, April 20-24, 2020 at Raleigh, North, Carolina and UC Davis, California and Virtually.

*Presented by*

- International Association of Wildland Fire

*In partnership with*

- NWCG Smoke Committee;
- UC Davis Air Quality Research Center; and
- UC Davis School of Medicine.

The symposium will be an international nexus of research, management and policy with a target audience of governmental air quality regulators; land managers and fire practitioners; research and extension communities; public health professionals; air quality and fire weather forecasting communities; and climate change researchers.

<https://www.iawfonline.org/event/3rd-international-smoke-symposium/>

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## **Joint Meeting Announcement**

Joint Meeting

Society for Economic Botany

International Society of Ethnobiology

May 31 - June 4th, 2020

The University of The West Indies, Kingston, Jamaica

In collaboration with The New York Botanical Garden



*The University of the West Indies campus*



More information:

<https://www.econbot.org/home/meetings/economic-botany-2020.html>

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## 7<sup>th</sup> Biennial Conference of the Forests and Forest Products Society



**Forests and Forest Products  
2020**

**7<sup>th</sup> Biennial Conference**

**Theme:**  
*Forest Production and Products in a  
Diversifying Economy for Sustainable  
Livelihoods.*

**April 20<sup>th</sup> – 24<sup>th</sup>, 2020**

**Call for papers**

**Venue: University of Uyo, Uyo, Nigeria**

The announcement link is:

<https://www.eventbrite.com/e/7th-biennial-conference-of-the-forest-and-forest-products-society-ffps-tickets-84881610181>

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## **II Regional Symposium of Urban Floresta and The I International Symposium of Urban Silviculture**

### **News**

#### *English Version*

The Floresta Urbana association with the collaboration of the Federal University of Mato Grosso, Campus-Sinop, opens the call for the II REGIONAL SYMPOSIUM OF URBAN FLORESTA and the I INTERNATIONAL SYMPOSIUM OF URBAN SILVICULTURE to be held between the days 22, 23 and 24 October 2020, in the city of Sinop, Mato Grosso, Brazil.

The event will feature the themes: Urban Forestry, Landscape Architecture, Environmental Education and the healing power of trees in preventive medicine. This unique, exciting and innovative union of science, laser, entertainment and environmental education will be in analysis and discussion by forestry engineers, agronomists, professionals in the area of environment, architects and urban planners, health professionals, teachers, extension workers, students (graduation and post-graduation), the works may be presented as individual proposals, groups of research projects or projects executed for any of the themes of the event. The experiences developed by municipal, state and government governments will be welcome.

In the discussion of the themes, the Urban Forest Association will show the visitor a city in harmony with the living and green nature back to our daily life.

In the context, Urban Forestry as a tool for environmental education. As urban society is the biggest demand for an environmental service of forests, it will emphasize the need for school children to really know the forest and all the functions it performs for the benefit of the community.

Landscape architecture as a discipline that combines management, planning, design and construction of outdoor spaces, possessing the role of conserving them respecting the nature configuration in a conscious way, with the aim of enriching the premises so that they are functional, sustainable and suitable for ecological and human needs.

Being in touch with nature improves health and quality of life. Urban forests apart from promoting or being, also play an important role in the prevention of physical and mental diseases.

#### **For more information**

Visit the site Association Floresta Urbana-Sinop.

<https://florestaurbanasinop.wixsite.com/brasil>

## Noticia

### *Spanish Versión*

La asociación Floresta Urbana con la colaboración de la Universidad Federal de Mato Grosso, Campus-Sinop, , abre la convocatoria para el II SIMPÓSIO REGIONAL DE FLORESTA URBANA y el I SIMPÓSIO INTERNACIONAL DE SILVICULTURA URBANA a ser realizado entre los días 22, 23 e 24 de octubre de 2020, en la ciudad de Sinop, Mato Grosso, Brasil.

El evento contara con las temáticas: Silvicultura Urbana, Arquitectura de Paisaje, Educación Ambiental y el poder curativo de los árboles en la medicina preventiva. Esta unión única, emocionante e innovadora de ciencia, laser, entretenimiento y educación ambiental estarán en análisis y discusión por Ingenieros forestales, agrónomos, profesionales en al área de medio ambiente, arquitectos y urbanistas, profesionales de la salud, profesores, extensionistas, alumnos (graduación y pós-graduación ), los trabajos podrán ser presentados como propuestas individuales, de grupos de proyectos de investigación o de proyectos ejecutados para cualquiera de las temáticas del evento. Las experiencias desarrolladas por gobiernos municipales, estaduais y gubernamentales serán bien venidas

En la discusión de las temáticas la Asociación Floresta Urbana mostrara al visitante una ciudad en armonía con la naturaleza viva y verde de regreso a nuestro cotidiano.

En el contexto, la Silvicultura Urbana como herramienta para la educación ambiental. Al ser la sociedad urbana la mayor demandante de un servicio medio ambiental de los bosques, se enfatizara en la necesidad de que los escolares conozcan realmente el bosque y todas las funciones que esta efectúa en beneficio de la colectividad.

La arquitectura del paisaje como disciplina que combina gestión, planificación, diseños y construcción de espacios exteriores poseyendo el papel de conservarlos respetando la configuración de la naturaleza de forma consciente, con el objetivo de enriquecer los locales para que sean funcionales, sustentables y adecuados para las necesidades ecológicas y humanas.

Estar en contacto con la naturaleza mejora la salud y la cualidad de vida. Los bosques urbanos aparte de promover o bien estar, también desempeñan un importante papel en la prevención de enfermedades físicas y mentales.

Contactos: Dr. C. Pastor Amador Mojena. Presidente de la asociación Floresta Urbana

[Pamadormojena@hotmail.com](mailto:Pamadormojena@hotmail.com) and [simposioflorestaurbana@gmail.com](mailto:simposioflorestaurbana@gmail.com)

Para mayores informaciones visite el site Asociación Floresta Urbana-Sinop. <https://florestaurbanasinop.wixsite.com/brasil>

**CPAM Short Course 2020****2020**

CENTER FOR PROTECTED  
AREA MANAGEMENT  
COLORADO STATE UNIVERSITY



### **XXX Curso Internacional de Manejo de Áreas Protegidas (*impartido en español*)**

*7 de julio al 8 de agosto, 2020*

Ofrecido en colaboración con la Oficina de Programas Internacionales del Servicio Forestal de los EE.UU., este curso se centra en los desafíos involucrados en la planificación y gestión de áreas protegidas. Impartido totalmente en español, el curso de 32 días combina clases, ejercicios en grupo y salidas de campo a áreas protegidas de diferentes categorías, tipos de usos y desafíos de gestión en Colorado y Utah. Los temas cubiertos incluyen planificación y gestión de sistemas de áreas protegidas; corredores de conservación y zonas de amortiguamiento; manejo de recursos naturales; mitigación de impactos de proyectos de desarrollo; financiamiento de la conservación; gobernanza, colaboración y resolución de conflictos; interpretación ambiental; turismo y recreación; investigación, efectividad de gestión; cambio climático; y liderazgo personal y profesional. El costo, excluyendo pasajes y visas, es \$6.795 USD. La fecha límite para postularse es el 3 de febrero de 2020. Para más información y para el link para postularse visite:

<https://warnercnr.colostate.edu/cpam/curso-de-manejo-de-areas-protegidas/>

### **VIII Mobile Seminar on Tourism in Protected Areas (*given in English*)**

*September 3 – 19, 2020*

The Mobile Seminar on Planning and Managing Tourism in Protected Areas is an intensive, 2.5-week field-based training event for professionals working to promote sustainable tourism and outdoor recreation in protected areas globally. It is given in partnership with the US Forest Service International Programs. Seminar themes include planning and zoning for public use and tourism in protected areas; legal, financial and policy frameworks; institutional arrangements and governance including public-private partnerships; interpretation and environmental education; and tourism infrastructure. The seminar travels through Colorado, Wyoming, Montana and South Dakota and makes visits to national parks, forests, monuments, state and local parks, a guest ranch, and a tribal reservation. The seminar visits Yellowstone, Grand Teton, Badlands and Rocky Mountain national parks, Black Hills National Forest; Devils Tower National Monument and Mount Rushmore National Memorial. Cost excluding airfare and visas is \$5,695. Deadline to apply is May 8, 2020. To apply and for more information visit

<https://warnercnr.colostate.edu/cpam/seminar-tourism-protected-areas/>

Centro para el Manejo de Áreas Protegidas,  
Universidad Estatal de Colorado



<https://conservation.warnercnr.colostate.edu/>



<https://www.facebook.com/centerforprotectedareamanagement>

**Guía de Cursos Cortos  
Short Course Guide**



CENTER FOR PROTECTED  
AREA MANAGEMENT  
COLORADO STATE UNIVERSITY



2020

## II Seminar on Women's Leadership in Conservation *(given in English)*

October 19 – 30, 2020

The Women's Leadership in Conservation Seminar is a 12-day intensive training program that brings together mid-career women from around the world who are in position to make positive impact in the fields of biodiversity conservation, protected area management, climate change, and sustainable development in their communities, countries, and around the globe. The seminar responds to the current challenge of reducing inequality in the workplace and empowering women from different sectors that are acting as catalyst for change by mainstreaming biodiversity conservation into development programs. It also responds to the increase of women in the natural resources management workforce who are professionals performing as protected area managers, educators, communicators, advocates, and technical experts, among others. Participants will gain practical tools that will help them develop their individual leadership to influence change in their organizations and communities. For more information, please visit:

<https://warnercnr.colostate.edu/cpam/gender-protected-areas/>

## Seminario Internacional sobre Manejo de Áreas Protegidas Marinas y Costeras

En desarrollo para 2020

Este seminario seguirá el modelo utilizado en cursos similares de capacitación llevados a cabo por nuestro centro en los EE.UU. desde 1990. El seminario se realizará en alianza con el Parque Nacional de Galápagos, su personal técnico y socios. La audiencia meta son profesionales que trabajan en agencias gubernamentales, organizaciones de conservación, la academia y el sector privado, involucrados en la planificación y manejo de las áreas protegidas costeras, marinos e insulares, que al finalizar el evento se constituirán en una comunidad de aprendizaje. El seminario será intensivo y utilizará las Islas Galápagos (el Parque Nacional y la Reserva Marina) como un salón de clases al aire libre para abordar buenas prácticas de gestión de áreas protegidas insulares, costeras y marinas en América Latina y el Caribe. Para mas información, favor de visitar:

<https://conservation.warnercnr.colostate.edu/>

Centro para el Manejo de Áreas Protegidas,  
Universidad Estatal de Colorado



<https://conservation.warnercnr.colostate.edu/>



<https://www.facebook.com/centerforprotectedareamanagement>



## SAF INTERNATIONAL WORKING GROUP NEWS

### Join an SAF Working Group

This newsletter goes out to people beyond SAF members, but if you are on the working group list you receive this newsletter.

*As a member of the Society of American Foresters* you can join SAF working groups by going to the website:

Join a working group [here](#):

If you want to join, or rejoin, this working group, we are B3, the International Forestry Working Group. Please pass this information along to SAF members who might be interested in joining a working group – especially B3, the International Forestry Working Group.

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## International Society of Tropical Forestry News

### 1. Tropical Forestry Notes I and II.

Frank Wadsworth has complete Volumes I and II of a compendium of summaries of the salient points of recent abstracts in tropical forestry literature. Volume I can be downloaded from <http://www.orrforest.net/saf/TropicalForestryNotes1to20.pdf> and Volume II can be downloaded from <http://www.orrforest.net/saf/TropicalForestryNotes21to40.pdf>. Frank is one of the founders of the original ISTF when it was established in the 1950s. From 1942 to 2000 Frank was with the International Institute of Tropical Forestry in Puerto Rico, as a researcher, then as director, and then again as a researcher. Tropical silviculture has been his focus, but he also has strong interests in wildlife and conservation, and has worked in many tropical countries. Frank is interested in corresponding with ISTF members on tropical forestry issues. Please send a message to [frankhwadsworth@gmail.com](mailto:frankhwadsworth@gmail.com) or [tropicalforesters@gmail.com](mailto:tropicalforesters@gmail.com).

Frank's book *Forest production for tropical America (Producción forestal para América tropical)* is available for download in English at <https://www.fs.usda.gov/treearch/pubs/48916> . It is available in Spanish at <https://naldc.nal.usda.gov/download/CAT11107057/PDF> .

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### 2. Africa Forest Forum manuals

The African Forest Forum (<https://afforum.org/> ) has a number of documents to assist with tropical forest management. Recent manuals that have been shared with ISTF can be accessed at [this link](#).

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### 3. Best practices for management of private forests in Puerto Rico.

Oscar Abellera has made available a presentation on best practices for management of private forests in Puerto Rico (also applicable to other locations). It can be downloaded at [this link](#). Oscar also has other resources on his website at <https://www.uprm.edu/oscarabelleira/inicio/> . Estos recursos son en español/ These resources are in Spanish.

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#### 4. Queen's Commonwealth Canopy (QCC).

The QCC, in collaboration with the Commonwealth Forestry Association (CFA) is committed to raising awareness within the Commonwealth of the value of indigenous forests and to saving them for future generations. It will create a unique network of forest conservation projects that brings collective credibility and integrity to individual Commonwealth initiatives. So far 45 out of 53 Commonwealth countries are participating with 60 projects. For more information on case studies, see <https://queenscommonwealthcanopy.org/> The documentary on the project, The Queen's Green Planet, can be viewed at <https://www.dailymotion.com/video/x6jtoen> .

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#### 5. The Terra Viva Grants Directory

The Terra Viva Grants Directory is an online information service. We develop and manage information about grants for agriculture, energy, environment, and natural resources in the world's developing countries. We post [funding news](#) and [short profiles of grant makers](#) by subject areas which are available for free on our website.

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#### 6. Pulitzer Center's Rainforest Journalism Fund (RJF)

Pulitzer Center's Rainforest Journalism Fund (RJF) is accepting proposals to report on tropical rainforests in Southeast Asia, Congo Basin, and Amazon regions. The RJF is aimed at developing, promoting, and supporting journalism on issues related to tropical rainforests and climate change. Proposals should address the following subjects: 1) tropical rainforest-climate linkages, including social dimensions; 2) deforestation drivers; 3) solutions to halt deforestation. Learn more [here](#) and find out how to apply [here](#) (information available in English, French, Spanish, Portuguese, and Bahasa Indonesia). Email [nmoragalewy@pulitzercenter.org](mailto:nmoragalewy@pulitzercenter.org) with questions. Applications are reviewed on a rolling basis until June 2022

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#### 7. The UNDP Equator Prize 2020.

This eleventh cycle of the UNDP Equator Prize focuses on Nature for Life and, will recognize innovative initiatives from local communities and indigenous peoples that demonstrate exceptional achievements in the area of nature-based solutions for local sustainable development. Winning initiatives will be honored for their successes in protecting, restoring and/or sustainably managing biodiversity for positive development outcomes. The winners will join a prestigious network of 245 leading community-based organizations from 81 countries that have been awarded the Equator Prize since 2002. Each Equator Prize winner will receive USD 10,000 and will be supported to participate in a series of policy dialogues and special events during the IUCN

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World Conservation Congress in Marseille, France, in June 2020. To access the online nomination system, please visit [prize.equatorinitiative.org](http://prize.equatorinitiative.org). For more news about the Equator Prize follow it on Facebook @equatorinitiative, Twitter @equatorinit, or Instagram @equatorinitiative or visit the website [here](#).

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### **8. Keeling prize for innovation in addressing climate change.**

This prize of \$25,000 is awarded to 10 projects per year in the areas of Carbon Capture & Utilization, Energy Access, Finance, Transportation, and Social & Cultural Impacts. Application opens 1 November 2019 for the next round. See <https://www.kcurveprize.org/> for more information.

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### **9. Do you need volunteer (and/or paid) assistance for your international forestry project or research?**

The International Society of Tropical Foresters (ISTF), and the International Forestry Working Group of the Society of American Foresters (SAF), are looking for opportunities international forestry for volunteer or paid assistance. Many SAF and ISTF members ranging from students to retirees are looking for such opportunities.

If you know of any international programs that would be open to forestry and natural resource students or professionals please send the information to Bob Sturtevant, Chair of the SAF International Forestry Working Group ([robert.sturtevant@colostate.edu](mailto:robert.sturtevant@colostate.edu)). These can include programs that are only offered through your university or agency. They can also include non-profit and religious oriented programs. We are aware of some of the well-known opportunities: Peace Corps, Study Abroad and Semester at Sea; but there must be many more out there. Please share what you know!

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### **10. Volunteer projects for the ISTF Mission Committee.**

The ISTF Mission committee is looking for members who will be interested in completing specific tasks. These would include: 1) Membership engagement: a) Email forestry schools around world about membership; b) Email industry organizations about membership; 2) Mission Analyst: Analysis of survey results in more detail and come up with stats to present to board; 3) Membership Analyst: Analyze membership and come up with statistics to present to board; 4) Assist with developing ISTF website. If you are interested in serving on the Mission Committee and carrying out one of these tasks, please contact the ISTF Board members on the Mission Committee Ruth Metzler ([ngolela@gmail.com](mailto:ngolela@gmail.com)) or Paula Sarigumba (Secretary) [pausarigumba@gmail.com](mailto:pausarigumba@gmail.com).

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## 11. ISTF Senior Resource Pool.

The current ISTF List of senior resource people who are happy to receive questions include:

- **Ron Billings**[ronbillings41@gmail.com](mailto:ronbillings41@gmail.com). Forest pest management, pine bark beetle management in the Caribbean and Central America.
- **Patrick Durst** [pdurst.asiaforest@gmail.com](mailto:pdurst.asiaforest@gmail.com): Natural resources policy, economics, forest and landscape restoration, assisted natural regeneration, agroforestry, bio-energy, community forestry, forest foods (including edible insects), project development and management.
- **Eberhard F Bruenig**[eb Bruenig@yahoo.de](mailto:eb Bruenig@yahoo.de): Integrated Conservation and Management of Forests; 70 years of practice and research in forests of the temperate and tropical zones
- **Carl Mize** [carlmize@gmail.com](mailto:carlmize@gmail.com): For help with designed experiments - Experimental design of field and lab experiments.
- **John Schelhas**[John.schelhas@usda.gov](mailto:John.schelhas@usda.gov): Social and cultural aspects of private forests, including landowner decision-making, ways of valuing forests, diverse forestry options, and ethno-forestry.
- **Simon Shomkegh**[sshomkegh@uam.edu.ng](mailto:sshomkegh@uam.edu.ng): Forest resources management, ethnobotany and climate resilience building
- **Frank Wadsworth**[frankwadsworth@gmail.com](mailto:frankwadsworth@gmail.com): Tropical silviculture and tropical forestry in general
- **Jeff Wright**[patula.wright@gmail.com](mailto:patula.wright@gmail.com): Planted forests, nursery, genetic improvement, silviculture, wood quality, sustainable forest products.

If you are a senior forester and would like to be resource person for others to contact with questions, please send a message to [tropicalforesters@gmail.com](mailto:tropicalforesters@gmail.com) Please include your name, preferred email address for contact, and a two-line description of your expertise.

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## 12. ISTF Chapters.

If you are interested in starting an ISTF chapter but have not told us yet, please fill out [this survey](https://docs.google.com/forms/d/e/1FAIpQLSehc5LDeycz-91TY6SLZKFavVs3lePFTSKjmtW_gmArgJIQwg/viewform) ([https://docs.google.com/forms/d/e/1FAIpQLSehc5LDeycz-91TY6SLZKFavVs3lePFTSKjmtW\\_gmArgJIQwg/viewform](https://docs.google.com/forms/d/e/1FAIpQLSehc5LDeycz-91TY6SLZKFavVs3lePFTSKjmtW_gmArgJIQwg/viewform)) The support documents for developing ISTF chapter proposals can be accessed at [this link](https://drive.google.com/open?id=1v37p7yimTQynFLp0yvz8AwS8pfJaoYL) (<https://drive.google.com/open?id=1v37p7yimTQynFLp0yvz8AwS8pfJaoYL>) . If you have any questions, please contact [tropicalforesters@gmail.com](mailto:tropicalforesters@gmail.com).

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### 13. News for ISTF Update.

Any short items for the next ISTF update? Please send them to [tropicalforesters@gmail.com](mailto:tropicalforesters@gmail.com)

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### 14. Resources for Tropical Forestry.

We need to develop the link library for ISTF, in preparation for the prospective new website. To start, let us focus on “how to” guides for various aspects of tropical forestry. If you have open access publications that explain how to carry out anything relevant to tropical forestry, from clonal propagation to reforestation to..., please send a message to [tropicalforesters@gmail.com](mailto:tropicalforesters@gmail.com). Grey literature (government/organization/institution publications) is especially useful for this sort of thing. ISTF can handle publications in English, Spanish, and French. An already-compiled list of resources for tropical forestry and forests and links to those resources is available at [this link](https://drive.google.com/open?id=1kyuZX_kBgsCD-tDQTD0p1ONoOQyS7UnC3owivDDIBgI) ([https://drive.google.com/open?id=1kyuZX\\_kBgsCD-tDQTD0p1ONoOQyS7UnC3owivDDIBgI](https://drive.google.com/open?id=1kyuZX_kBgsCD-tDQTD0p1ONoOQyS7UnC3owivDDIBgI)). The links include websites, elists you can join, and sources of (free) publications. If you have additions to make to this list, please send a message to [tropicalforesters@gmail.com](mailto:tropicalforesters@gmail.com).

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### 15. ISTF Board.

The ISTF officers are: President: Warren K. (“Keith”) Moser; Vice-President: Ruth Metzler; Secretary: Maria Paula Sarigumba; Treasurer: Mike Sterner; Tropical Africa Representative: Daniel Kofi Abu; Tropical America Representative: Rene Zamora-Cristales; Tropical Asia-Pacific-Australia Representative: Patrick Durst. More information on the Board can be found at [this link](#).

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### 16. ISTF online resources.

The current online resources for ISTF include:

- 1) Blair Orr’s continuation of the former ISTF newsletter as a newsletter for the Society of American Foresters International Forestry Working Group. (Available at: <http://www.orrforest.net/saf/>). If you fill out the table, we will add you to the list for receiving this newsletter.
- 2) The old ISTF web page, still at <http://www.istf-bethesda.org/>
- 3) The ISTF Facebook group page at: <https://www.facebook.com/groups/2262122534/>
- 4) The ISTF Linked-In page at: <https://www.linkedin.com/groups/12150640/>
- 5) The ISTF twitter handle is @tropforester address: <https://twitter.com/tropforester>

- 6) Student chapter at Yale University, which sponsors the annual Yale ISTF conference: <http://istf.yale.edu/> , <https://www.facebook.com/yalefesistf/>
- 7) Student Chapter at North Carolina State University: <https://research.cnr.ncsu.edu/sites/istf/> , <https://www.facebook.com/NCSUISTF/>
- 8) [ISTF Organizing documents can be found at this link](#)

### 17. Membership in the Association des Forestiers Tropicaux et d’Afrique du Nord.

ISTF members are invited to join the Association des Forestiers Tropicaux et d’Afrique du Nord (AFT). The AFT embraces those interested in sustainable forestry and conservation for Tropical Africa and North Africa. It produces an annual bulletin, a newsletter 3 times a year, and it publishes books and organizes technical meetings focused on the regions of interest. The annual membership fee for individuals is 40 € for French citizens residing in France, 15 € for non-students outside of France, and 10 € for students. More information on AFT can be found at [this link](#) and the membership form can be found at [this link](#). For any questions, please contact the AFT president, Lanly Jean-Paul [jean-paul.lanly@orange.fr](mailto:jean-paul.lanly@orange.fr)

### 18. Membership in the Commonwealth Forestry Association.

We have been exploring how ISTF might collaborate/cooperate with the Commonwealth Forestry Association (CFA; <http://cfa-international.org/>). ISTF and CFA are aligned in their objectives, although ISTF is focused on tropical regions. CFA was founded in 1921 and is one of the oldest international forestry organizations. It has 1200 members in 78 Commonwealth and other countries. The CFA “promotes the conservation and sustainable management of the world’s forests and the contribution they make to peoples’ livelihoods”.

*This year the Commonwealth Forestry Association is launching a new free membership category – **Basic Membership** – for those who want to receive the CFA Newsletter in an electronic format, to read on your phone, tablet or PC. If you would like to join at the **Basic Membership** level please send an email to [cfa@cfa-international.org](mailto:cfa@cfa-international.org).*

In addition, CFA is offering ISTF members a discount of 20% on CFA **Professional Membership** fees. That would make the annual cost to ISTF members as follows (in GB£):

Type	Level	Country	Cost
Basic		All	Free
Professional	Standard	Developed	60£
		Developing	20£
	Plus	Developed	72£
		Developing	32£

Basic Membership includes the CFA Newsletter only.

Standard Membership includes the CFA Newsletter (both hard copy and online) and online only access to the International Forestry Review

Plus Membership provides the CFA Newsletter (both hard copy and online) and receipt of the online access and hard copy receipt of the International Forestry Review

If you are interested in becoming a member of CFA, please send a message to [tropicalforesters@gmail.com](mailto:tropicalforesters@gmail.com)

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## 19. Membership in the Association for Tropical Biology and Conservation.

ISTF members are invited to join the [Association for Tropical Biology and Conservation](#) (ATBC), a scientific professional society. The ATBC is global in scope, membership, and objectives. There are over 900 members from 67 countries. Members include students, researchers, educators, and conservation practitioners concerned with issues of science, conservation, development, and environmental policy in the tropics. The society holds annual meetings around the world, publishes the scientific journal [Biotropica](#), and is increasingly engaged in conservation and capacity building activities internationally. Regional chapters in Asia-Pacific, Neotropics, and Africa also organize events and annual meetings. More information on ATBC and membership can be found at this [link](#).

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## 20. ISTF membership.

ISTF now stands at ~1450 members. Help us keep growing! If you have any contacts that you would like to invite to join ISTF, you can use the following message:

Dear friends:

We hope you will be interested in joining the International Society of Tropical Foresters (ISTF). With its focus on being a communication network, ISTF can help you connect with others interested in tropical forests and forestry. ISTF was founded in the 1950s and “in response to a worldwide concern for the fate of tropical and subtropical forests, ISTF is committed to the protection, wise management and rational use of the world’s tropical forests”. So far, over 1270 people from around the world have joined. For now, the organization will be dues-free (although this is under discussion). If you would like to join, please fill out the membership form at [GoogleForms](#) .

### Questions?

Email [tropicalforesters@gmail.com](mailto:tropicalforesters@gmail.com)

Sheila Ward, ISTF Coordinator

**FROM THE ARCHIVES**

**1960 Timber Industry stamp from New Zealand**



## RECENT PUBLICATION AND RESEARCH NOTES

### **Agroforestry Systems and Practices in Nepal**

“Agroforestry Systems and Practices in Nepal”, jointly written by Swoyambhu Man Amatya, Edwin Cedamon, and Ian Nuberg has recently come to the hands of readers. Divided into 10 chapters with an introduction section, the book offers insight about the agroforestry that has been practiced in the hills of Nepal for centuries. The agroforestry has been an important aspect of life of the people as it has been enabling them to earn household income and reduce labour availability. The book sheds light on the current knowledge base for agroforestry that includes local farming system and socio-cultural dimensions.

In his foreword, Tony Bartlett, Forestry Research Programme Manager at the Australian Centre for International Agriculture Research, Canberra, said that the book builds on earlier work by Dr. Amatya and incorporates new knowledge and experiences gained over the past five years. Dr. Amatya said that as the understanding of how Nepalese agroforestry systems continues to grow, there are still rooms for improvement to meet the demands of the rapidly changing Nepal’s economy and society. “There was a realization that agroforestry could be a viable option of livelihood development especially in private farmlands of the country.:

The book is expected to help policy makers, experts, students and common readers understand the nitty-gritty of agroforestry and its socio-economic implications for Nepal.

**The content of the book is available from this website**

[https://www.iufro.org/download/file/29095/1317/Agroforestry\\_Systems\\_and\\_Practices\\_in\\_Nepal\\_2018\\_pdf/](https://www.iufro.org/download/file/29095/1317/Agroforestry_Systems_and_Practices_in_Nepal_2018_pdf/).

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ISBN: 978-9937-0-4026-6



**AGROFORESTRY SYSTEMS  
AND PRACTICES IN NEPAL**  
*(REVISED EDITION)*

**SWOYAMBHU MAN AMATYA  
EDWIN CEDAMON  
IAN NUBERG**

**June 2018**



Swoyambhu Man Amatya is a pioneer in developing agroforestry in Nepal. Especially in agroforestry he has written several booklets (both in Nepali and English language) and his research articles on agroforestry have been published in many national and international journals. He has contributed in the second edition of the Asia Pacific Agro forestry Profiles published by the Asia Pacific Agro forestry Network, FAO Regional Office for Asia and the Pacific, Bangkok, in 1996. He has the opportunity of working in Afganistan, Bhutan, North Korea, Thailand and Timor-Leste in the capacity of expert and consultant in the field of agroforestry.



Swoyambhu Man Amatya

Amatya holds a Ph.D degree in Economics from Tribhuvan University, Kathmandu, Nepal and M. Sc. from University of Oxford, United Kingdom (UK). He has been trained in Agroforestry from the Silsue College, University of Cranfield, UK.

He has served with the Government of Nepal in various capacities including Secretary at various Commissions and Ministries.

He has been recognized by various institutions for his contribution in forestry research and development. He has received Rastriya Pratiba Puraskar from the Ministry of Culture, Tourism and Civil Aviation and was also awarded by the then Royal Nepal Academy of Science and Technology King Birendra Science and Technology Academy Award for his contribution in developing agroforestry. He is also the recipient of V. S. Rao Prize for the best foreign student at the Indian Forest College, Dehra Dun, India.

Amatya is the Coordinator, Agroforestry Research Group (1.04.00) of International Union of Forestry Research Organizations (IUFRO) Vienna. He is Adjunct Professor at the Agriculture and Forestry University (AFU) Nepal. He is also the Fellow of Nepal Administrative Staff College.



## **Sustainable Development Goals: Their Impacts on Forests and People**

New comprehensive assessment of potential and anticipated impacts of efforts towards attaining the different SDGs on forests and forest-related livelihoods and development:

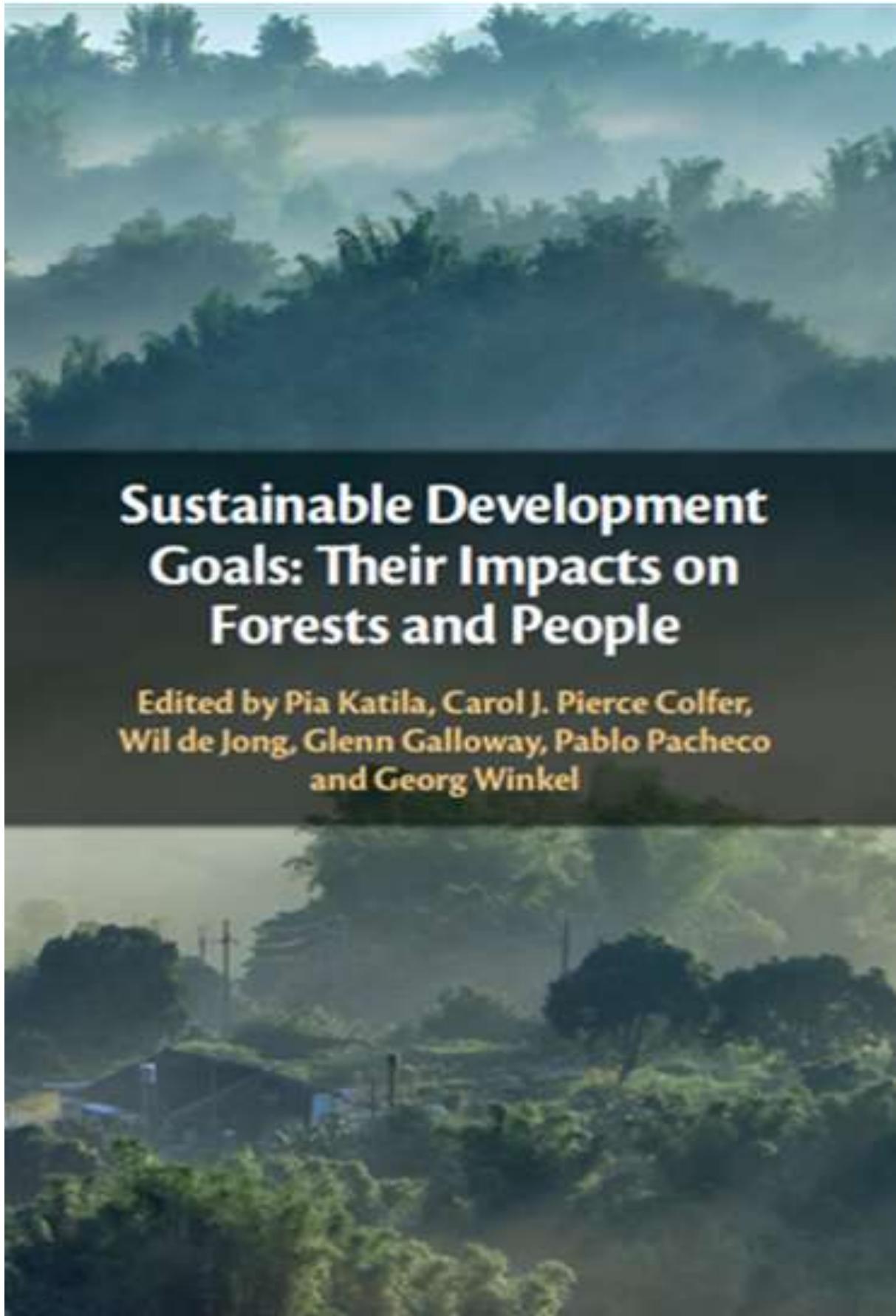
### *Sustainable Development Goals: Their Impacts on Forests and People*

Forests provide vital ecosystem services crucial to human well-being and sustainable development, and have an important role to play in achieving the seventeen Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda. Little attention, however, has yet focused on how efforts to achieve the SDGs will impact forests and forest-related livelihoods, and how these impacts may, in turn, enhance or undermine the contributions of forests to climate and development. Understanding the potential impacts of SDGs on forests and forest-related livelihoods and development as well as the related trade-offs and synergies is crucial for the efforts undertaken to reach these goals. It is especially important for reducing potential negative impacts and to leverage opportunities to create synergies that will ultimately determine whether comprehensive progress towards the SDGs will be made.

This book discusses the conditions that influence how SDGs are implemented and prioritized, and provides a systematic, multidisciplinary global assessment of interlinkages among the SDGs and their targets, increasing understanding of potential synergies and unavoidable trade-offs between goals from the point of view of forests and people. Ideal for academic researchers, students and decision-makers interested in sustainable development in the context of forests, this book will provide invaluable knowledge for efforts undertaken to reach the SDGs.

The assessment was undertaken by the International Union of Forest Research Organizations' Special Project World Forests, Society and Environment (IUFRO WFSE). It involved 120 scientists and experts from 60 different universities and research and development institutions as well as 38 scientists who acted as peer reviewers of the different SDG chapters. The development and publication of the book and policy brief were made possible by the financial contributions of the Ministry for Foreign Affairs of Finland and the Natural Resources Institute Finland.

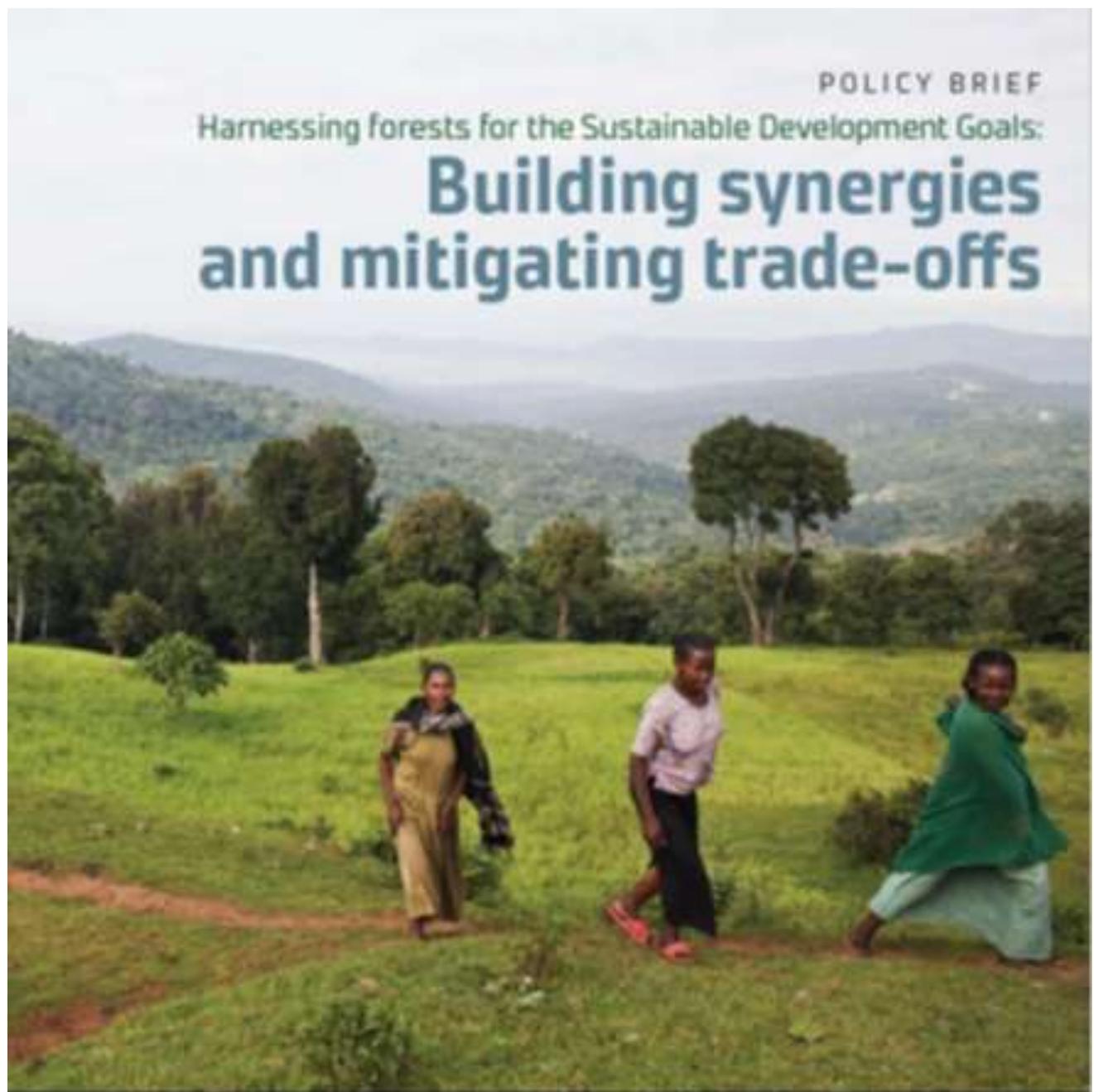
The book is published by Cambridge University Press and available as Open Access via Cambridge Core: <https://www.cambridge.org/core/books/sustainable-development-goals-their-impacts-on-forests-and-people/5FA75743F80CCE33751BD2095E5754DC>



# **Sustainable Development Goals: Their Impacts on Forests and People**

**Edited by Pia Katila, Carol J. Pierce Colfer, Wil de Jong, Glenn Galloway, Pablo Pacheco and Georg Winkel**

The related *Policy Brief Harnessing forests for the Sustainable Development Goals: Building synergies and mitigating trade-offs* is available at <https://www.iufro.org/fileadmin/material/science/spps/wfse/wfse-pol-brief-building-synergies-mitigating-tradeoffs.pdf>



For more information about IUFRO WFSE visit: <https://www.iufro.org/science/special/wfse/>

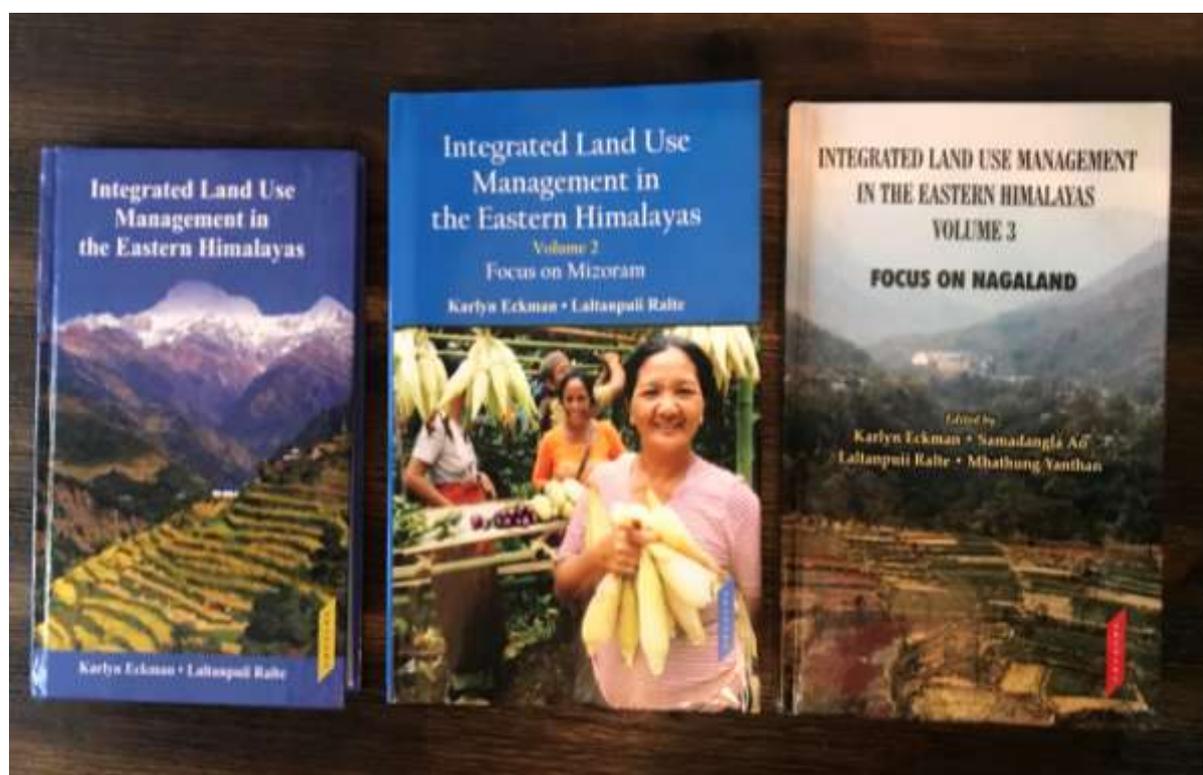
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## Integrated Land Use Management in the Eastern Himalayas

Research on land use, forests and water resources in Northeast India has been very limited due to remoteness, historical isolation, conflict and lack of resources. In 2012 the Indian government began to relax restrictions on travel to the area, enabling Indian and international scholars to collaborate and to conduct field research for the first time. Since 2012, researchers from Mizoram University, Kohima Science College, the University of Minnesota (USA), Bangabandhu Sheikh Mujibur Rahman Agricultural College (Bangladesh), Food and Agriculture Organization, Mississippi Watershed Management Organization (USA) and others have partnered on academic exchanges, multidisciplinary field studies, training and research. This edited volume is the third in a series, and presents new research findings from Northeast India, with a focus on Nagaland. Prior volumes focused on the Eastern Himalayas and on Mizoram. Papers presented in these volumes present the results of research on agricultural practices, agroforestry, hydrologic studies, shifting cultivation and other topics, most of which has never been previously studied directly in the region.

Eckman, Karlyn, SamadanglaAo, LaltanpuiiRalte and MhathungYanthan. 2019, editors. *Integrated Land Use Management in the Eastern Himalayas: Volume 3. Focus on Nagaland*. New Delhi: Akansha. ISBN 978-81-8370-561-5. 1800 Indian Rupees. Available from Akansha Publishing House,

[www.akanshapublishinghouse.com](http://www.akanshapublishinghouse.com).

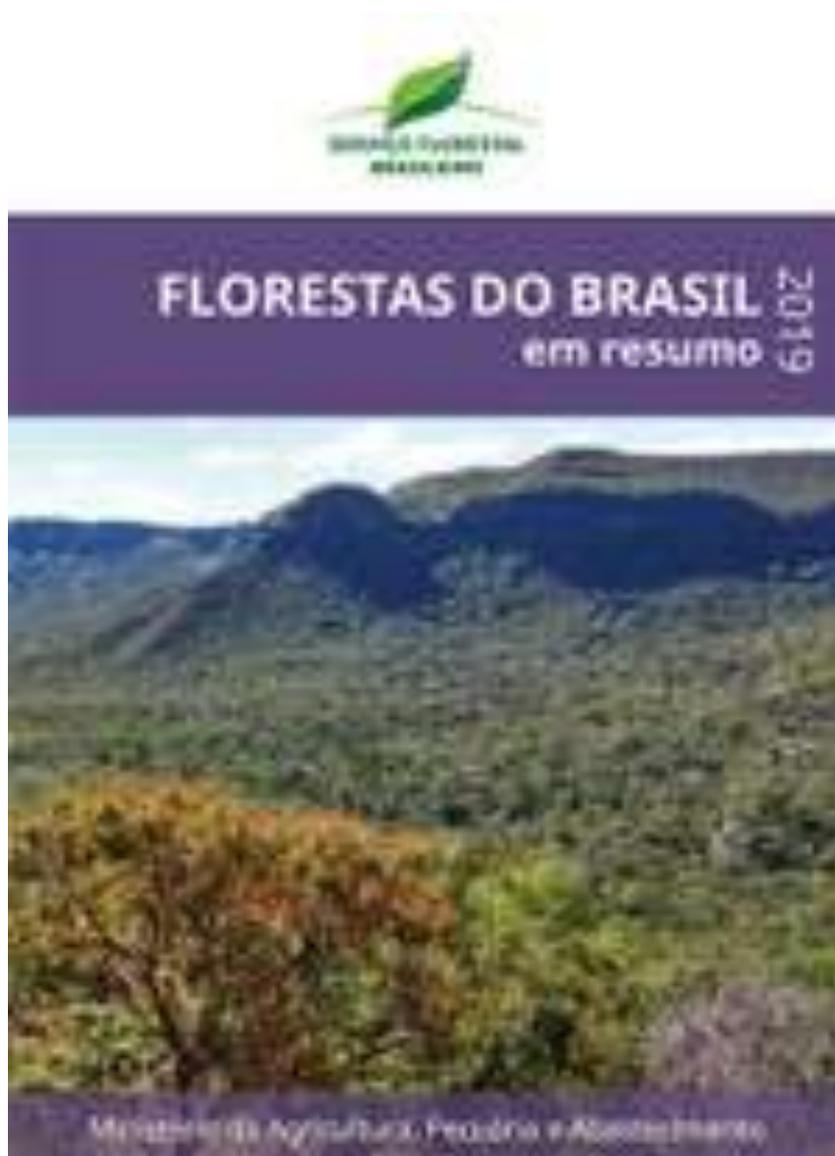


## Florestas do Brasil em resumo 2019

Link: [http://snif.florestal.gov.br/images/pdf/publicacoes/Boletim-SNIF\\_Ed1\\_2019.pdf](http://snif.florestal.gov.br/images/pdf/publicacoes/Boletim-SNIF_Ed1_2019.pdf)

Florestas do Brasil em resumo 2019 proporciona uma visão concisa e atualizada sobre as florestas brasileiras, naturais e plantadas, assim como sobre a sua importância para o país. A publicação é baseada em dados obtidos de fontes nacionais produzidas pelos principais atores envolvidos na gestão, uso e conservação de nossos recursos florestais.

<http://snif.florestal.gov.br/pt-br/component/content/article?id=553a> versão digital em Português.





## ABSTRACTS AND KEY MESSAGES

### **A global wildfire dataset for the analysis of fire regimes and fire behavior**

T. Artés, D. Oom, D. de Rigo, *et al.*

#### **Abstract**

Global fire monitoring systems are crucial to study fire behaviour, fire regimes and their impact at the global scale. Although global fire products based on the use of Earth Observation satellites exist, most remote sensing products only partially cover the requirements for these analyses. These data do not provide information like fire size, fire spread speed, how fires may evolve and joint into single event, or the number of fire events for a given area. This high level of abstraction is very valuable; it makes it possible to characterize fires by types (either size, spread, behaviour, etc.). Here, we present and test a data mining work flow to create a global database of single fires that allows for the characterization of fire types and fire regimes worldwide. This work describes the data produced by a data mining process using MODIS burnt area product Collection 6 (MCD64A1). The entire product has been computed until the present and is available under the umbrella of the Global Wildfire Information System (GWIS).

**Citation:** Artés, T., Oom, D., de Rigo, D. *et al.* A global wildfire dataset for the analysis of fire regimes and fire behaviour. *Sci Data* **6**,296 (2019) doi:10.1038/s41597-019-0312-2

**Full article:** <https://www.nature.com/articles/s41597-019-0312-2>

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## **Perception and Motivation of Farmers in the Development of Natural silk Business in Soppeng Regency Sulawesi Selatan**

**Wahyudi Isnan, Nurhaedah Muin dan Nur Hayati**

Balai Penelitian dan Pengembangan Lingkungan Hidup dan Kehutanan Makassar Jl. Perintis Kemerdekaan Km.16 Makassar, Sulawesi Selatan, Indonesia Kode Pos 90243 Telp. (0411) 554049; Fax. (0411) 554058; Email: [yudix\\_19@yahoo.com](mailto:yudix_19@yahoo.com)

### **Abstract**

The development of natural silk has not been optimal because the handling of the problem tends to be general and not adjusted to the socio-economic characteristic of the community. In Soppeng Regency, natural silk is carried out by diverse socio-economic backgrounds of the community that can influence perceptions and motivations in the development of natural silk business. This study aimed to determine the perceptions and motivations in developing natural silk business which is expected to be a formulation material in the preparation of natural silk business policies. The study was conducted in Donri-Donri District as the center of natural silk development in the Soppeng Regency. Data collection used survey method and interview. The sampling of respondents used a random sampling method for natural silk farmers. The results of the study indicate that in Soppeng District, the high farmer's perception of natural silk business is related to socio-economic factors such as the length of residence in the village and gender. The motivation of farmers in the natural silk business is generally because natural silk business is easy to implement, technological mastery, and easy to obtain information. Natural silk has a big chance to be developed with quality improvement of silkworm seed and silkworm feed. High perception and motivation of community need to be accompanied by the availability of supporting factors so that this business can develop optimally.

**Keywords:** natural silk, farmer perception, farmer motivation, Soppeng Regency

**Citation:** Isnan, W., Muin, N., & Hayati, N. (2019). Perception and motivation of farmers in the development of natural silk business in Soppeng Regency Sulawesi Selatan. *Jurnal WASIAN*, 6(1), 1–10. <https://doi.org/10.20886/jwas.v6i1.4638>

**Full Article:** <http://ejournal.forda-mof.org/ejournal-litbang/index.php/JWAS/index>

## Strengthening Gender Role in Managing Private Forest in South Konawe, South East Sulawesi Province

Nurhaedah Muin<sup>1</sup>, Achmad Rizal H. Bisjoe<sup>1</sup>, Bugi K. Sumirat<sup>2</sup>, & Wahyudi Isnan<sup>1</sup>

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### Abstract

National strategy on gender that stated in Presidential Instruction No. 9/2009, was also applied in private forest management. The composition of private forests which generally consist of woody plants, agricultural crops, and lower crops, allows for the sharing of gender roles in their management, as found in South Konawe. Research methods using survey methods and interviews through Focus Group Discussion (FGD). Data were analyzed qualitatively and quantitatively. The results of the study indicate that there is a share-out of roles between men and women in private forest management in South Konawe. Men play a dominant role in the management of woody plants, starting from planting to logging, while women are dominantly involved in the lower crop cultivation. Women's involvement has greatly helped the family economy by selling vegetables and sago for family consumption as well as to meet daily needs. Supporting activities in private forest management such as attending farmer group meetings and being administrators of farmer groups are still dominated by men. For this reason, it is necessary to consider the proportional involvement of women in private forest management so that they can contribute more to the family needs.

**Keywords:** Family income, gender role distribution, private forest

**Citation:** Muin, N., Bisjoe, A. R. H., Sumirat, B. K., & Isnan, W. (2019). Strengthening Gender Role in Managing Private Forest in South Konawe, South East Sulawesi Province. *Jurnal Penelitian Sosial Dan Ekonomi Kehutanan*, 16(2), 127–135.

**Full article:** <http://ejournal.forda-mof.org/ejournal-litbang/index.php/JPSEK/index>

## **Analysis of Biogeophysics Characteristics and Discharge of Lompo Riaja Atas River and Lompo Riaja Bawah River, Ralla Sub Watershed**

Usman Arsyad<sup>1</sup>, Beta Putranto<sup>1</sup>, Nur Aeni<sup>1</sup>, Wahyudi Isnan<sup>2</sup>, dan Hasnawir<sup>1,2</sup>

<sup>1</sup>Fakultas Kehutanan Universitas Hasanuddin

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### **Abstract**

The biogeophysical characteristics of watersheds have an important role as a determinant of the river discharge amount in the watershed. Various watershed problems such as floods and drought-related to river discharge require data and information. The importance of this data and information will determine a better watershed management plan. The issue of flooding and drought are important issues in Ralla sub watershed, South Sulawesi Province. This study aims to describe the biogeophysical characteristics and the discharge of Lompo Riaja Atas and Lompo Riaja Bawah Rivers in Ralla sub watershed, Lisu Watershed. This research was conducted from November 2016 to August 2017. Primary data collection was done through river discharge and precipitation measurements during 34 days of observation. Secondary data obtained from government or related agencies such as geological data obtained from Geological map of the Ujung Pandang sheet 1982, the slope data from Aster DEM, land type from RePPPProt 1987, land cover data from google earth image 2015. A quantitative descriptive method was used to analyze the data obtained. The results showed that the Lompo Riaja Atas and Lompo Riaja Bawah rivers have relatively similar discharge fluctuation, although they have a different amount of discharge. River discharge of both rivers is more influenced by rainfall compared to biogeophysical conditions such as geology, topography, soil type, watershed area, watershed shape, river length and order, gradient, flow pattern, flow density, and land cover.

**Keywords:** Biogeophysical characteristics, discharge, LompoRiaja river, Ralla sub watershed

**Citation:** Arsyad, U., Putranto, B., Aeni, N., Isnan, W., & Hasnawir. (2019). Analysis of Biogeophysics Characteristics and Discharge of Lompo Riaja Atas River and Lompo Riaja Bawah River, Ralla Sub Watershed. *Jurnal Wallacea*, 8(1), 27–38. DOI: <http://dx.doi.org/10.18330/jwallacea.2019.vol8iss1pp27-38>

**Full Article:** <https://jurnal.balithutmakassar.org/index.php/wallacea/issue/view/17>

## **Spatial distribution and impacts of climate change on *Milicia excelsa* in Benin, West Africa**

S.B.Kakpo, A.K.N.Aoudji, D.Gnanguenon-Guesse, J.A.Gbètoho, K.Koura,  
G.K.Djotan and J.C.Ganglo

African teak (*Milicia excelsa* (Welw.) C.C. Berg) is an endangered multi-use species. Understanding the impact of climate change on the distribution of this species may improve the ability to anticipate or recognize its decline or expansion and to take appropriate conservation measures if necessary. Ecological niche modeling was projected in geographical space to study the current and future distribution of *Milicia excelsa* in Bénin.

MaxEnt was used to estimate the potential geographic distribution of the species under two Representative Concentration Pathways (RCP). Miroc 5 summaries and two RCP 4.5 and RCP 8.5 scenarios were used as predictor variables for projections of the geographic potential of this species. The performance of the model was assessed by the area under the curve (AUC), true skill statistics (TSS) and partial receiver operating characteristics (Partial ROC).

From the results, *M. excelsa* was more a secondary species in the Guinean climatic zone and part of the Sudanian-Guinean and Sudanian climatic zone. The projections show a significant decrease in suitable habitats for the species from the two RCP scenarios. Only a part of the Guinean climatic zone remained suitable and few protected areas will conserve *in situ* *M. excelsa*. For the sustainable conservation of *M. excelsa*, it is essential to strengthen the protection of sacred forests located in the Guinean climatic zone.

**Keywords:** ecological niche modeling, climate change, *Milicia excelsa*, Benin, West Africa

**Citation :** Kakpo S. B., Aoudji A. K. N., Gnanguenon-Guesse D., Gbètoho J. A., Koura K., Djotan G. K., Ganglo J. C., 2019. Spatial distribution and impacts of Climate Change

on *Milicia excelsa* Welw. C.C. Berg in Benin, West Africa. Journal of Forestry Research. Doi: 10.1007/s11676-019-01069-7

**Full Article:** <https://link.springer.com/content/pdf/10.1007/s11676-019-01069-7.pdf>

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## **Balancing carbon dioxide: a case study of forest preservation, out-migration, and afforestation in the Pueblos Mancomunados of Oaxaca, Mexico**

M. Jurjonas and E. Seekamp

### **Abstract**

Carbon-based payments for ecosystem services solely consider reforestation and reforestation to assess sequestration. However, political ecology researchers demonstrate that tropical forests are complex socioecological systems where humans and institutions play an integral role in shaping landscapes. The current framing overlooks the net effect of traditional subsistence agriculturalists leaving behind low emission lifestyles, despite the likelihood of a significant increase in per capita emissions over time. In this case study, we use the history of forest use in the Pueblos Mancomunados—a common-wealth of indigenous communities in Oaxaca, Mexico—to explore sequestration through a socioecological systems lens. As negative emissions programs consider afforestation, we triangulated semi-structured interviews, an unsupervised GIS classification of land cover, and a review of carbon dioxide emissions to consider out-migration, abandonment, and lifestyle change. We find that communities are struggling to maintain livelihoods as migration to urban centers and the United States continues. Meanwhile, spatial analysis revealed 800 ha of afforestation. Our analysis of out-migration scenarios and per capita emissions changes identified a tipping point in which no net-sequestration would occur from afforestation due to the changing lifestyles of the migrants and recommend improved local development to avoid this form of “leakage” when assessing global carbon stocks.

**Citation :** Jurjonas, M., & Seekamp, E. (2019). Balancing carbon dioxide: a case study of forest

preservation, out-migration, and afforestation in the Pueblos Mancomunados of Oaxaca, Mexico. *Journal of Sustainable Forestry*, 1–18.

<https://doi.org/10.1080/10549811.2019.1602058>

### **Full article:**

[https://www.researchgate.net/publication/332472549\\_Balancing\\_carbon\\_dioxide\\_a\\_case\\_study\\_of\\_forest\\_preservation\\_out\\_migration\\_and\\_afforestation\\_in\\_the\\_Pueblos\\_Mancomunados\\_of\\_Oaxaca\\_Mexico](https://www.researchgate.net/publication/332472549_Balancing_carbon_dioxide_a_case_study_of_forest_preservation_out_migration_and_afforestation_in_the_Pueblos_Mancomunados_of_Oaxaca_Mexico)

## Current perspectives on forest recovery trends in Guanacaste, Costa Rica

Calvo-Alvarado, J.; Jiménez, V.; Calvo-Obando, A.; Castillo, M.

### Abstract

The main goal of this study was to evaluate whether the trends in the recovery of forest cover in Guanacaste continued during the past decade and to evaluate if the socioeconomic drivers of recovery have been altered. Our analysis found that forest cover in Guanacaste province increased marginally from 48.14% in 2005 to 50.74% in 2012. This implies that the forest recovery process during this period has continued but with a much smaller pace, showing signs of stagnation. The province landscape has changed since the 1970s, when it was dominated by livestock ranching and was the most deforested province with only 23.6% of forest cover. Today Guanacaste is a good example of an economic development forest transition region, with a matrix of land use that is dominated by new forests in different successional stages, which has resulted in great benefits to society given the ecosystem services that this landscape provides.

**Citation:** Calvo-Alvarado, J.; Jiménez, V.; Calvo-Obando, A.; Castillo, M. (2019) Current perspectives on forest recovery trends in Guanacaste, Costa Rica. *International Forestry Review*, 21(4), 425-431. <https://doi.org/10.1505/146554819827906825>

### Full Article:

<https://www.ingentaconnect.com/contentone/cfa/ifr/2019/00000021/00000004/art00003>

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## Matching Site-Suitable Poplars to Rotation Length for Optimized Productivity

Solomon B Ghezehei

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### Abstract

Diversity of applications, productivity potential, broad suitability and genetic variations make *Populus* a valuable fast-growing genus. Our goal was to assess if clonal site-suitability varies with rotation-length. We examined survival, growth (height, diameter at breast height) and estimated stem and total-wood (stem and branches) biomass of 89 clones near Fountain, North Carolina (35°42'7.52" N, 77°34'35.04" W) in the coastal southeastern USA at four- and eight-year rotations. The unsuitability of some clones was evident at early age while other clones became less suitable with stand age. Specifically, most mortality occurred by year-four, yet 25% clones experienced 17 to 50% mortality at older ages. Clone '379' was the most site-suitable with 100% survival and 141.3 kg total-wood per tree (approximately 47.5 Mg ha<sup>-1</sup> yr<sup>-1</sup>). Moreover, several clones with low survival produced high per-hectare biomass. Biomass (stem and total-wood) rankings changed between four- and eight-year rotations with only three top-ten clones in year-four ('379', '402', '449') in the top-ten of year-eight and two top-ten clones in year-eight ('379', '402') also in the top-ten of year-four. Clonal productivity differences increased by 25 to 836% with age. Clones of TD (*Populus trichocarpa* Torr and Gray × *P. deltoids* Barts Ex Marsh) and DD (*P. deltoides* × *P. deltoides*) genotypes were affected by wood infection (*Septoriamusiva*) indicating that selection based on disease resistance should be performed at clonal level. Hence, for productivity-focused stands, site-suitable clones should be selected by productivity first, then narrowed by survival and rotation length. Changes in the most 'site-suitable' clones can be expected between longer and shorter rotations.

**Keywords:** Efficient SRWC design; *Populus*; rotation length; rotation-suitable clones; site-suitability

**Citation:** Solomon B. Ghezehei\*, Jeff Wright, Ronald S. Zalesny, Elizabeth G. Nichols, Dennis W. Hazel (2020) Matching Site-Suitable Poplars to Rotation Length for Optimized Productivity. *Forest Ecology and Management*. 45 (February 2020) Article 117670. <https://doi.org/10.1016/j.foreco.2019.117670>.

### Full Article:

<https://www.sciencedirect.com/journal/forest-ecology-and-management/vol/457/suppl/C>

## Effect of logging on tree structure and diversity in tropical forests of Quintana Roo, Mexico

Tadeo-Noble, A.E., Valdez-Hernandex, J.I., Beltran-Rodriquez, L., and Garcia-Moya, E.  
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### Abstract

Timber harvesting may lead to changes in the dasonomic and ecological attributes of tree vegetation, affecting the productivity and biodiversity of ecosystems. Although, little is known about the effect of this practice on the tropical forests of Mexico. The aim was to compare the structure and diversity in forest ejidos under timber harvesting in Quintana Roo. Two inventories (2009) were developed in Permanent Forest Areas (PFA) of medium evergreen forests. In Bacalar, 625 plots of 10x25 m distributed in 15.6 ha were used, while in Noh Bec 302 plots of 10x40m located in 48.32 ha. In each plot, all trees with normal diameter  $\geq 7.5$  cm were measured to document the richness and dasometric variables. Structural indexes (IVI and FMVI) and diversity indexes (Shannon-Wiener  $H'$  and Sorensen  $C_s$ ) were also calculated. In Bacalar there were 86 tree species (36 families and 81 genera), 284 tree ha<sup>-1</sup>, 7.3 m<sup>2</sup>ha<sup>-1</sup> of BA and 86.4 m<sup>3</sup>ha<sup>-1</sup> of TTV; whereas in Noh Bec, we registered 106 species (34 families and 94 genera), 625 individuals ha<sup>-1</sup>, 23.9 m<sup>2</sup>ha<sup>-1</sup> of BA and 183.8 m<sup>3</sup>ha<sup>-1</sup> of TTV. *Bursera simaruba* (IVI= 16.6 %, FMVI= 18.1 %) was the dominant species in Bacalar, whereas in Noh Bec it was *Pouteria reticulata* (IVI= 13.5 %, FMVI= 14.8 %). The species diversity was not different ( $P > 0.05$ ) between ejidos ( $H' = 3.48$  vs  $H' = 3.37$ ); nonetheless there was a high floristic similarity ( $C_s = 60.4$  %). Our results provide evidence that timber harvesting associated with the history of natural disturbances drives a key role in the structure and diversity of tropical forests.

**Keywords:** Bacalar; Shannon-Wiener and Sorensen indexes; Noh Bec; Importance value index; Forest management value index.

**Citation:** Tadeo-Noble, A.E., Valdez-Hernandex, J.I., Beltran-Rodriquez, L., and Garcia-Moya, E. Effect of logging on tree structure and diversity in tropical forests of Quintana Roo, Mexico. *Bosque (Valdivia)* [online]. 2019, vol.40, n.2, pp.129-140. ISSN 0717-9200.  
<http://dx.doi.org/10.4067/S0717-92002019000200129>.

**Full Article:** <https://scielo.conicyt.cl/pdf/bosque/v40n2/0717-9200-bosque-40-02-129.pdf>

## Jojoba Cuttings in Kenya

### Genotypic and Plant Growth Regulator interaction on propagation of jojoba (*Simmondsia chinensis* L.) cuttings in semi-arid areas of Voi, Kenya

Shadrack Kinyua Inoti

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#### Abstract

Asexual propagation is necessary to provide known sex plants in jojoba to boost yields. An experiment was set up to identify the most appropriate Plant Growth Regulator (PGR) and genotype interaction for propagation of cuttings in semi arid areas of Kenya. The experiment was a 42 factorial laid down in a RCBD with 16 treatments replicated 3 times. The treatments consisted of 2 factors namely: PGR and genotype and 4 levels of PGRs which were IBA, Roothom, Anatone and the Control while those of genotypes were M1= male 1, M2= male 2, F1= female 1 and F2= female 2. ANOVA was carried out using SAS package whereas the significantly different treatment means were separated using DMRT at  $p < 0.05$ . The trial was carried out for 5 months in 2013 at Wildlife works Ltd, Voi. Results showed that Anatone x M2 interaction was the best for rooting (62.7%) whereas IBA x M1 interaction showed the highest performance in most of the variables measured for shoot and foliage growth. This study recommends the use of Anatone x M2 genotype interaction for future propagation of jojoba cuttings. However, further research is recommended on screening of a wide range of PGR x genotype for propagation of jojoba cuttings in semi-arid areas of Kenya.

**Keywords:** Genotype, Plant Growth Regulator, jojoba, cuttings

**Citation:** Inoti, S.K. (2019). Genotypic and Plant Growth Regulator interaction on propagation

of jojoba (*Simmondsia chinensis* L.) cuttings in semi-arid areas of Voi, Kenya.  
International Journal of Applied Science and Research 2(5), ISSN: 2581-7876

## Ground Cover for Mine Reclamation

### Some physiological characteristics to estimate species potential as a mine reclamation ground cover

E. Nurtjahya and J.A.Franklin

#### Abstract

In finding what physiological characteristics can be used to predict ground cover success on mine reclamation sites, 14 herb and grass species were tested. Establishment and early growth was tested on three different soils, ie vermiculate and quartz sand mixture, quarry overburden and coal mine overburden in a greenhouse. The results indicate that plant height and cover, transpiration rate and foliar pigments may be used to select plant adaptability to mined soil. White clover (*Trifoliumrepens* L.) showed the greatest potential as ground cover for mined soils. Species most widely used in reclamation tended to be perennials of moderate rate.

**Keywords:** Physiological characters, cover crops, reclamation, mine revegetation, white clover

**Citation:** Nurtjahya, E. & Franklin, J.A. (2017). Some physiological characteristics to estimate

species potential as a mine reclamation ground cover. *International Journal of Mining,*

*Reclamation and Environment*, Vol. 33 (2): 75-86.

#### Full Article:

<https://www.tandfonline.com/eprint/ICT2PZVTSQXIP4GISDEA/full?target=10.1080/17480930.2017.1333296>

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## **Ecosystem Service Values Changes in Response to Land-Use/Land-Cover Dynamics in Dry Afromontane Forest in Northern Ethiopia**

N. Solomon, A.C.Segnon and E. Birhane

### **Abstract:**

Despite their importance as sources of ecosystem services supporting the livelihoods of millions of people, forest ecosystems have been changing into other land use systems over the past decades across the world. While forest cover change dynamics have been widely documented in various ecological systems, how these changes affect ecosystem service values has received limited attention. In this study we assessed the impact of land-use/land-cover dynamics on ecosystem service values in dry Afromontane forest in Northern Ethiopia. We estimated ecosystem service values and their changes based on the benefit transfer method using land cover data of the years 1985, 2000, and 2016 with their corresponding locally valid value coefficients and from the Ecosystem service valuation database. The total ecosystem service values of the whole study area were about USD 16.6, 19.0, and 18.1 million in 1985, 2000, and 2016, respectively. The analyses indicated an increase in ecosystem service values from 1985 to 2000 and a decrease in ecosystem service values from 2000 to 2016. Similarly, the contribution of specific ecosystem services increased in the first study period and decreased in the second study period. The findings highlight how forest cover dynamics can be translated into changes in ecosystem service values in dry Afromontane forest ecosystems in Northern Ethiopia and showed how specific ecosystem services contributed to the observed trends. The findings also illustrated the temporal heterogeneity in the impacts of land-use/land-cover dynamics on values of ecosystem services. The findings can serve as crucial inputs for policy and strategy formulations for the sustainable use and management of forest resources and can also guide the allocation of limited resources among competing demands to safeguard the ecosystems that offer the best-valued services.

**Citation:** Solomon, N., Segnon, A. C., & Birhane, E. (2019). Ecosystem Service Values Changes

in Response to Land-Use/Land-Cover Dynamics in Dry Afromontane Forest in Northern Ethiopia. *International Journal of Environmental Research and Public Health*, 16(23), 4653. doi: 10.3390/ijerph16234653

Full Article: <https://doi.org/10.3390/ijerph16234653>

## Differences in tree species diversity along the rural-urban gradient in Bengaluru, India

Rajeev Kumar Jha, NilsNölke, B.N.Diwakara, V.P.Tewari and Christoph Kleinn.

### Abstract

Trees are invaluable and multifunctional elements of many land cover types. In urban areas trees serve particularly important ecological and environmental functions. In order to manage the multi-functionality of trees as efficiently as possible, biophysical information on the presence and distribution of species is helpful, as is general information about their provenance, utilization and services. This study examined the tree species diversity along the rural-urban gradient in the rapidly expanding megacity of Bengaluru, India, where the focus was on density and species composition. A number of 23 observation plots of 1-ha each in built-up environments were established within a 50 × 5 km transect running from the city center to the rural surroundings. Tree species diversity decreased with increasing distance to the city center due to the abundance of non-native ornamental tree species in the urban areas. The percentage of native species was about the same along the gradient (around 35% in urban, transition and rural areas). Our study offers a comprehensive description of tree species diversity along the rural-urban gradient in Bengaluru, which may bear connections, for example, to bird and insect diversity, and which may also be of interest and relevant for city planners and administrators as well as for researchers and the general public. Moreover, our study adds to the relatively limited information available on this topic in South Asia and suggests a design that is transferable to other urban areas. In addition, we hope to raise a critical awareness that contributes to protecting and developing the unique tree cover in Bengaluru.

**Citation:** Rajeev Kumar Jha, NilsNölke, B.N.Diwakara, V.P.Tewari and Christoph Kleinn. Differences in tree species diversity along the rural-urban gradient in Bengaluru, India. *Urban Forestry & Urban Greening*, volume 46, December 2019, 126464.

**Full Article:** <https://doi.org/10.1016/j.ufug.2019.126464>

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