International Forestry Working Group Newsletter
Working Group B3

December – 2020

Volume: 8 Issue: 4

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@ymail.com only.

Editor	Co-Editor
Mr. Blair Orr Professor of Forestry Michigan Technological University Houghton, MI 49931 USA Email: blairorr@ymail.com; bdorr@mtu.edu (906) 487-2291	**Dr. N. Krishnakumar** Forest Range Officer (Trainee) Tamil Nadu Forest Department Tamil Nadu, India Email: krishna.forest@gmail.com +91 9443796166

Content

RECENT PUBLICATION AND RESEARCH NOTES

ABSTRACTS AND KEY MESSAGES

****

NOTES FROM THE EDITORS & CO-EDITORS

Many thanks to the many people who have contributed to the December 2020 issue of the newsletter.

Feel free to pass the newsletter along to other people.

If you wish to be added to the subscription list send an email with your name and email address to **blairorr@ymail.com.**

- Blair Orr, IFWG Newsletter Editor

CONTRIBUTED ARTICLE

EI SECTOR FORESTAL MESOPOTÁMICO, ARGENTINA NOTA OPINION

Dr. Patricio Mac Donagh
Email: patricio.macdonagh@gmail.com

Enesta nota, un análisis de situación del sector forestalen la region Mesopotámica y el estado de la industria, en el marco del Seminario del Sur al Mundo 2030. También, los horizontes post pandemia y los incentivos que podrían generar inversiones y desarrollo local.

El sector de plantaciones forestales se caracteriza por ser de largo plazo. En el Manejo Forestal Sustentable (MFS) se planta todos los años lo que se corta. En la Mesopotamia se encuentra el 80% de la superficie plantada de todo el país, y se produce el 80% de la maderaen rollos de todo el país. La principal característica que presenta el sector hoy es la sobreoferta de maderaen pie. Estoconlleva a una baja generalizada de los precios de los rollos. La otra gran característica es la falta de mayor cantidad de grandes empresas, que puedan consumir el material fino, y sobretodo, ser tractoras del sector dondeactúan. En la tabla 1, se presenta un detalle de las plantaciones forestales de la Mesopotamia, con relación al total del país.

Tabla 1. Superficie de Plantaciones Forestales (has)

	Pinos	%	Eucaliptos	%	Otras	%	Total
Corrientes	345965	73%	121857	26%	6161	1%	473983
Entre Rios	14156	9%	112785	75%	23856	16%	150797
Misiones	348305	86%	40902	10%	16617	4%	405824
Total 3 pcias.	708426	69%	275544	27%	46634	5%	1030604
Total Pais	835760	64%	313869	24%	153306	12%	1302935

Fuente: InventarioForestal Nacional (2018). No incluye el Delta ER.

La producción industrial

La industriaforestal es una industria de commodities, que se basaen la producción de Madera proveniente de plantaciones forestales. Con lo cual, la industria es la que traslada demandas y precios a los propietarios de las plantaciones.

Un conceptomuy important eaaclarar es que las plantaciones forestales se muevenen cuanto a la ofertaen el largo plazo, es decirtienen una elasticidad de ofertamuybaja. Esto se debe fundamentalmente a los plazos de corta de las plantaciones.

Por otrolado, el mercado de rollos se comportacomo un oligopoliomonopsónico, endonde las grandesempresas, enestecaso las celulósicopapeleras, fijan un precio, y este se traslada a los sectores del aserrío y otrosproductos. Con lo cual es de esperar que las plantacionesforestales, y el mercado de rollos se comportecomo un mercado de economías de escala, endonde los grandesproductorestendránmásbeneficios, al poderdiluirparte de sus costosen la escala de producción, mientras que los pequeñosproductorestendrán que buscar sus beneficiosenotrotipo de argumento que no sea el precio de la Madera.

Existenen la Mesopotamia 766 aserraderos, (57% Misiones). Consumen el 46% de los rollos de la región y producen el 46% de la maderaindustrializada. En la Tabla 2 se presenta una caracterización de los aserraderos, con informacionessobre personal ocupado, consumo de rollos, producción y eficiencia.

Tabla 2. Producción industrial de los aserraderosen la Mesopotamia.

Provincia	Aserraderos		Personal Ocupado		Consumo de rollos (m3)		Producción (m3)		Eficiencia
Corrientes	150	20%	3.226	26%	2.254.258	28%	767.902	27%	34%
Entre Rios	178	23%	2.911	24%	2.066.959	26%	755.932	27%	37%
Misiones	438	57%	6.195	50%	3.676.226	46%	1.309.414	46%	36%
Total tres pcias	766	100%	12.332	100%	7.997.443	100%	2.833.248	100%	35%

Fuente: Censo de Aserraderos, Dirección Nacional de Desarrollo Foresto Industrial, 2018. No incluye el Delta ER..

Oferta y demanda de rollosen las tresprovincias

En la Tabla 3 se presentanresultadosen base a los datos de consumo de rollos de los aserraderos, y aestimaciones del autoren base a la superficie de las plantaciones mencionadasen la Tabla 1.

Estametodología de estimación de la ofertaen base a la superficie y el IMA es bastanteinexacta, aunqueampliamenteutilizadaenestudiospreliminares. Enfunción de la oferta de rollos y del consumo de los aserraderos se obtuvo el Balance 1.

El consumo de madera de No Aserraderos son estimaciones del autor, enfunción del conocimientosobre las demandas de madera de las grandesindustrias no contempladasen el Censo de Aserraderos. El Balance 2, representa la diferencia entre estas dos últimascolumnas, y reflejaríaenestascircunstancias, la oferta y demanda de madera para abastecimiento industrial.

Con lo cual se comprueba la sobreoferta de madera antes mencionada. Entre las limitantes de la infraestructuraproductiva, se señalaenestecontexto a la red de caminos rurales como un problema, sobretodoen un escenario de crecimiento de la demanda. La logística para exportar es uno de los mayoresproblemas, en mayor gradoen Misiones.

Tabla 3. Oferta y demanda de maderaen la Mesopotamia (metros cúbicos).

Provincia	Oferta de rollos	Consumo de rollos	Balance 1	Cons. No Aserradero	Balance 2
Corrientes	8.950.250	2.254.258	6.695.992	240.000	6.455.992
Entre Ríos	2.162.870	2.066.959	95.911	240.000	-144.089
Misiones	7.647.800	3.676.226	3.971.574	1.980.000	1.991.574
Tres Pcias	18.760.920	7.997.443	10.763.477		

Fuente: Censo de Aserraderos, Dirección Nacional de Desarrollo Foresto Industrial, 2018. No incluye el Delta ER.

Al comparar con los sectores forestales de Brasil, Uruguay y Chile, una de las principales diferencias que se observa es que enestospaíses ha crecidomuchomás que el de la Mesopotamia en los últimos 10 o 20 años. El motor fundamental de ese crecimiento de los

paísesvecinoshansido las inversiones. Sobretodo las grandes inversionesen empresas de escala.

Pensandoen 2021

La actividadforestalfue una de las primerasen ser exceptuadas. Primero celulosa, luego los aserraderos. Sin embargo, el principal destino de la producción de maderasólida es la construcción, que estáfrenada. Aquellasindustrias que veníanexportando y continúan, siguentrabajando. Aquellasconcentradasen el mercado interno, tienen una situaciónmuyvariada, con casos de cierres y suspensiones de personal.

Entonces, si bien la producciónforestal es de largo plazo, y la capacidad industrial estáinstalada, como sector se dependeen gran medida de la reactivación de la demanda interna.

Incentivos para generardesarrollo local

En los últimos 10 añoshubopocasgrandesinversionesenindustrias del sector forestal. Algunashanestadoligadas a la generación de energíaen base a biomasaforestal, otrashansidoenaserraderos, y tambiénenfábricas de tableros. La mayoríahansido con capitalesnacionales.

Cabe señalar que enperíodosrecientes de auge de las exportacionesforestales (2005-2008) la inversion directatambiénsuperó la inversión externa. Muchas empresashanseguidoin virtiendoenequipamiento, a pesar de las dificultades de acceso al créditobancario,

principalmente por las altastasas. Enestecontexto se puedeargumentar que el crédito fiscal para pymes es una herramientapoderosa.

Las tresprovinciastienendistintaincidencia de los impuestosprovincialesen la producción. Las herramientasfiscales para promoverinversiónpodrían ser exploradasen la región y másdesarrolladas a nivelnacional.

El gran desafío del sector es mejorar la productividad y, a partir de estamejora, ser máscompetitivos a nivel global. Para ello se sugieren dos pilares. El primero es desarrollarmáscapacitación para operadores, víaherramientasfiscales.

Ensegundotérmino, y talvezmásimportante, el desarrollo de actividades con gerentes y propietarios, con focoen la gestión y productividad, que permitanlograrcambiosen las pymes que las haganmáscompetitivas.

Mercados

La demandamundial de productosforestales ha crecidosistemáticamenteen los últimos 30 años. China y los países asiáticos se convirtieronen los principalesconsumidores. La pandemia ha retraído un poco estos mercados y la demandaestámuchomásconcentrada. Enconsecuencia, se resintieron los precios de los productoscomocelulosa y maderaaserrada a nivelinternacional.

La demanda de pellets tuvo un aumentososteni doen los últimosaños, principalmente por una estrategia de sustentabilidad de la Unión Europea, que apunta a cambiarsumatrizenergética.

EnEstados Unidos ha reactivado la construcción de casas de madera, lo que constituye un aumentososteni do que permitereactivar la demanda interna de madera del SE de Estados Unidos, y también las importaciones.

La generación de energíatérmica/eléctricaen base a biomasaforestal es el nuevo paradigma del sector a nivelmundial. Enestecontexto de la Bioeconomía, las biorefinerías son las nuevasinversiones de gran escala que puedentransformar al sector.

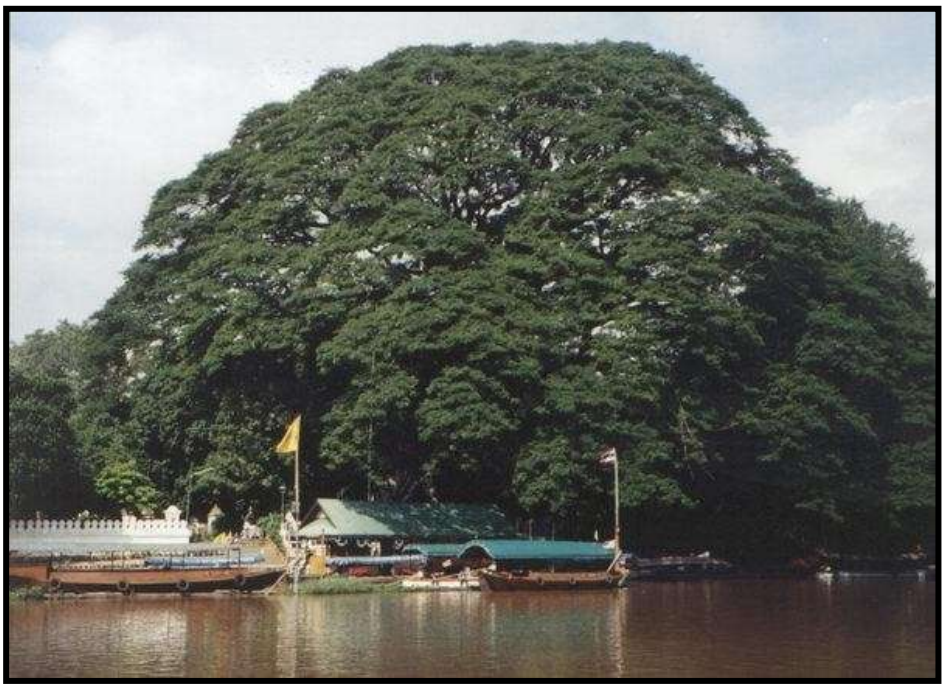
*This article was originally published in and copyright is held by Agropost (*http://cpia.org.ar/agropost/tapa/14*). It is reprinted with permission.*

THE RAIN TREE

Donald W. Cox
Certified Master Arborist
Urban Forestry – Arboriculture - IPM Specialist
drtreelove@gmail.com

(Published in Chiang Mai City Life magazine 2003)

The magnificent Rain tree is one of the most loved and widelycultivated trees throughout the tropicalworld. Its broad umbrella shaped canopy of feathery leaves is unmistakable on the landscape. The massive trunk of a mature tree and open wide-spreading branch structure is a wonder to behold, and an awe-inspiring example of nature's living beauty in symmetry and structural integrity.



Large Rain tree at Wat Chaimongkonand the Mae Ping River Cruise boat landing. Chiang Mai, Thailand

Native to the northern part of South America, the Rain tree's widespread cultivation around the world has earned it a long list of common names in many languages; Rain tree (or Rain Tree) and Monkeypod seem to be the most used names in the English-speaking world. But it is also known as French Tamarind, Cow Tamarind, East Indian Walnut, and Saman. Even in Thailand it has several names in Thai language: Cham chaa (northern), Cham churee (central), Tuttuu (Tak), Se-duu (Karen-Mae HongSon).*In my Internet and library searches, the list of common names went on and on, names from Latin America, Africa, Asia, the Caribbean and Pacific regions.

Common names of plants, with all the local variations, are often undependable for identification. Scientific botanical names are usually definitive in classification, but the Rain tree again has several, and apparently the nomenclature is still in debate. *Samanea saman* is the most consistent botanical name on the Internet and in books, but theWorld Agroforestry Centre website on Botanical Nomenclature has *Albizia saman* as the most current classification.

The Rain tree is a legume (family *Leguminosae*, subfamily *Mimosoideae*). All legumes have be an pods, the characteristic by which they can most easily be recognized. One well known aspect of the plants in this family is that they have the capacity to provide their own nitrogenous fertilizer through bacteria that live in nodules on their roots; the bacteria chemically convert nitrogen gas from the air into soluble compounds that the plant can absorb and utilize. As a result, legumes generally require no additional nitrogen fertilizer for average growth.**

The Rain tree has a reputation for allowing healthy grass to grow right up to its trunk, unlike many other shade trees. This must have something to do with ample nitrogen availability as well as another interesting characteristic; the leaflets fold together at night and in cloudy wet weather, allowing the rain to fall through. Farmers value the tree in their pastures, where it shades the livestock, showering down nutritious pods and fostering the growth of grass. The rain falling through onto the lush green beneath the trees is one reason for the name Rain tree.** But cicadas feeding in the canopies in the native habitat and the resulting honey dew secretions falling like rain is the primary reason for the name.

Like Carob, Tamarind and some other legume trees, the Rain tree produces seed pods with edible pulp. When ripe the pulp is sweet and sugary, with a flavor rather like licorice.

These pods can also be dried and ground into a meal that makes excellent animal feed. In some countries, the Rain tree is grown for this commercial product.

The wood of the Rain tree (Monkey pod in Hawaii) is highly valued for furniture and wood working. It is strong and hard with rich dark colors and striking bands of cream-colored sapwood. It is durable wood and is used in boat building.**

Chiang Mai has many fine young Rain trees, and a few older mature specimens. They are allover town, but the largest concentration that I have seen is along the Ping River and in the area east of the river, in and around Prince Royals College, PayapU, Bumrungrat Road, and McCormack hospital. There is a large old specimen at the Gymkana Club; the large trunk and branch structure is awesome, but unfortunately this tree has been poorly pruned; the stubbed-off lower branch ends have resprouted heavily, giving them an unnatural bushy appearance.

There are two incredible Rain trees on the west bank of the Ping River, on each side of Wat Chaimongkon (133 Charonenprathet Rd). They are both on private property, but can be seen from three primary vantage points; a distant perspective is looking downriver from the one-way iron bridge that crosses the river from Charoenprathetto the Chiangmai-Lamphun Rd. A great view of these two beauties is looking across the river from the outdoor terrace at the former Cha Cha club on Chiangmai-Lamphun Road near Rimping market. The other view of the biggest tree is from Wat Chaimongk on itself.

The tree to the north of the wat, which spreads over the boat landing, is the grandmother of them all. This giant is reportedly about300 years old and said to be the largest Raintree in Thailand, and what an amazing creation it is! The crown can be viewed from the river bank at thewat, but the awesome trunk and branch structure isbest seen from the littledirt lane just to the north, which is marked with a sign on Charoen prathet– “Boat Landing, Mae Ping River Cruise”.

There are so many Rain trees in Chiang Mai that many people think that they are native. We are fortunate to have one of the world’s favorite trees to shade our yards and enhance the beauty of the Thai landscape.

*Thai Plant Names, Tem Smitin and, Royal Forest Dept

**Tropical Legumes: Resources for the Future, the National Academy of Sciences, Washington, D.C. 1979

RE-VIVA LA PRIMAVERA

Andrea Barrera y Beatriz Ramirez
Asociación de Becarios de Casanare

The ecological restoration project "Re-viva La Primavera" increases forest connectivity and recovers ecosystem services that directly benefit 50 families in the Colombian eastern Andes foothills. The research approach, involving local community members, overcomes the knowledge-gaps regarding: 1) native species propagation and establishment, 2) soil recovery, and 3) reduction of anthropogenic restoration barriers. Within three years, our results are: the propagation of 30 native species in a communitarian nursery, the restoration of 80 ha through the sowing and monitoring of 4500 trees, and the development of an outreach and communication strategy, developed through the participation of a) the rural school community in research and knowledge dissemination activities, b) men and women in the "biodiversity and gastronomy festival", c) knowledge exchange with, and local empowerment of 17 forest rangers, including men, women, youth and elder (20-80 years old), and d) over 60 external visitors to the nursery guided by the forest rangers. "Re Viva" has contributed to restore the social capital through an environmental governance exercise that provides the community new tools to better manage their territory. This is a socio-ecological context-based effort that can be scaled up in other scenarios of tropical ecosystems and Latin American communities with restoration needs.

This innovative exercise, recognized in 2018 by the LatinoaméricaVerde awards, improves the understanding of ecosystem dynamics and environmental services by focusing on the role of those who use and depend on natural resources. In this way, it evidences the beneficiaries (for whom) and the reasons/motivations (for what) behind ecological restoration, thus, involving the community that faces forest lost, water scarcity and soil deterioration. This project combines research and outreach strategies that feedback one

another; native species propagation combined local and academic knowledge, that was presented back to the community whose children sing songs about local diversity and restoration, and whose families propagate native species on their own; hydrological variables are monitored by forest rangers who now discuss climate-change hydrological impacts on their well-being; research on sylvicultural practices that reveal that industrial fertilizers do not make plants grow better, reducing restoration costs; and other information that makes restoration accessible to all.

Visit our web page atwww.abccolombia.org

Contact us at dir.investigacionrn@abccolombia.org

EXPLORING NOVEL WOOD WASTE UTILIZATION OPTIONS FOR THE MORATUWA WOOD WORKING CLUSTER IN SRI LANKA

Rajitha Rupasinghe[1], Priyan Perera[1], Hiran Amarasekera[1], Shahsika Himandi[1], Richard Vlosky[2]
[1]Timber Process Innovation Center, Department of Forestry and Environmental Science, University of Sri Jayewardenepura, Sri Lanka
[2]Lousiana Forest Products Development Center, Louisiana State University Baton Rouge LA USA

The Moratuwa Woodworking Industry Cluster is a concentration of traditional wood carpenters in the Moratuwa Municipal Council Area in the Western Province of Sri Lanka. Historical information from the British colonial era suggest that the Moratuwa area was a well-known area for furniture manufacturing and carpentry back in the island, back in 1800s.At present, the MWWIC is characterized by hundreds of small to medium scale carpentry shops with the majority being traditional family-owned businesses catering the local markets. Although the MWWIC has numerous constraints such as socio-technological and knowledge barriers for expansion, the majority in the area are dependent on furniture manufacturing and other woodworks as their main source of income generation.The Moratuwa Woodworking Industry (MWWIC) cluster has been identified by the Government of Sri Lanka as a priority area for economic development based on traditional carpentry and woodworking. The State Ministry of Technology and Innovation recently introduced a brand name 'Moratuwa Lee' for furniture produced in MWWIC in an attempt to transform Sri Lanka's wood and timber industry into a high tech global export market and to develop MWWIC as a center of excellence for wood and timber-based products.

The Timber Processing Innovation Center (TPIC) of the University of Sri Jayewardenepura (USJ) Sri Lanka is currently engaged in numerous national-scale programs to promote the sustainable utilization of timber resources, improve the overall quality of the wood products and uplift the socio-economic status of wood working community in the country. Investigating the sustainable utilization options for wood waste generated in the MWWIC is one of the projects the TPIC is involved at present. Wood waste generation and improper disposal of wood waste is one of the major environmental and health problems in Moratuwa area. To find feasible solutions for this issue, the TPIC recently carried out a comprehensive assessment to quantify the wood waste generated in MWWIC.

Six major types of wood-based industries can be identified in the MWWI cluster. They are mainly Carpentry Shops, Sawmills, Integrated Sawmills (the industries that conduct log conversion activities and furniture manufacturing activities at the same place), Sawn Timber Retail Shops, Furniture Shops, and Timber Seasoning/Processing Centres. As the first three industries are directly involved in lumber and furniture production processes, a higher amount of wood waste can be identified in these industry types.

Band sawing

Drilling

Wood waste from the woodworking industries is generated from the activities such as sewing, cutting, drilling, and sanding the sawn timber, furniture, or lumber. However, the wood waste can be the waste generated during lumber production from solid timber or the secondary processing waste that generates during the production process of wood products from lumber and sawn timber. The waste type and amount generated vary from one industry to another according to the cutting pattern, number of sawyers and number of machines, Saw setting in sawmills, log alignment, log turning, sawyers' skills, etc. This wood waste is also utilizable into different product categories of other production organizations if collected and carefully processed.

Timber species used in MWWIC for manufacturing furniture are mainly hardwood. As identified by the study, the most abundant species are *Tectona grandis* (38.7%) and *Swietenia macrophylla* (28.8%) which are known as Teak and Mahogany in general.

Detailed information of the species usage in MWWI

Common Name	Botanical Name	Standard Density at 20% m. c. (kg/m^3)	Percentage Use
Teak	*Tectona grandis*	720	38.7%
Mahogany	*Swietenia macrophylla*	560	28.8%
Alstonia	*Alstonia macrophylla*	640	7.4%
Albizia	*Albizia molucana*	480-560	3.1%

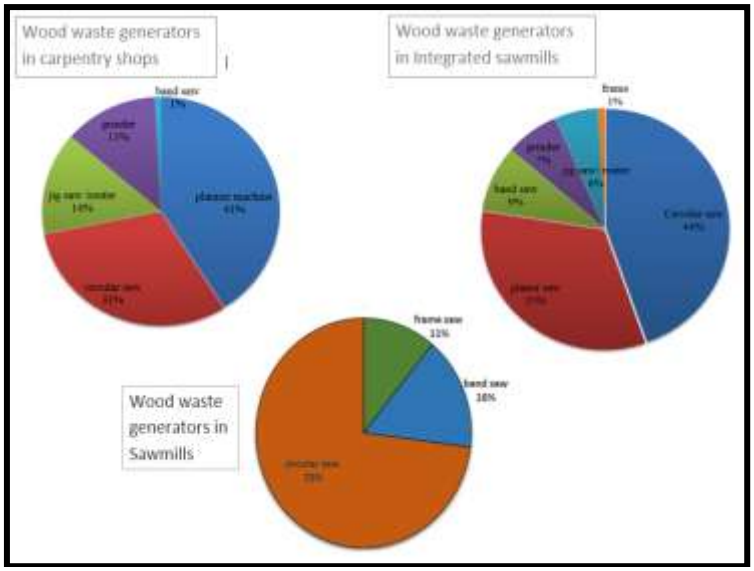
Jak	*Artocarpus heterophyllus*	640	3.1%
Sapu	*Michelia champaca*	400	2.5%
Pinus	*Pinus caribaea*	480	2.5%
Lunumidella	*Melia dubia*	400	2.5%
Hora	*Dipterocarpus zylanicus*	800-960	1.8%
Kumbuk	*Terminalia arjuna*	720-800	1.2%
Burutha	*Chloroxylon swietenia*	760-800	1.2%
Nadun	*Pericopsis moonina*	800	1.2%
Balau	*Shorea spp(balau group)*	700	1.2%
Rubber	*Hevea brasiliensis*	640-720	1.2%
Tulang	*Koompassia excelsa*	630	1.2%
Mango	*Mangifera indica*	480-560	0.6%
Kempas	*Koompassia malaccensis*	720	0.6%
Maara	*Albizia lebbeck*	800-880	0.6%
Halmilla	*Berrya cordifolia*	780	0.6%

The wood waste survey conducted by the TPIC identified three main types of wood waste in the MWWI cluster. They are Sawdust, Offcuts, and Timber wanes. Generation of wood shavings, the wood waste generated from the traditional conventional plane tool (Yathuketaya) is very low in carpentry shops as the majority of the firms had been replaced by planer saw or/and hand planer machine which produce only sawdust.

Traditional conventional plane tool (Yathuketaya)

Wood shavings

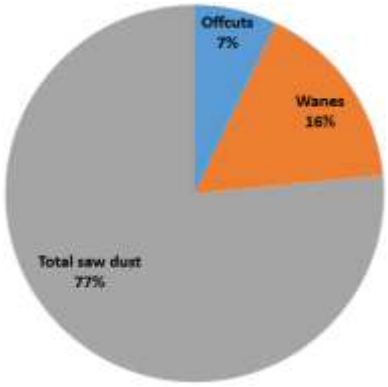
Saw Dust waste had different origins and sizes. According to the experimental results, different machines were responsible for the origin of sawdust at different scales of sizes. Some integrated sawmills and the furniture manufacturing industries collect all types of sawdust into the same collection bag which is named the mixed sawdust. Offcuts are the small wood parts which were usually generated while cross-cutting the sawn timber by circular saw and wood router machine. Wanes are the planks that were discarded due to the higher percentage of the bark wood which was generated principally by sawing head rigs while producing sawn timber at sawmills and integrated sawmills.



Major Wood waste generators

Wooden sawdust can further be separated according to the particle sizes as Coarse dust (>212µm), Medium dust (>90µm), Fine dust (<110µm). Sieve Analysis Technique was used to determine the particle size of the sawdust.

Weight contribution of different industries and different waste types to the total wood waste



Particle sizes of wood waste according to the different origins

Type of Wood Waste	Particle Size Range/mm	Category according to the literature
Circular sawdust (Main Cut)	0.500 -0.053	Fine sawdust
Circular sawdust (Cross Cut)	2 – 0.500	Coarse sawdust
Frame sawdust	0.500 -0.053	Fine sawdust
Planner sawdust	2 – 0.500	Coarse sawdust
Finishing sawdust	0.500 -0.053	Fine sawdust
Mixed sawdust	2 – 0.500	Coarse sawdust
Offcuts	Small wood pieces	Offcuts
Wanes	Wooden planks	Wanes


Circular saw and its blade

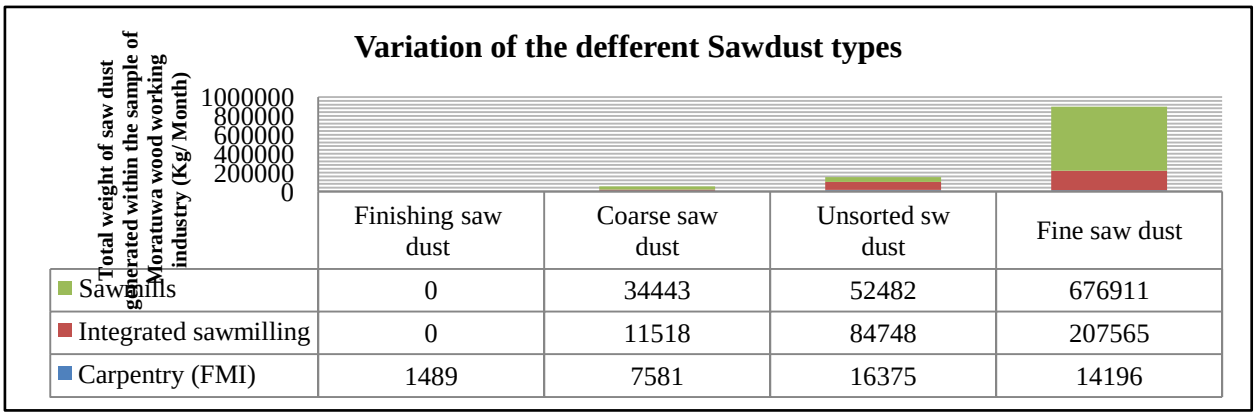
With the particle size analysis, Quantifying wood waste generated from each industry type was carried out. It was identified that a large amount of reusable sawdust and other wooden residues are removed monthly as waste from the MWWI cluster.

Type of wood waste	**% weight contribution of individual waste types to the total wood waste production by Carpentry industry in Moratuwa FMI**			
	Carpentry	Integrated Sawmilling	Sawmilling	Total Wood Waste
Saw Dust	2.58%	22.41%	51.59%	**76.58%**
Wanes	0.00%	5.76%	10.60%	**16.36%**
Offcuts	0.63%	6.43%	0.00%	**7.06%**
Total wood waste	**3.21%**	**34.60%**	**62.19%**	**100.00%**

Sawdust is the major waste type generated in MWWI. It shows a very higher rate when it compares with the other wood waste types Wanes and Offcuts. As there is no proper management strategy for this generated waste, a deep investigation of each waste type was conducted. As the majority is Sawdust, higher priority was given to the sawdust.


University students actively participated in data collection

Sawdust is the most prominent type of wood waste generated within the Moratuwa WWI. Among the different types of sawdust, Fine sawdust has allocated the largest weight contribution to the monthly generation of wood waste at Moratuwa. As the fine sawdust has the smallest particle size (<110µm), this sawdust can be used in different production activities. Although currently there is no proper method to divide this dust considering



	Finishing saw dust	Coarse saw dust	Unsorted sw dust	Fine saw dust
Sawmills	0	34443	52482	676911
Integrated sawmilling	0	11518	84748	207565
Carpentry (FMI)	1489	7581	16375	14196

particle sizes, a separate collection based on particle size will add extra value and new market opportunities to this waste sawdust.

Monthly sawdust generation of MWWI according to the particle sizes

This waste generation has also become a huge environmental problem to Bolgoda Lake which flows through the Moratuwa Municipal Council area. Bolgoda Lake and its ecosystem facilitate so many floral and faunal species and develop the scenic beauty of the area facilitating the fishermen community of the area. When considered the future expansion of MWWI cluster with Government interventions, wood waste generation and wood waste management is likely to become a severe issue in the years to come. Current practices of open dumping and releasing wood waste to associated wetlands fronting Weras Ganga and Bolgoda Lake has resulted in considerable environmental pollution and health risks to the community. Thus innovative solutions for wood waste managementshould be implemented to promote sustainable use of this natural resource and to protect the sensitive ecosystem of the area.

Waste saw dust dumping site (near the banks of Bolgoda Lake)

As TPIC is always considering innovative, sustainable solutions, it is now investigating the possible solutions to utilize this waste. With the support of the Academic professionals and woodworkers, TPIC and USJ have now started investigating the feasibility of energy biomass production using the sawdust and common water hyacinth (*Pontederia crassipes*) which is available as an aquatic plant in the Bolgoda Wetland System.

Invasive Water Hyacinth population in Bolgoda Lake ecosystem

However,*Pontederia crassipes* is an aquatic plant native to the Amazon basin, and is often a highly problematic invasive species outside its native range has spread through main water bodies in Sri Lanka causing severe issues to the aquatic floral and faunal species. Using this waste sawdust and invasive plant materials to produce energy products will be a good start to promote waste utilization, environment conservation, and sustainable energy product generation.

Although manufacturing these types of energy products is rather new to Sri Lanka, both Asian and European Countries produce and utilize briquettes and pellets for energy products. After the feasibility studies, marketing strategies are over the production will be promoted at the domestic level as a community development program. Production of briquettes and pellets means to convert sawdust and biomass residues through simple technology that is inexpensive and suitable to be managed by small communities.

Wood Pellets produced from different types of wooden species

Source: www.pellet suppliers.comecosystem

Parallel to this production, wood waste-collecting networks and centers will be developed covering major wood waste generation hotspots of the area so that woodworkers can easily handover their waste to these collection bodies. That will produce new job opportunities and trends in the field of wood waste utilization which is not much popular concept in Sri Lanka.

Timber Process Innovation Center
Center for Sustainability
Department of Forestry and Environmental Science
University of Sri Jayewardenepura
Gangodawila
Nugegoda
Sri Lanka
Telephone: +94 11 275 8414, +94 71 298 4365
Fax: +94 11 280 2937
Email: sustainability@sjp.ac.lk
Web: sjp.ac.lk/timber/about/
sustainability.sjp.ac.lk/timber

NET ECOSYSTEM PRODUCTION (NEP) STUDY OF NATURAL FOREST IN PASOH FOREST RESERVE, NEGERI SEMBILAN, MALAYSIA

Mohd Afzanizam Muda
Forest Research Institute Malaysia (FRIM),
Climate Change and Forestry Program (CCF)
Email: mohdafzanizam@frim.gov.my

In 2015, International Foundation of Science (IFS) Sweden and The Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), Philippines agreed to pilot collaborative research in some Southeast Asian countries where the two organisations are both active. The Carolina MacGillavry endowment and SEARCA were finance pilot 3 study. It covers Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Thailand, TimorLeste, and Vietnam.

NEP and carbon accumulation is a fundamental property of ecosystems. It was initially defined as the difference between the amount of organic carbon fixed by photosynthesis in an ecosystem and total ecosystem respiration. Based on this definition, NEP represents the organic carbon available for storage within the system or loss from it by export or non-biological oxidation. In other ways, NEP is known as the rate of carbon accumulation in the forest ecosystem. Fig. 1 demonstrates how NEP is calculated.

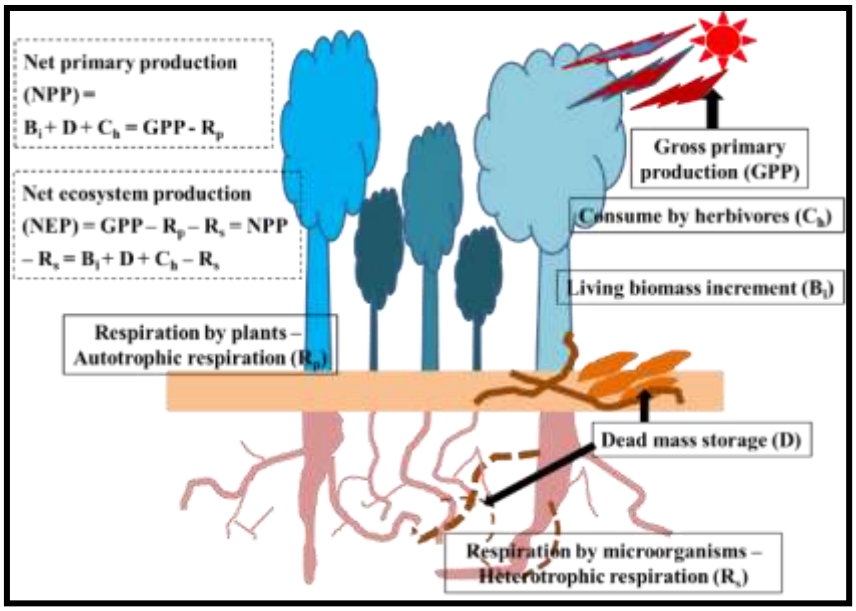


Fig. 1: The summation method used to estimate NEP of forests.

A total number of trees were 1474 ha^{-1} with 122 families, and 235 species were enumerated and recorded at a 1-ha Tropical Ecology and Assessment & Monitoring (TEAM) plot (https://www.wildlifeinsights.org/team-network). Aboveground biomass and carbon stocks were calculated based on flora inventory.

The NEP study aimed to quantify carbon fluxes in all pools and net carbon accumulation of forest under a pristine condition in lowland dipterocarp forest in Malaysia and to estimate the metabolic status of terrestrial ecosystem whether it is a net autotrophic (production exceeds respiration) or net heterotrophic (respiration exceeds production). Field experiment and calculated data including flora inventory, above ground litterfall (Fig.2) and coarse root increment, fine root production (Fig. 3) and soil respiration measurement (Fig.4).

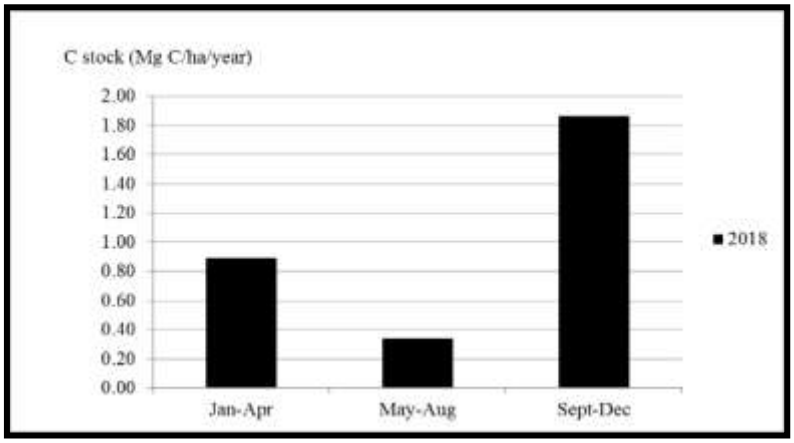


Fig.2: Seasonal variation of litterfall of tropical lowland forest in Pasoh FR.

Fig. 3: Fine root samples were weighed in the lab. Inset is the root bag experiment.

Fig. 4: CO_2 efflux from soils was measured using a LiCOR6400XT (portable photosynthesis system)(left pic) configured with the soil respiration chamber(middle pic) using trenching method (right pic)

Total NPP estimated from this study was 7.30 Mgha^{-1} year^{-1} while root respiration (R_s) referring to heterotrophic respiration was 7.52 Mg C ha^{-1} year^{-1}. NPP is first estimated as dry biomass Mgha^{-1} year^{-1} then is converted to carbon (Mg C ha^{-1} year^{-1}) as equal to 50% of dry biomass. Hence, The NEP value was –0.22 Mg C/ha. NEP has a negative value when carbon loss exceeds carbon input indicated as a carbon source in an old-growth forest with a mature stand between 2017 and 2018.

NEP of the forest ecosystem is depending on forest-type, forest-age, geographical location etc., which is generally higher in the young forest than old one, higher in the tropical forest than in temperate one, higher in the mixed forest than in a pure forest. The accuracy of NEP estimation much depends on methods and equipment applied, and the regularity of data collection, especially for soil respiration measurement, which must be conducted in all seasons of a year.

TEAM FOREST CARBON

The team aims to estimate net ecosystem production (NEP) of forests in Malaysia, Thailand and Vietnam, to contribute to REDD+ (reducing emissions from deforestation and forest degradation). The research will provide results on carbon sequestration capacity of natural forests and simplify the NEP estimation method for applications where human and technology resources are limited.

Coordinator: Dr. Do Van Tran (Vietnamese Academy of Forest Sciences)

Collaborators: Dr.JeyannyVijayanathan (FRIM), Mr. MohdAfzanizam Muda (FRIM), Dr.PhongthepHanpattanakit (Srinakharinwirot University, Thailand)

BIODIVERTY IN GLOOM: NEED FOR MAINSTREAMING

Dr. V.P. Tewari
President, ISTF India Chapter
Former Director, Himalayan Forest Research Institute, Shimla (India)
Email: vptewari@yahoo.com, tewarivp@gmail.com

Introduction

More than half of the world's population now lives in urban areas. By 2050, this figure will have risen to 6.5 billion people which are two-thirds of all human population.The rapid growth of cities in the developing world, coupled with increasing rural to urban migration, has led to a boom in mega-cities. In 1990, there were ten mega-cities with 10 million inhabitants or more. In 2014, there were 28 mega-cities, home to a total 453 million people (https://www.undp.org/).

Biodiversity means the diversity of species comprising the ecosystems on land, sea and other water bodies, and the processes that form part of these eco-systems. This includes the diversity within the species as well as between different species.

Biodiversity is important for overall health of the species. In addition to maintaining water cycle and soil and moisture conservation, improving soil productivity, absorption and destruction of pollutants, scientific knowledge, entertainment and aesthetic values are some other benefits of conserving biodiversity.

Biodiversity, at all three levels—genes, species, and ecosystems—is the basis for the sustainability, productivity and resilience of agricultural systems, and is the foundation of ecosystem services essential to agriculture and human well being.

Biodiversity is the origin of all crops and domesticated livestock (species) and the variety within them (genes). Around 7,000 species of plants have been cultivated and about 30 to 40 species of mammals and birds (out of the estimated 15000 species) have been domesticated for food production.

According to 2018 report of theIntergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services(IPBES), the main global drivers of biodiversity loss are

climate change, invasive species, over- exploitation of natural resources, pollution and urbanization (https://en.unesco.org/).

Global Scenario

The very human existence is dependent upon the biodiversity wealth of the Earth. Forests are also a part of the valuable biodiversity. Agriculture is a key example of how human activities have profound impacts on the ecosystems of our planet. Over the past 50 years, agricultural expansion into tropical and sub-tropical regions has substantially reduced levels of biodiversity. At the same time, food production has increased by 160% from 1961 to 2003. Tradeoffs for an increase in food production have contributed to a decline in other ecosystem services, with 60% of them being degraded (https://www.cbd.int/ibd/2008/).

The resulting loss of biodiversity from these drivers of change and an associated decline in ecosystem services has significant consequences for the health and well being of all species on Earth. Globally, there are 6,500 breeds of domesticated animals and a third of these are under threat of extinction due to their very small population sizes (https://www.greenfacts.org/).Coral reefs host a quarter of the Earth's marine biodiversity and support livelihoods of more than half a billion people. However, the planet has already lost half of its coral reefs over the last three decades and more than 90% of them might become extinct by 2050 (https://earth.org/).

The fifth edition of global biodiversity outlook report (GBO5) underlines that 1.7 number of Earths would be needed to regenerate the biological resources used by humanity from 2011 to 2016 (https://www.cbd.int/gbo/gbo5/).There is continued threat to over 60% corals due to overfishing and risk of extinction to 1940 local domesticated animal breeds out of 7155 whose risk status are known across the globe.

As per the bi-annual 'Living Planet Report 2020' released by the WWF, 68% of the biodiversity is lost in the past five decades.The brunt of it was borne by freshwater species, whose population went down by a staggering 84%. It is estimated that even with increased conservation efforts, an improvement seems unlikely before 2050 (https://timesofindia.indiatimes.com/india/).

The Living Planet Index maps 21,000 populations of mammals, birds, fish, reptiles and amphibians. The Latin America and Caribbean lost 94% of its biodiversity while the Asia

Pacific saw a 45% drop in Biodiversity. Almost one in three freshwater species are threatened with extinction (https://livingplanet.panda.org/). The biggest threat to biodiversity in the Asia Pacific was change in land use (accounting for 45% of the threat) followed by species overexploitation (26.9%) and invasive species and disease (14%).

Indian Context

Due to geographic and climatic diversity, the country possesses a varied biological diversity, and ranks 6th amongst the 8 countries which are leaders in biodiversity across the world. Around 60% to 70% of world's biodiversity is found in India and the other Mega diversity countries put together. More than 86,870 animal species are identified in India. Some 14% of its 1232 bird species, 47% of its 496 reptile species and 62% of its 209 amphibians are unique to India. About 10% of insect species are endemic to the Indian region, whereas over 40% of Indian leeches, freshwater sponges and mollusks also exhibit endemism (https://shodhganga.inflibnet.ac.in/).

The diverse physical features and climatic conditions in India have given rise to a unique complement of forests, grasslands, wetlands, coastal and marine habitats, and desert ecosystems across a wide altitudinal gradient; thus, India has been described as a "mega-biodiverse" country. Biogeographically, India is located at the tri-junction of three realms, - the Afro-tropical, Indo-Malayan and Paleo-Arctic realm, - and thus has characteristic elements from each of them making the country rich in biological diversity (MoEF, 2001). The country is also one of 12 primary centers of origin of cultivated plants and domesticated animals. It is considered to be the homeland of 167 important plant species of cereals, millets, fruits, spices, vegetables, pulses, fiber crops and oilseeds, and 114 breeds of domesticated animals (Sinha *et al*., 2010; Sahu, 2011).

India has only 2.4% of the world's land area, but 12% of all flowering and non-flowering plant species of the recorded world flora (MoEF, 2001). This includes 15,000 species of flowering plants, of which 35% are endemic. These are distributed among 141 genera belonging to 47 families and are concentrated in the floristically rich areas of North-East India, the Western Ghats, the North-Western Himalayas and the Andaman and Nicobar Islands (Sinha *et al*., 2010). It is estimated that 62 per cent of the known amphibian species in India are endemic, of which the majority is found in the Western Ghats (Sahu, 2011).

As per the bi-annual 'Living Planet Report 2020', over 12% wild mammals and 3% bird species face the threat of extinction while 19% amphibians are threatened or critically endangered in India. With 14 of 20 river basins already stressed, it is predicted that the water demand is likely to be twice the availability by 2030.One-third of India's wetlands have already been lost in the past four decades (https://timesofindia.indiatimes.com/india/).

Global Biodiversity Targets and Protocols of UNCBD

Despite numerous commitments, biodiversity loss continues to accelerate in all regions. The tenth meeting of the Conference of the Parties, held during October 2010 in Nagoya, Aichi Prefecture, Japan, adopted a revised and updated Strategic Plan for Biodiversity, including the Aichi Biodiversity Targets, for the 2011-2020 period. However, only 15 per cent of countries appear to be on track to achieve the Aichi Targets on biodiversity by the target date of 2020.

The Cartagena Protocol on Biosafety to the Convention on Biological Diversity, which aims to ensure the safe handling, transport and use of living modified organisms resulting from modern biotechnology that may have adverse effects on biological diversity taking also into account risks to human health, was adopted in January 2000 and entered into force in September 2003 (https://bch.cbd.int/protocol/).

TheNagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) to the Convention on Biological Diversity was adopted in October 2010 and entered into force in October 2014 with the objective to set an international, legally binding framework to promote a transparent and effective implementation of the ABS concept at the regional, national and local level in the future (https://www.cbd.int/abs/doc/protocol/).

As per the fifth Global Biodiversity Outlook Report (GBO5) released by the United Nations Convention on Biological Diversity (UNCBD), none of the 20 agreed conservation targets of the past 10 years could be fully met by the world. Out of 20 Aichi biodiversity targets agreed in 2010 with 2020 deadline, the world has not achieved 14 targets while six could be only partially achieved within the deadline (https://www.cbd.int/gbo/gbo5/). This report is quite worrying, especially when new goals to protect biodiversity in next 10 years (2021-30) are soon to be finalized.

Conclusions

With one million species facing extinction, there has never been a more important time to focus on biodiversity.

Biodiversity is an important cross-cutting issue in the 2030 Agenda for Sustainable Development. Goal 15 explicitly recognizes the importance of halting biodiversity loss, and other Goals recognize the importance of biological diversity for eradicating poverty, providing food and fresh-water, and improving life in cities.

Reversing the trend of biodiversity loss requires action by all sectors and stakeholders including Govt. agencies, civil society, academia and business. We need better research, and we need to act on the evidence that biodiversity is integral to achieving social and economic goals.

The responsible use of natural resources is essential to sustainable development. It is critical that we make progress in mainstreaming biodiversity and transforming how societies value and manage. Mainstreaming biodiversity will ensure that addressing development needs and protecting the environment are mutually supportive.

References

- https://bch.cbd.int/protocol/background/
- https://earth.org/how-to-protect-worlds-coral-reefs-before-they-go-extinct/
- https://en.unesco.org/commemorations/biodiversityday/2018
- https://livingplanet.panda.org/en-gb/about-the-living-planet-report
- https://shodhganga.inflibnet.ac.in/jspui/bitstream/10603/194349/6/06_chapter%201.pdf
- https://timesofindia.indiatimes.com/india/68-of-biodiversity-lost-in-5-decades-wwf-report/articleshow/78031490.cms
- https://www.cbd.int/gbo/gbo5/publication/gbo-5-en.pdf
- https://www.cbd.int/ibd/2008/atstake/

- https://www.cbd.int/abs/doc/protocol/nagoya-protocol-en.pdf
- https://www.greenfacts.org/en/biodiversity/l-3/3-extinction-endangered-species.htm
- https://www.undp.org/content/seoul_policy_center/en/home/sustainable-development-goals/goal-11-sustainable-cities-and-communities.html
- MoEF, 2001. India: State of the Environment 2001. Biodiversity (Chapter 9). Ministry of Environment & Forests, Govt. of India. pp. 77–95.
- Sahu, R.K., 2011. Mega Biodiversity in India. 31 p. (Free e-book may be downloaded from https://vigyanprasar.gov.in/).
- Sinha, R.K., Dubey, M., Tripathi, R.D., Kumar, A., Tripathi, P. and Dwivedi, S. (2010). India as a Megadiversity Nation. *EnvioNews* (Newsletter of ISEB India) 16(4), November issue.

RESTOR: AN OPEN DATA PLATFORM OF ECOLOGICAL INSIGHTS FOR THE GLOBAL RESTORATION MOVEMENT

Last week, Prof. Thomas Crowther publicly announced Restor in a talk during the TED Countdown Event. Restor is an open data platform of ecological insights for the global restoration movement. It will enable restoration practitioners to analyze, monitor and share their work.

The Crowther Lab at ETH Zurich is pleased to be working with Google and a wide network of restoration projects, communities, scientists, and environmental organizations around the world as we prepare for a global launch in 2021 to support the beginning of the UN Decade on Ecosystem Restoration.

To view the TED talk and for more information, visit Restor: www.restor.eco.

Are you a restoration practitioner? Join an ever growing group of restoration organizations all over the world sharing project location information (i.e. polygons) and guiding the platform's development before it is public: https://www.crowtherlab.com/restoration/#sign-up

COLLABORATIVE PARTNERSHIP ON SUSTAINABLE WILDLIFE MANAGEMENT

Boris Matejčić, Rijeka, Croatia

The Food and Agriculture Organization of the United Nations through the Collaborative Partnership on Sustainable Wildlife Management has developed four major themes around the COVID-19 Challenge: Zoonotic diseases and wildlife. The document describing the importance and themes can be found at: http://www.fao.org/forestry/wildlife-partnership/en/. Click on "Read the statement here! found at the right hand side of the page.

NEW MIRASILV SOFTWARE-2020 FOR FORESTRY AND AGROFORESTRY PLANTATIONS CASE STUDY FOR TEAK AND CACAO PLANTATIONS

Luis Ugalde Arias
International Forestry Advisor
International Forestry & Agroforestry – INFOA, Costa Rica
E-mail: laugalde@gmail.com

Modules of MiraSilv-2020 Software

Originally the MiraSilv was developed as part of doctoral research at the College of Forestry, University of Minnesota, USA (Ugalde, 1988) and primarily consisted of the forest inventory module, now expanded and in wide use throughout the world for monitoring and evaluating different **forest plantations, agroforestry and silvopastoral systems**. However, at their request and supported by a group of companies and forestry projects that have been using this software for many years, as well as incentives national programs in different countries, a decision was made to further expand the software. The new modules incorporated have been developed and put into practice with a group of companies in recent years. The new version of MiraSilv-2020is trilingual (Spanish, Portuguese and English), can run single-user or in a network, and is composed of eight modules and other additional options as shown in Figure 1.

Figure 1. The main modules (in capital letters) and other options of the MiraSilv-2020

Forest Inventory

Based on measurements of permanent or temporary plots, the Forest Inventory module estimates total volume and commercial volume of standing trees representing the forest assets of the company or forestry project. Thinning can be simulated and reports and charts generated on diameter class distribution in growth and yield at the level of measurement plot or stands of plantations.

The MiraSilv allows to export previous trees measurements to use in a movil devise (like a **Tablet**) in order to collect in the field the next trees measurement and then import it into the MiraSilv.

The main objective is **to facilitate, reduce errors and lower costs** in measurements of forest inventory plots and experiments, as well as in logs measurement and in timber sales.

Chain of Custody

The methodology consists of documenting Chain of Custody (CoC) from the last measurement of standing trees in monitoring measurement plots (MP) located within a stand where trees to be thinned in each plot are felled, or all of the trees in the case of a clear felling. Bucking of the felled trees produces logs in the dimensions utilized by the company or the specifications of the buyer. The logs are measured in the field and can be classified or coded by **log class**(depending on defects and percent of use) and **type of use** (depending on the products to be fabricated in the sawmill). With this information, the system estimates and projects total yield of the different volumes by log class and product type for a plot or entire

stand. This provides very realistic estimates of expected timber production and sale from one or an array of stands without felling trees in the rest of the plantation.

Later, all of the logs from thinning in all stands can be entered to complete the entire chain of custody according to FSC standards. Figure 2 shows an example of a projection to estimate the commercial volume of teak by circumference classes using the Hoppus formula plus allowances, and its valuation based on buyer list prices for export to India. In the case of timber sales, the system allows for different types of reports, including the packing list of logs or blocks per shipment or dispatch of containers, according to the buyer's specifications.

Sistema MiraSilv 20/01/2017

TEAK PLANTATIONS SLB-CR

CofC - Diameter distribution of pieces according to the price list with valuation

Only plot forms; Form: 0000000039 (LI-P1); Type of harvest: Raleo; Circumference; Type of material: Trozas con corteza; Piece class code: All; Piece usage code: All

Species: TECTGR, Tectona grandis; Age: 64 months (5.3 years); Measurement: 0; Project: SLB; Lot: 1 (15.8 hectares); Site: 001; Site Name: FINCA QUEBRADA HONDA; Experiment: 00001; Treatment: 001; Repetition: 0; Sampled plots: 1; Total sampled area: 1049 m2; Equation: Hoppus C-6 L-5 => ((C-6)^2*(L-5))/16; Price list: MAYARGROUP 1.80M JULY-2016 (COPIA) (U.M. Circ.: cm; U.M. Length: m; catalog allowances: C = 0 cm; L = 0 m)

Entry forms date: 02/10/2016; Exchange rate: USD 1 = CRC 540.00 (31/12/2015); Process date: 15/04/2016; Range of circumference (cm): 29 - 101; Range of length (m): 2.30 - 10.30

Range of circumference and length	Mean Circ. (cm)	Mean length (m)	Freq. of sampled pieces	Freq. of pieces per Ha	Frequency (%)	Total Vol. (m3)	Indust. Vol. (m3)	Ind. Vol. in Local Units (Pmt)	Indust. Vol. (m3/Ha)	Vol. (%)	Ind. Vol. by Lote by Spec. (m3)	Value of Ind. Vol. in USD/Ha	Value of Lot's Ind. Vol. in USD
1 40 <= C < 51 (1.8 <= L <= 2.35)	48.60	2.30	5	47	19.23	0.21	0.12	41.53	1.21	5.57	19.23	121.74	1,923.49
2 51 <= C < 61 (1.8 <= L <= 2.35)	55.50	2.30	8	76	30.77	0.46	0.27	89.87	2.63	12.06	41.67	382.48	6,043.20
3 51 <= C < 61 (4 <= L <= 11.8)	60.00	10.30	1	9	3.85	0.29	0.18	60.71	1.78	8.14	28.13	373.95	5,908.36
4 61 <= C < 71 (1.8 <= L <= 2.35)	67.00	2.30	2	19	7.69	0.16	0.10	34.02	0.99	4.56	15.76	219.58	3,469.40
5 61 <= C < 71 (4 <= L <= 11.8)	65.75	7.38	4	38	15.38	1.02	0.66	214.99	6.30	28.83	99.64	1,955.17	30,891.69
6 71 <= C < 81 (1.8 <= L <= 2.35)	76.00	2.30	1	9	3.85	0.10	0.06	22.39	0.65	3.00	10.37	174.05	2,750.02
7 81 <= C < 91 (4 <= L <= 11.8)	83.67	4.53	3	28	11.54	0.76	0.51	166.64	4.88	22.34	77.22	2,077.19	32,819.56
8 91 <= C < 101 (1.8 <= L <= 2.35)	91.00	2.30	1	9	3.85	0.15	0.10	33.02	0.96	4.43	15.30	368.03	5,814.87
9 101 <= C < 111 (4 <= L <= 11.8)	101.00	4.55	1	9	3.85	0.36	0.25	82.49	2.41	11.06	38.22	1,330.67	21,024.59
	63.96	3.73	26	247	100.00	3.54	2.29	745.69	21.87	100.00	345.59	7,002.86	110,645.18
				Grand Total		3.54	2.29	745.69	21.87		345.59	7,002.86	110,645.18

Figure 2. Example of projected commercial volume of logs in the stand based on measurement plots in Costa Rica.

Valuation of Logs and Value-added Products

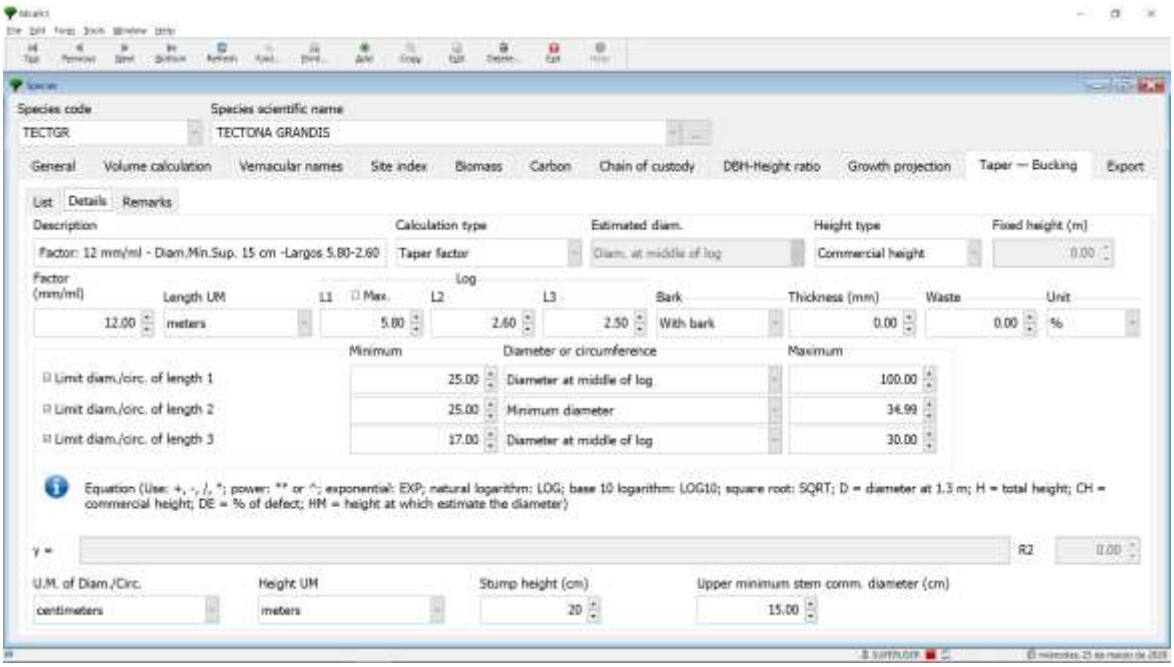
Based on the estimation of commercial volume and using the price catalogues of potential buyers, the system makes it possible to estimate the value of standing wood and/or total income corresponding to the sale of wood as logs and value-added products of different quality, sizes, and types of use.

This valuation can be made based on estimates of current commercial volumes in a forest inventory or through projections of future volumes. This permits and facilitates the estimation of possible future income and decision making about the best moment for thinning and the most appropriate period of rotation. The system also allows storage of all wood sales of the different products over time in the corresponding stands.

Bucking of Standing Trees

This module was developed to facilitate and to predict the optimum bucking of teak trees before felling. The software estimates the number of logs of various lengths and their commercial volume. These estimates are based on the price list of teak buyers that include the appraisal of the logs by diameter or circumference class.

The system allows comparing the bucking software's projections of logs number and individual volume of logs per tree with the results obtained using the chain-of-custody method developed for quantifying actual field production of logs from individual trees from a thinning or clear felling (Ugalde, 2008). The bucking estimates diameters for logs at different heights of the tree, using taper equations or taper factors generated from chains of custody of individual trees. This application makes it possible to project logs and volume by individual standing tree based on a simulated thinning or clear felling of the trees on a measurement plot or from a forest inventory (Figure 3). It reports logs and volumes by individual tree, averages by plot, by hectare and by stand and the respective log values with or without bark and up to a minimum upper trunk diameter.



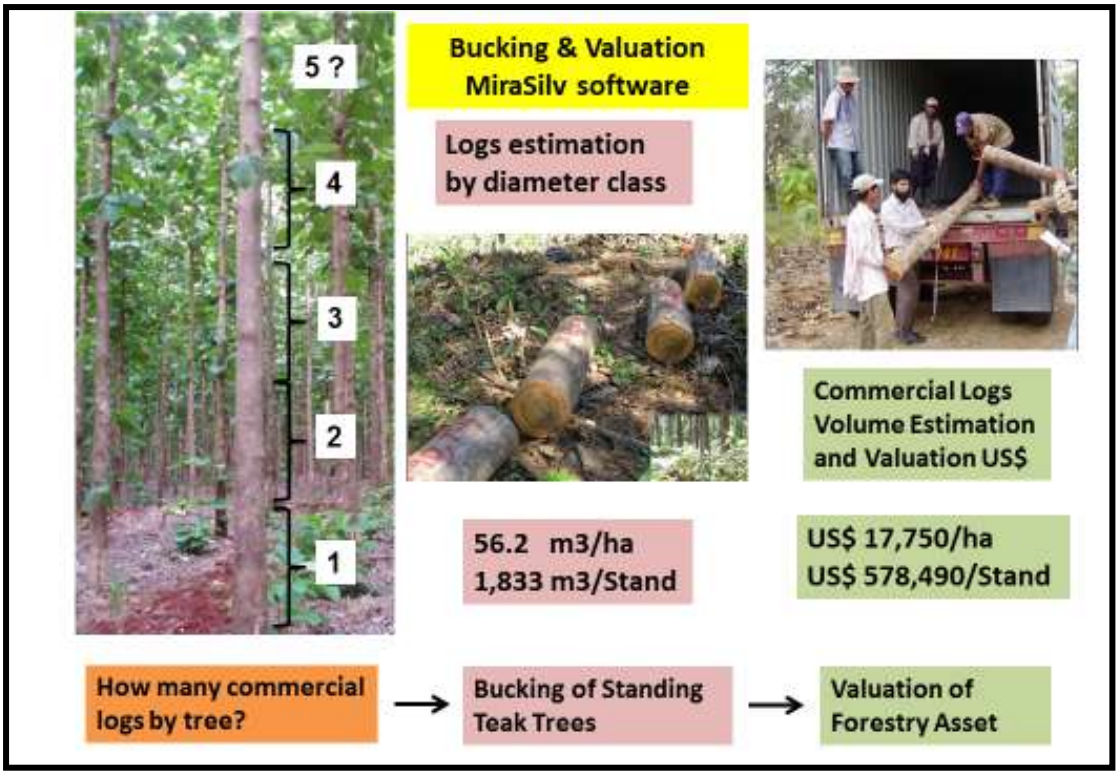


Figure 3. Example of bucking and valuation of teak timber in Panama

Transformer Logs– Sawmill

The Log Transformation module is linked with the results from the modules of **Bucking of Standing Trees** into logs or Chain of Custody (CoC) of individual trees.

Through transformation equations, factors and tables generated from chains of custody of individual trees, the **Transformer** converts logs from bucking into value-added products, such as rough sawn timber, rough squares, clean squares, and sawn timber of different dimensions (Figure 4). It also facilitates valuation of the transformed products based on the price catalogs of potential buyers.

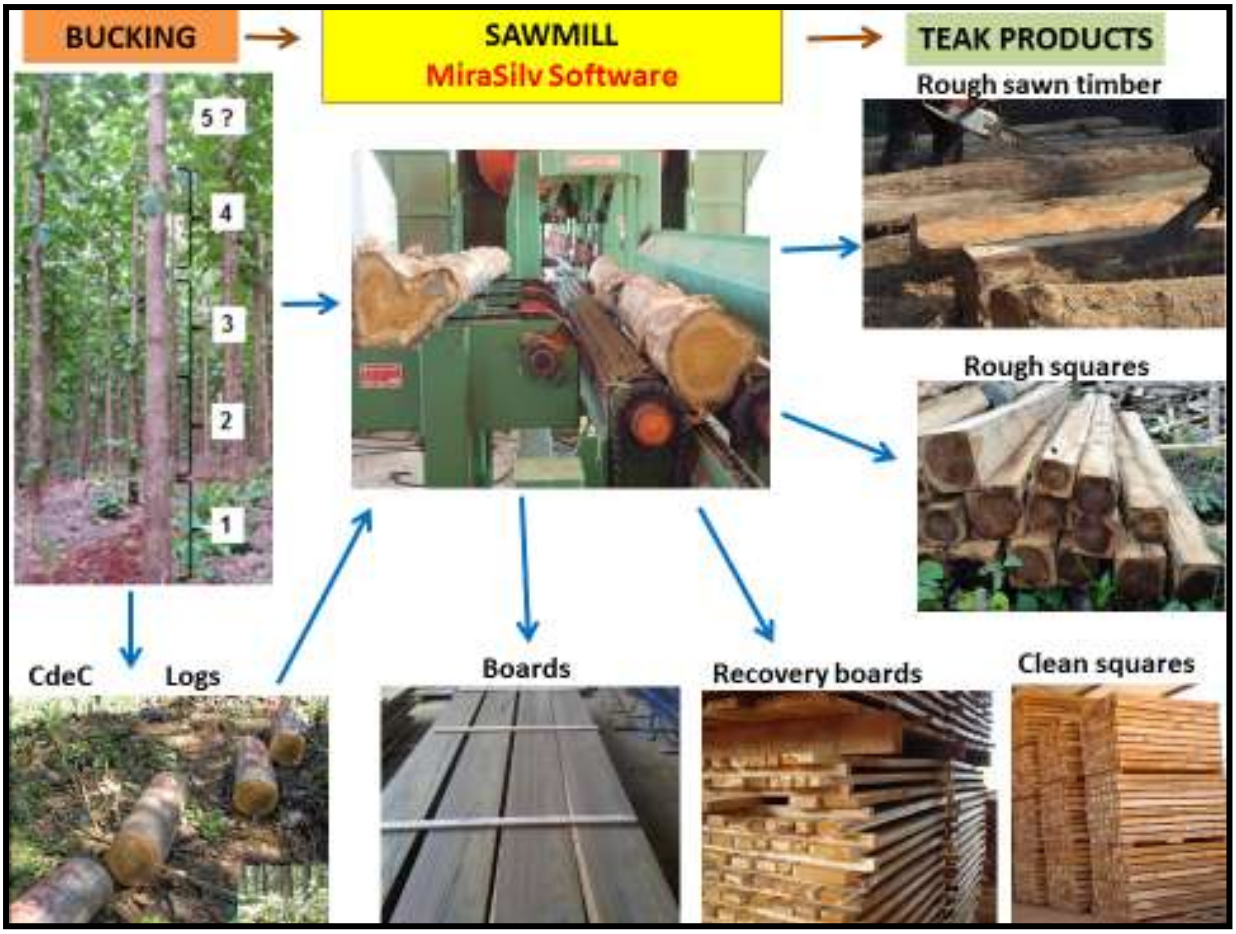


Figure 4. Application of log transformer to generate different teak value-added products

Bar Code for Pieces Inventories

The objective is to facilitate and streamline inventories of logs, lumber or value-added products in the field, stockyards, containers or timber yards, thus reducing the time and costs of these operations.

Label printing is done through MiraSilv utilising an **application** for generating **bar codes**. The labels are printed with a **thermal printer** on moisture-resistant plastic paper and placed on the logs or pieces forming part of the inventory (see photos above). A **tablet** or a bar code scanner is then used to record measurement information (diameters, lengths, etc.)in a file with spreadsheet format, while at the same time the bar code for each piece is read using a tablet application or scanner, thus creating a database for all pieces in the inventory.

The tablet or bar code scanner can then be used for automated reading of the labels to keep track of pieces taken out of inventory. For example, at the moment wood is sold as logs,

a file on the logs placed in the truck or container is generated on the tablet or scanner (Figure 5).

Figure 5. Loading and dispatch of teakwood (left) inventoried with bar code (right) in Mato Grosso, Brazil.

Growth and Yield Projections

With the Growth Projector, DBH and heights at future age scan be predicted based on previous consecutive measurements and with a forest site and management (management profile) level of quality. Projection equations can be used at the levels of stands or individual trees.

The future projection can be bucked, transformed, and valuated to support and facilitate decision making about felling age and the type of products to be sold. Below are examples of growth curves developed for teak in given site qualities, and with a projection of DBH for up to30-year rotation period.

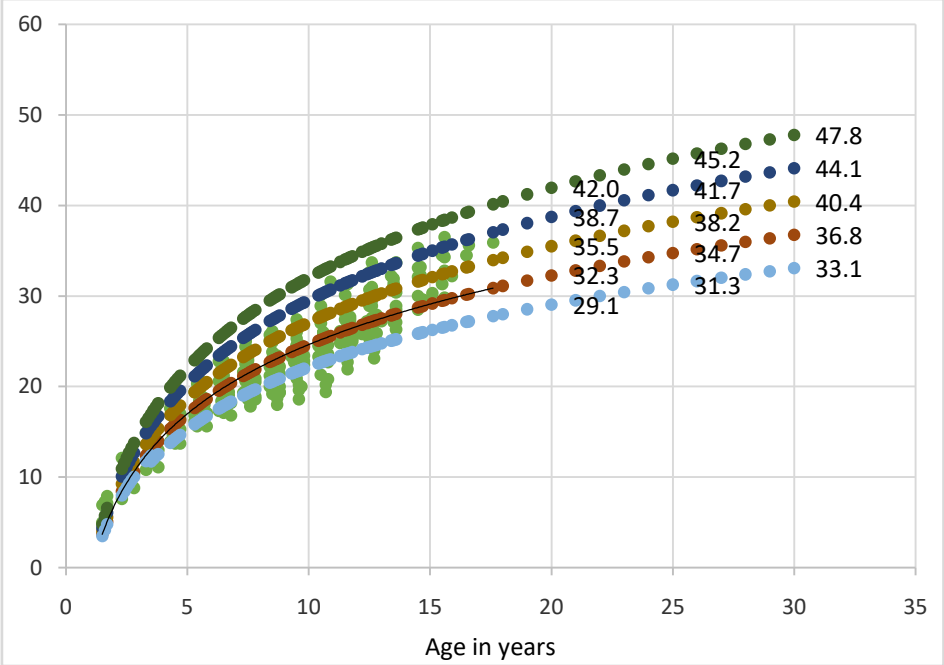


Figure 6. Projection of growth curves in DBH (cm)for teak in different site qualities (Ugalde, 2016).

Annual Operational Plan (AOP)

The objective is to implement the Annual Operational Plan (AOP) of the Activities per plantation Lot, it includes the labor needs and the cost (wages / day), Supplies (fertilizers, herbicides, pesticides, etc.), method of implementing the activity (chemical, manual, machining, etc.), Tools, Machinery and Warehouses. The detailed AOP allows to have a better estimate of the annual budget and the planning for the following years, as well as, to keep a history of the operational activities of the different years and to be able to compare the yields through the years.

Agrosilvopastoral Systems

The MiraSilv software allows the estimation and monitoring of the growth, volume, biomass and carbon sequestration of trees in any arrangement or design in which the trees are associated with agricultural production systems such as cocoa and coffee and / or in silvopastoral systems (see examples below).

Fig. 7. Examples of agrosilvopastoral systems for estimating biomass and carbon sequestration with MiraSilv software.

See below an example of agroforestry systems with different forest trees associated with cocoa

MiraSilv System 20/03/20

AGROFORESTRY WITH CACAO

Carbon and CO2 Sequestration Means by Plot

Most recent measurement; Most recent inventory; Permanent and temporary plots

Country code: CR **Proj.:** REFOREST THE TROPICS (RTT) **Site S.N.:** 001 **Site name:** DELICIAS-MOHEGAN

Planting date	Meas. S.N.	Age (m.)	Age (y.)	Lot code	Experim. code	Treat. code	Treat. S.N.	Rep. S.N.	Species code	Orig. trees (plot)	Surv. trees (plot)	Survival (%)	Surv. stems (ha)	Spacing (cm)	Net area (m2)	Mean DBH (cm)	Mean height (m)	Tot. vol. (m3/Ha)	MAI TV (m3/Ha per year)	CAI TV (m3/ Ha)	Carbon (Tn/Ha)	MAI Carbon (Tn/Ha /year)	CAI Carbon (Tn/Ha)	CO2 (Tn/Ha)	MAI CO2 (Tn/Ha /year)
15/12/99	1	93	7.8	10	33	MIXTA033	33	0	MIXTAV	265	221	75	480	300x300	4000	18.0	11.3	74.8	9.7	--	14.6	1.9	--	53.5	6.9
15/12/99	1	93	7.8	10	33	MIXTA033	33	0	ARAUHU	39	29	74	63	300x300	4000	16.4	10.2	6.4	1.1	--	1.9	0.2	--	6.9	0.9
15/12/99	1	93	7.8	10	33	MIXTA033	33	0	CEDJOD	1	1	100	2	300x300	4000	5.2	4.2	0.0	0.0	--	0.0	0.0	--	0.0	0.0
15/12/99	1	93	7.8	10	33	MIXTA033	33	0	CORDAL	7	7	100	15	300x300	4000	31.4	14.6	11.8	1.5	--	2.7	0.3	--	9.7	1.3
15/12/99	1	93	7.8	10	33	MIXTA033	33	0	DIPRPA	6	6	100	13	300x300	4000	11.7	10.2	0.7	0.1	--	0.1	0.0	--	0.5	0.1
15/12/99	1	93	7.8	10	33	MIXTA033	33	0	EUCADG	5	4	80	9	300x300	4000	21.0	12.3	1.6	0.2	--	0.4	0.0	--	1.3	0.2
15/12/99	1	93	7.8	10	33	MIXTA033	33	0	HYERAL	30	24	80	52	300x300	4000	19.3	13.4	9.6	1.3	--	2.2	0.3	--	8.1	1.0
15/12/99	1	93	7.8	10	33	MIXTA033	33	0	TECTON	10	9	90	20	300x300	4000	19.3	15.0	4.0	0.5	--	0.6	0.1	--	2.0	0.3
15/12/99	1	93	7.8	10	33	MIXTA033	33	0	THEOCA	197	141	72	306	300x300	4000	17.5	10.4	38.6	5.0	--	6.8	0.9	--	24.9	3.2

For more information about MiraSilv-2020software and how it can be obtained, contact:

Dr. Luis Ugalde Arias, International Forestry Advisor

International Forestry & Agroforestry – INFOA, Costa Rica

E-mail: laugalde@gmail.com

Website:http://internationalforestry.org

Mobile: +506 83496718

PROJECT REPORT

CONSERVATION OF COMMUNITY FORESTS AND RIPARIAN ECOSYSTEMS WITHIN THE BLACK VOLTA RIVER BASIN (BVRB) OF GHANA

Emma Baah Agyapong, Fatawu Nisirudeen, Clement Issaka Anaba and Martin Kusi

Summary

This document contains the final report of the project to promote the conservation of forests and riparian ecosystem within the Black Volta River Basin (BVRB) in Ghana. The project was supported by Rufford Small Grant and Environment and Agroforestry Foundation (EAF) with the objectives of promoting conservation of riparian forest and wildlife species and building the capacities of community members to manage their natural resources effectively. The project area is characterized by biodiversity, sensitive ecosystems, natural reserve sites and a great potential for tourism development and for the establishment of Community Resource Management Area (CREMA). However, human activities including bushfire, uncontrolled farming and felling of trees is deteriorating the ecosystem at a faster rate. This project used a participatory management approach where communities were involved from the initial to the final stage of the project. Three communities (Menji, Kulmasa and Maluwe) which falls within Tain, Bole and Sawla-Tuna-Kaliba District Assemblies respectively were selected. There was an intensive sensitization and education on conservation where over 3000 inhabitants were reached within January 2018 to May 2020. Community members were trained as trainers on forest

and wildlife conservation, tree nursery establishment and silvicultural operations. Between 2018 to 2020 over 5 hectares degraded portions were restored with indigenous trees whereas Menji community was supported with a draft of a by-law to manage their forest and crocodile species which is now at the Tain District Assembly for gazetation. At the end, community members shown positive change in attitude towards conservation whereby they are now restoring their forest and wildlife resources to promote tourist attraction. In Menji and Kulmasa communities have started receiving tourist attraction for sight-seeing of diverse crocodiles.

Introduction

The project team members have been working in communities along the Black Volta River Basin of Ghana for over five years as facilitators of several community development projects. Among the projects was the assessment of the socioeconomic and ecological status of communities along the BVRB supported of the United Nation Development Programme (UNDP) under the Small Grants programme of the Global Environmental Facility (SGF-GEF) in 2015.

The BVRB is a trans-national river system that stretches through Mali, Burkina Faso, Ghana and Cote d'Ivoire. In Ghana, the basin flows through part of the Upper West, Savannah and Bono East regions comprising of several fringe communities. The basin is biologically diverse system comprising tropical forest (downstream) and savannah forest (in upstream) and riparian vegetation (Quandzie, 2012; GreenWater Hut, 2015).

Field inspection and observation indicated that the landscape isbiologically diverse and support flora (such as *Pterocarpus erinaceus* (Endangered), *Vitellaria paradoxa* (Vulnerable*), Khaya ivorensis (VU) and Azadirachta indica (LC),* and fauna (such as the white colobus monkey *(VU)* and crocodile species (eg. West African dwarf crocodile (*Osteolaemus tetraspis* (VU), Nile crocodile (*Crocodylus niloticus* (LC), critically endangered, slender-snouted (*Mecistops cataphractus* (CR), African buffalo (Cyncerus caffer) LC, Hippopotamus amphibious (Vulnerable), *Alcelaphus buselaphus* (Endangered) and fishes such as the *Alestes, Protopterus* and *Hydrocynus* which confirmed studies done by Allwaters consult Ltd in 2012 and Quandzie in 2012.

Moreover, the flooding of the Bui Dam reservoir that was constructed on the Black Volta River Basin in 2009 resulted to the flooding of Bui National Park which led to the migration of most wildlife to nearby ecosystems (thus forest patches and riparian vegetation) that need to be well protected and managed.

Field observation indicated that human activities such as mining, bush burning, farming and uncontrolled felling of trees and poaching of wildlife is deteriorating the ecosystems at a faster rate. These activities are resulting from ignorance, negligence and poor attitude in relation to conservation by local communities.

This led to the emergence of the project on conservation of community forest fragments in the transitional zone of Ghana and Conservation of community forests and riparian ecosystems in the transitional zone of Ghana which was funded by Rufford 1st and 2nd Small Grant and EAF in December 2017- December 2018 and June 2019- June 2020 respectively in three selected communities along the Black Volta River Basin. These communities were strategically selected from the upper, middle and lower stream of the Basin as model communities where the outcome of the project can be replicated in other communities.

There is a need to provide evidence based-conservation approach where local communities are fully involved in decision making, planning and execution of conservation activities to initiate sustainable conservational goals through participatory management approach, which is the only way the commitment of the communities (grassroots stakeholders) can be gained. Studies in Dolakha, Nepal and Ethiopia, revealed that forest areas managed by local communities is far better than areas where locals are not involved in management (Takahashi & Todo 2012; Niraula *et al.*, 2013). We therefore seek to promote the conservation of community forest patches and riparian vegetation along the BVRB through capacity building of locals to manage their own forest and other resources. The objectives of the project are;

1. To promote the conservation of community forest patches and riparian vegetation along the BVRB.
2. To embark on mass education on the importance of forest and riparian vegetation in supporting wildlife.

3. To assist community members to map and assess tree and wildlife species to serve as a basis for management plan design.
4. To build the capacities of local members and equip them to effectively manage their own resources.
5. To train members on nursery establishment and silvicultural operations and rehabilitate degraded sites.
6. To assist community members to review and amend local by-laws on the protection of riparian ecosystem, forest patches and wildlife species.

Study area

The BVRB has a total catchment area of 142,056 km^2 including areas outside Ghana. Only 33,302 km^2 (23.5%) of the entire catchment area are located in Ghana. Geographically the project was located at the upstream (thus Maluwe and Kulmasa) and downstream (thus Menji) portion of the BVRB in Ghana. Maluwe is located on Lattitude 8.668931and Longitute -2.289577, Kulmasa is found on Lattitude 9.698649 and Longitute -2.492504) and Menji is located on Lattitude 7.9251 and Longitute -2.386145. Maluwe is located in Bole District in Savanah Region, Kulmasa is found in Sawla-Tuna-Kalba in Savannah Region and Menji is located in Tain District belonging to Bono East Region.

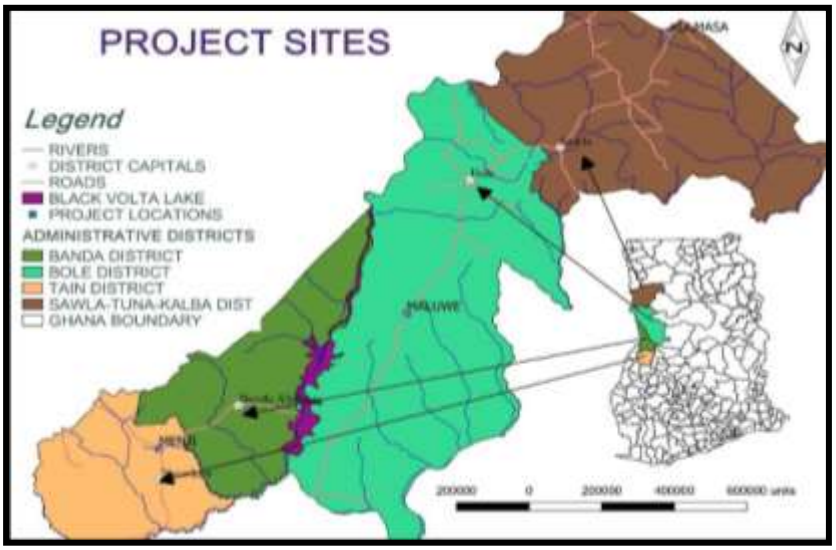


Plate 1: Map of the project area including the three districts where the project communities were located; Maluwe is located in Bole District, Kulmasa is found in Sawla-Tuna-Kalba and Menji is located in Tain District

Source: Author's own construct (2019)

Rainfall, evaporation and temperature

Rainfall patterns vary from 1043mm to 1270mm to the south. The minimum evaporation is within 1450mm/year to about 1800mmm/year with an average runoff of about 243m3/year with the upstream experiencing single rainfall pattern unlike the downstream with double rainfall pattern. Temperature is high throughout the year with temperatures ranging between 21°C to 35°C with the upstream recording the highest. The rainfall pattern is becoming more erratic and poses a major challenge in the basin as most farmers do rain-fed farming in a farm of monoculture (Ghana Statistical Services, 2014).

Geology and soil

Its geology is dominated by sand, stones, shales, mudstones, limestone, phylites and schists with mineral depositions on granites formations. The soils have primarily light textured surface horizons where sandy loams are common with abundant coarse material, either gravel or stone which adversely affect their physical properties particularly their water holding capacity (Adu,1995).

The upstream area is characterized by a series of varied plateaus made up of Birrimian and post Birrimian granites and their weathered materials with levelled surface under the influence of denudation. In the downstream zone, the geology is known to be underlain by the precambian formation of rock believed to be rich in mineral deposits. The predominant soil type in the upstream zone is Lixisol which is comprised of soils that have higher clay content in the subsoil than in the topsoil as a result of pedogenetic processes leading to an argic subsoil horizon. Lixisols usually have a high base saturation and low-activity clays. The main soil type in the downstream zone consist of ochrosols and small patches of Oxysols and Rubrisols according to the National Soil Classification System (Junner & Hirst,1946).

Vegetation type

The structure of forest tree stands determines a number of ecosystem and community processes, and defines the habitat for much forest dwelling species. Within the basin is diverse forest cover types including guinea savannah type characterized by tall grasses and woodland and shrubs examples of trees found include *Adansonia digitata* (Baobab), Khaya spp, dawadawa (*Perkia biglobosa*), shea, and Acacia species. In the

upstream is moist semi-deciduous and guineas savanna woodland forest types comprising of trees such as Khaya spp, *Ceiba pentandra*, *Milicia wxcelsa Odum*, wawa *Triplochiton scleroxylon*), *Mansinia ultisima* (oprono), (Emire) *Terminalia ivorencis*, *Pycnanthus angolensis* (otie) and *Ceiba pentandra* (onyina). Within this area is the Bui National Park which serve as a priority conservation area and serve as a home for several important species of flora and fauna (including the white-breasted guinea fowl, the colobus monkey, chimpanzee, hippopotamus, and the honey badger (Green WaterHut, 2015).

Population

Population in the Volta Basin in 1990 was 5,198,000 and in 2010 was 8,570,068 and has been projected to be 11,696,054 in 2015 with an urban population being 16% and 84% rural population (Barry et. al., 2005). Since it is generally rural, people depend largely on the exploitation of the natural resources for subsistence agriculture and livestock breeding as their livelihood, which might not be environmentally sustainable in the future.

Economic Activities

The major economic activity in the upstream is agriculture covering about 80% of the population and crops grown are mostly cereals such as Maize, Sorghum and rice in the rainy season and vegetables including pepper; tomatoes and onions in the dry season. Other minor economic activities are trade, shea butter production, charcoal production, weaving, production of traditional textiles, fishing and mining. In the downstream zone, 64% of the populace are involved in agriculture which includes both annual crops such maize, cassava, yam and cash crops such as cocoa and cashew whereas the remaining populace involve in production, transport operators, sales workers and professional and related workers. Apart from the Bui National Park (wildlife reserve), the land is mainly used for agriculture and animal husbandry. The system of farming is predominantly shifting cultivation or land rotation cultivation on a mostly subsistence basis (Ghana Statistical Services, 2012).

Methods

The project was conducted using the following approaches;

1. Reconnaissance survey, stakeholder consultation, identification and selection of participants of the project

Reconnaissance survey and informal visit was conducted to select three communities within the BVRB (in upstream and downstream) to identify key informants and relevant stakeholders of the project between December 2017 and March 2018. The selection of these communities was based on the richness of the landscape which was the focus of the project. This was a preliminary approach conducted at the study area to have a general overview of the entire landscape and meeting of key informants and authorities within the study sites for familiarization to pave way for actual project activities to be undertaken.

The project team and stakeholders (including Traditional Authorities, Assembly members, Traders, Farmers, Religious Leader, leaders of women and youth groups, Teachers, Students, staffs of Forest Services Division and Wildlife Divisions) were involved in the selection of participants. The involvement of these people was to seek their consensus and build their trust and gain their commitment.

Stratified purposive sampling method was used to select twelve participants (four from each community) to be involved in mapping and field assessment. Participants were trained on mapping by the use of Global Positioning System (GPS) and field data collection. This was followed by field assessment where key tree and wildlife species (the endangered and threatened species) were identified in each community to serve as a basis for community sensitization, education and capacity building.

2. Mapping and data collection methods

During the months of December 2017 and March 2018, mapping and assessment was done in a priority forest fragment by the project team (4 persons) and selected 7 community members who were trained on basic assessment, data collection methods and the use of global positioning system (GPS), tree and wildlife assessment. The initial plan was to conduct hundred percent assessment of all plant and animal species in one priority fragment however; due to time and limited funding, we focused on dominant and threatened species. The aim of the assessment was to have a general overview of the

different tree and wildlife species to serve as a basis for education and sensitization activities.

The team took coordinates of the boundary of each fragment by using GPS to know theextent of each riparian ecosystem. 200m-500 km transects with an interval of 10m (survey lane) between transects were used to record tree species. Each survey lane was walked on independently whilst recording tree species between transect. Wildlife species which were observed by sight, their droppings and foot prints. Crocodiles in each area were observed several times and captured with a camera and with the help of a field guide (a guide to crocodiles in Ghana) the various species were identified.

3. Community Sensitization and Education Method

During April 2018- December 2018, June 2019 to April 2020 Community sensitization and education methods used for mass education included; interviews and focus group discussions, one on-one discussions, talk shows in schools and during community gatherings, and jingle on local media.

A) Interviews and Focus Group Discussions

Selected individuals in each community were interviewed to gather information on their views in relation to the importance of forest, riparian ecosystem and wildlife and how to manage them effectively at community level. This was to get a general view of their understanding on conservation and to serve as a basis to restructure sensitization and education programmes. It was observed that women and children are not allowed to be part of decision-making in the community, therefore during the interview and discussion there was a need to segregate sex and age groups to capture the opinion of women and children. During interviews and focus group discussions, audio and video recordings were done and later transcribed.

B) One-on-one discussions, floats, talk shows and jingle on local media

Community members were informed on the composition of the available resources (trees and wild animals) from the results of inventory and the importance of riparian ecosystem to the well-being of humans and animals as well as the dos and the don’ts in protecting the areas on the local media. Subsequent education in schools (Primary, Junior

High and Senior High Schools) and community gatherings (durbars, funerals and religious gatherings) were done and relatively smaller groups were supported in awareness creation with fliers on forest and wildlife conservation through street floats.

4. Formation of and Training of Environmental Management Clubs (EMC) and Community

Fire Management Advisory Groups (CFMAG)

During the months of April to July 2018, Community Fire Management Advisory Group (CFMAG) and Environmental Management Clubs (EMC) were formed in schools and in communities and trained to spread conservation messages and to assist in the management of community forest and wildlife in the respective communities.

5. Participatory Capacity Building Workshops

During the months of June-July 2017, 7-days capacity building workshop was done where individuals were purposively selected and trained as trainers on forest and wildlife conservation in their respective communities. Individuals comprised of students (from primary to Senior high school), community members and opinion leaders (including Teachers, Sub Chiefs, Assembly Members and Religious Leaders). There was comprehensive discussion where ideas were shared on basic communication skills, best forest and wildlife management practices among several others. Simple and understandable educational materials such as power point presentations, brochures and videos were used during training using an informal education method since majority were illiterate. The workshop involved getting participants to identify challenges and discussed in focus groups (FGD) strategies that can improve ecosystem resilience. Participants were allowed to agree or disagree with each other so that it provides an insight into how a group thinks about an issue, about the range of opinion and ideas, and the inconsistencies and variation that exists in a particular community in terms of beliefs and their experiences and practices.

6. Capacity building for Environmental Management Clubs (EMC) and Community Fire

Management Advisory Groups (CFMAG)

Within the month of June 2018, 7-days intensive training was conducted to 30 members thus 10 from each community comprising of EMC and CFMAG members by the support of Ghana national Fire Service and Forest Services Division by the use of simplified guide and PowerPoint presentations on effective management of forest, wildlife and wildfire and field demonstrations. These members have been accepted by the communities with the backing of the Chiefs in each community as people that will oversee the management of the resources (forests and wildlife) and continue the spread of conservation messages during and after the project period. Their duties and roles have been stated in simplified handouts to guide their operations and there were tasked to sign membership agreement to ensure commitment.

7. Nursery establishment and rehabilitation of degraded areas

August to December 2018, June 2019- March 2020. The capacity of community members was built in nursery establishment and silvicultural operation. Communities were supported to establish a prototype nursery with indigenous trees for rehabilitation of degraded sites.

8. Review and amendment of by-law method

Between January 2020 to March 2020, the project team selected Menji as priority community to assist them to review and amend its by-laws on conservation of their riparian forest and wildlife (especially crocodile) species and to serve as a guide for other communities to emulate. During the review and amendment of the by-law, all vital stakeholders were involved to solicit for their views for effective management.

9. Monitoring

Prior to the commencement of the project, an activity plan was designed by project team with community representatives to guide the activities of the project. Project team members in collaboration with local team selected people who reported to project team every month. There was a weekly monitoring and evaluation among project team and

community representatives. There was a monthly review meeting with leaders to share ideas on the progress of work and areas that needed improvement and amendment.

Results Mapping and Assessment of Trees and Wildlife

The project trained seven locals (2 from Menji, 2 from Kulmasa and three from Maluwe) on resource mapping using GPS and assessment of tree and wildlife as shown in plate 2.

Plate 2: Training of community members on mapping using GPS and resource assessment

Assessment of Tree and Wildlife

During the assessment, tree species which were identified in all the areas (upstream and downstream) included; *Pterocarpus erinaceus* (Endangered), *Vitellaria paradoxa* (Vulnerable (VU)), *Khaya ivorensis (VU)* and others including *Adansonia diditata*, *Khaya spp*, *Perkia biglobosa*,*Acacia species* in the upstream C*eiba pentandra*, *Milicia excels*, *Triplochiton scleroxylon*, M*ansinia ultisima*, *Terminalia ivorensis*, *Pycnanthus angolensis* and *Ceiba pentandra* in the downstream.

Animals recorded includes in the areas included; white colobus monkey *(VU),* West African dwarf crocodile (*Osteolaemus tetraspis* (VU), critically endangered, slender-snouted (*Mecistops cataphractus* (CR), *Hippopotamus amphibious* (Vulnerable) and *Alcelaphus buselaphus* (Endangered).

Community education and sensitization

Between December 2017 to May 2020, about 3000 locals were reached with conservation messages in schools (as shown in plate 3) and community gatherings (as shown in plate 4) in the three communities as shown in plate 3 below.

Plate 3: Education in Menji Junior High School (right) which was proceeded with float (left) in the community to create awareness on conservation

Plate 4: Community education during religious gathering at Maluwe (left) and in small groups at Kulmasa (right)

Capacity building of local members for effective management of forest and wildlife resources 100 community members, which included 10 teachers, 15 traditional leaders, 3 Assembly members, 20 church leaders, 25 locals and 27 students' capacities,

were built on the effective management of forest and wildlife resources as shown in plate 5 below.

Figure 5: Picture taken during capacity building workshop for community members

Formation of Environmental Management Clubs (EMC) and Community Fire Management Advisory Groups (CFMAG) and capacity building of EMC and CFMAG

EMC was formed and trained in four basic and one senior high schools to continue the spread of conservation messages among their peers (as shown in plate 6). CFMAG were also formed and trained to manage wildfires and comprised of 25 (thus 15 from Menji and 10 from Kulmasa) as shown in plate 6. Simplified handout were provided to guide their education activities in schools and in communities as well as fire management. Moreover, the teachers were urged to include them in the environmental studies course. CFMAG were provided with safety cloths and tools (as shown in plate 7) for fire management. CFMAG members were mandated to sign the terms of conditions (as shown in plate 7) in relation to forest, wildlife, wildfire management.

Plate 6: Capacity building of CFMAG and EMC members

Plate 7: Donation of protective cloths and fire management tools (left) to CFMAG members and signing agreement on their involvement and commitment (right)

Nursery establishment and rehabilitation of degraded area

The capacity of 30 selected community members was trained on nursery establishment and silvicultural operation as shown in plate 8. Communities were supported to establish a prototype nursery with indigenous trees (as shown plate 9) for rehabilitation of degraded sites.

Figure 8: Filling of poly pots (left) and arrangement of poly pots (right) for nursery establishment

Figure 9: A model nursery comprising of mahogany, shea butter tree, Neem and Rosewood Thus Between 2018 to 2020 over 5,000 indigenous trees were planted in Menji, Kulmasa and nearby communities as shown in plate 10.

Figure 10: Tree planting exercise in Kulmasa community where over 70-years old man (right) who love to grow more trees and have the desire to conserve forest and wildlife was actively involved

Review and amendment of by-law at Menji community

During the review and amendment of the by-law, 104 stakeholders which included; representatives from Tain District Assembly, Forest Services and Wildlife Division, various youth and women groups' representatives, political leaders, traditional authorities, various religious leaders, Nongovernmental and community-based organizations were involved.

Participants were strategically divided into smaller groups during review and amendment to solicit for the views of each person in each group (as shown in plate 11) and later presented the compilation to participants, for validation, final compilation and endorsement (copy of draft attached as appendix 1).

Figure 11: Picture taken during review of Menji by-law, participants were divided into groups to gather their all opinions as which serve as a basis for an amendment

Figure 12: The reviewed draft was further scrutinised by participants where they were grouped (left) to solicit for their views and the final views from each group was presented to the whole group for final inputs (right)

Monitoring

The team paid monthly visit to schools and communities to assess the progress of conservation education through discussion and interviews with teachers, students and community members. The responses indicated some level of awareness on conservation of forest and wildlife species in the respective communities.

Discussion

The involvement of community members at the various stages of the project (from proposal development, execution of project activities and monitoring and evaluation) led to the realization of the project objectives. Their views were solicited and included during the implementation plan design and execution of the project activities, and they played the leading role in executing most of the activities, which motivated them to be responsible and fully involved in relation to conservation which was realised by Takahashi & Todo in Dolakha and Nepal in 2012 and by Niraula *et al.*, in Ethiopia in 2013. Community members have realized the need to preserve their forest including riparian ecosystem and crocodile species, which have the potential to become a tourist site in future. Protection of trees and wildlife has become the priority of community members and their focus is on the long-term benefit (where their focus is on restoring the area to attract tourist) rather than killing and felling of trees where the benefit is short term. In Menji and Kulmasa, communities use local 'calls' to bring crocodile out of water for sight-seeing which is currently gaining tourist attraction (as shown in plate (13). This is a link (https://youtu.be/a03szwXPvXE) for a video during the call of crocodile at Kulmasa community.

Plate 13: crocodile at Kulmasa which was brought out from the water by the use of local 'call'

Capacity building of community members and EMC and CFMAG on forest and wildlife conservation contributed to the spread of conservation messages and management of the resources and wildfire. This has led to a reduction in fire occurrences, poaching of wildlife especially crocodile species and management of restoration activities. Moreover, the threat of bushfires to food crops and other properties in the communities were highly minimized since last 2018. Community members are eager to establish their own tree nursery for planting of degraded areas which has contributed to over 5 hectares of degraded area benefiting from restoration activities.

The presence of by-law in Menji on conservation of riparian forest and crocodile species has deter culprits from illegal activities (which has created conducive environment for the increase of crocodile at Menji crocodile pond) and has gain much attention in neighbouring communities who are also calling for support to draft similar law for their community.

The team of this project recommend further project which will focus on improving the livelihood of local communities which will reduce pressure put on the resources since majority of the communities rely on forest and wildlife resources for their livelihood.

Acknowledgements

Firstly, we would like to express my honest gratitude to Rufford Small Grant who provided 1st and 2nd funding to support almost all the project activities. Secondly our appreciation goes to Mr. Brobbey Francis, District Manager Lawra Forest Services Division in Upper West Region for their support on education and tree planting activities, Tain District Assembly for their support during the drafting of Menji By-laws, Traditional Authorities and Hon. Assembly members at Menji and Kulmasa, and referees who recommended this project for funding: Doc. Amos Kabo-bah (HOD, University of Energy, Sunyani), Doc, George Ostein, Director forUNDP-JEF Small grant project, Prof. Dr. Louise (Wieteke) Willemen, Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente, Louise van Leeuween, Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente, The Netherlands. We would also like to acknowledge International Tropical Timber Organization (ITTO) for their support in the preparation and determination of this report.

References

- Adu, S. V. (1995) Soils of the Bole-Bamboi Area, Northern Region, Ghana. CSIR-Soil Research
- Allwaters consult Ltd (2012). Diagnostic Study of The Black Volta Basin In Ghana. Final Report
- Armenteras,D., Rodriguez,N. & Retana,J. (2009) Are conservation strategies effective in avoiding the deforestation of the Colombian Guyana Shield? *Biological Conservation*, 142,1411-1419.
- Barry, B., Obuobie, E., Andreini, M., Andah, W., Pluquet, M. (2005) *Comprehensive Assessment of Water Management in Agriculture.* Comparative Study of River Basin Development and Management Report. International Water Management Institute.
- Beck, B.B., Rapaport, L.G. & Stanley Price, M.R. (1994) Reintroduction of captive-born animals. In *Creative Conservation: Interactive Management of Wild and Captive Animals* (eds P.J.S. Olney, G.M. Mace & A.T.C. Feistner), pp. 265–286. Chapman & Hall, London, UK.
- Ghana Statistical Service (GSS). (2014) Statistical Year Book (201–2014). Accra: GSS.
- GreenWater Hut (2015) Baseline Assessment of Black Volta River Basin Socio-Ecological Production Landscape and Waterscape in Ghana. Unpublished Report. United Nations Development Programme (UNDP) GEF Small Grants Programme (SGP).
- Junner, R.R., and Hirst, T. (1946). The geology and hydrology of the Voltaian basin.
- Gold Coast Geological Survey Memoir 8, Gold Coast Geological Survey, Accra, Ghana.
- NiraulaR., GilaniH., PokharelB. & QamerF.M. (2013) Measuring impacts of community forestry program through repeat photography and satellite remote sensing in the Dolakha district of Nepal. *Journal of Environmental Management*, 126,20-29.
- Quandzie Stephen (2012): Potential for Increasing Agricultural Water Productivity in the Black Volta Basin, Ghana. MSc. Thesis

- TakahashiR. & TodoY. (2012) Impact of Community-Based Forest Management on Forest Protection :Evidence from an Aid-Funded Project in Ethiopia. *Environmental Management*, 50,396-404.

Appendix 1: Copy of Menji Community by-law

DRAFT BYE-LAWS FOR THE MANAGEMENT OF MENJI CROCODILE POND

(Menji Crocodile Pond Management Regulation)

PREAMBLE

WHEREAS wildlife is any undomesticated, free-ranging animal in their own naturally associated habitats.

WHEREAS riparian ecosystem is essential habitats for very sensitive wildlife such as Crocodile, fishes, birds, crabs, medicinal plants, etc.

WHEREAS proper management of riparian ecosystem brings a lot of benefits to the environment and the community (including; economic value, biomedical value, ecological value, aesthetic importance, spiritual value, ethnic/cultural value, among others)

WHEREAS as anthropogenic activities such as; Habitat destruction, Poaching, Bushfires, Farming, pollution, are but a few that threatens the survival and population of sensitive species.

WHEREAS the protection of these resources is critical and beneficial to the community and the world at large.

WE the members of Menji Community having realized the importance of the crocodiles in our water body, resolve to protect and enhance their environment and make it an attractive tourists' site for the benefit of the entire community.

WE therefore draft the following bye-laws to govern our conducts towards a successful establishment and sustainable management of the tourist site (Menji Crocodile Pond).

WE HEREBY ADOPT UNTO OURSELVES AND CIRCULATE THIS BYE-LAWS.

1. TITLE OF THE BYE-LAW

1.1 TITLE

The bye-law shall be known and called Menji Crocodile Pond Management Regulations, herein referred to as "MCPMR"

1.2 SUPREMACY OF THE BYE-LAW

a) This bye-law shall be the supreme regulatory instrument of Menji Crocodile Pond (MCP) and any other rules and regulation found to be inconsistent with any provision of this bye-law shall, to the extent of its inconsistency, be null and void.

b) This bye-law shall be subject to the constitution of the Republic of Ghana, and the forestry and wildlife division's policies.

2. GENERAL BYE-LAWS:

2.1 The pond, the crocodiles and all other resources in the water body belong to the community. Wherefore, the bye-laws drafted today shall be for the benefit of the community hence, our collective duty to adhere and protect it.

2.2 No one shall henceforth, wash or swim/bath in or along the water body (both the flowing and the stagnant)

2.3 There shall be no burning /use of fire in any form near the tourist site (Anyone found doing such shall be prosecuted)

2.4 Planting of trees around the pond (at least, about 50meter square) shall be a key role of Menji community

2.5 No one shall clear or cut any of the trees around the pond (whether planted or natural stand). As such, farming in any form within 100m around the river is prohibited

2.6 There shall be a reception unit of which, all tourist must register before going to the site.

(A special/approved group/committee formed by the community shall take charge of all matters of interest concerning the site).

2.7 In terms of employment opportunities, natives and recognized residence of the Menji community with the needed requirements shall be given the priority first.

2.8 (a). Only approved workers of the site shall provide chicks used for calling the crocodiles and may be verified by at least one tour guard.

2.8 (b). No one shall bring any chick from outside the reception unit and any one (tourists or non-tourist) found of carrying dangerous weapons/chemicals to the pond shall be prosecuted.

2.9 The tourist site shall be kept clean through communal labour and anyone found littering or defecation around the river shall be fined.

2.10 As a norm / taboo, of the community; No one shall use a cooking pot or bucket (use on fire before) to fetch water from the water body.

2.11 There shall be no hunting in any form (fishing, use of dogs, guns etc.) in and around the pond such act is realizable.

2.12 The safety of Tour Guards shall be ensured by the entire Menji community.

2.13 To ensure a conducive environment for the crocodiles and other supporting wildlife, there shall no noise close to the pond.

2.14 Nananom and Assembly members ought to announce to the community about the bye-laws governing the ponds.

2.15 Nananom, Assembly members and Tain District Assembly shall get involved to support the project to make it successful.

3. FINANCE AND DEVELOPMENT

3.1 The chiefs shall provide 10 to 20 plots around the site as property of the site for future development.

3.2 The profit gain shall be divided by three and shared among; The community, Tour Guards and Conservation Fund (for sustainable management of the pond).

3.3 The community share of the profit shall be used to build accommodation for tourists and other projects deemed beneficial to all members of the community.

3.4 There shall be proper and clear accountability of revenue generated from the site and its related projects.

3.5 Any form of conflict of interest shall not be entertained.

3.6 All monetary affairs shall be managed by; Unit committee, Nananom and Assembly member (s) and may be supervised by the supporting NGO herein called Environment and Agroforestry Foundation (EAF).

4. PENALTIES

4.1 There shall be a disciplinary committee comprising of the Chief or his assigned rep, Unit committee member (s) and the Assembly member.

4.2 Anyone found guilty of the above conducts (in 2 and 3) or any other offences relating to sustenance of the tourist site shall be called to order by the disciplinary committee.

4.3 Depending on the gravity of the offence, the particular person may be warned, fined, prosecuted or any other action deemed appropriate by the disciplinary committee.

4.4 A member found guilty of offence for the first time (deemed light by the committee) shall be warned and records of such shall be kept in the committee's file and copy in the district assembly's file.

4.5 A member found guilty of offence for the second time shall be sacked as member and published to the general public

5. AMMENDEMENTS

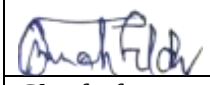
Every amendment to this bye-law shall be made by the Committee, provided, however, that no amendment shall be made unless:

5.1 Notice of such amendment has been submitted in writing to the Chief and District assembly at least one-month to the proposed effective date of amendment(s).

5.2 At least two-thirds of the Committee cast their votes in favour of the amendment.

We the management team of the area hereunto sign our names to give legal effect to these bylaws on this 15th day of May 2020.

Signed:

Nana Adisa IV	Hon Osman Tahiru	Emma Baah Agyapong
		
Chief of Menji Traditional Area	Assembly Member Menji Traditional Area	Director Environment and Agroforestry Foundation

SHARE YOUR KNOWLEDGE – PROTECT BIODIVERSITY

John Oluwaseun SHITTU
akanmualani@gmail.com

Forests are a stabilising force for the climate. They regulate ecosystems, protect biodiversity, play an integral part in the carbon cycle, support livelihoods, and supply goods and services that can drive sustainable growth. Increasing and maintaining forests is therefore an essential solution to climate change.

Forests, when sustainably managed, can have a central role in climate change mitigation, environmental services, conservation of biodiversity, provision of socio-cultural services, livelihood support. Humans need wild nature in order to survive. The best solution for fighting climate change and ending the extinction crisis is to set aside enough space for nature to support healthy biodiversity. That means protecting at least half the planet's land and seas. Scientists conclude that if we do so by 2030 we can successfully avert the worst of the climate and extinction emergencies. (In some cases, we need more than half. Fragile ecosystems, like rainforests, need up to 80% protected or stewarded by local, sustainable communities.)

Recent studies suggest that the local management of forests for carbon conservation and sequestration could mitigate emissions of carbon dioxide by an amount equivalent to 11 to 15 percent of fossil fuel. For example, my mandates is to domesticate Allanblackia floribunda trees in my organisation, in order to supply edible oil for Unilever International, as their raw materials for production of chocolates, cosmetics and spreads. At the same time, we are planting and conserving Allanblackia trees in the wild, because it is a carbon sink species. The method is to tackle climate change. Forest conservation, afforestation/reforestation and restoration are keys to tackle this.

Protecting the planet at that scale may seem like a huge task, but in fact, this is a historic opportunity for us to transform the way we live with nature. Because we must protect half the entire planet, that means every region, every community, every individual is on the frontlines of conservation. You are on the frontlines of conservation. The challenge is that while we need biodiversity and biodiversity needs us, most people around the world still don't know about the critical importance of wildlands and the biodiversity they support. You

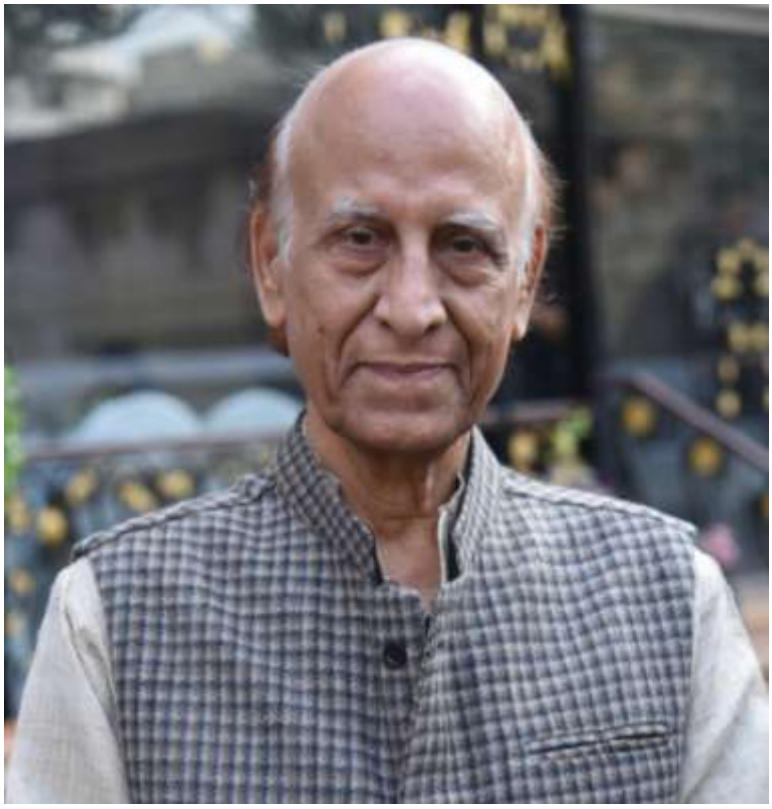
can help change that and spark new hope for the future. When you share with your friends, families, and networks about biodiversity, you expand the possibility for a healthy and wild future, and give new reason to hope.

Thanks

John Oluwaseun SHITTU

NOTICE

OBITUARY - BHAWANI SHANKER KUSUM



In Memory of Bhawani Shanker Kusum

Born 4 June 1947, deceased 14 November 2020. Bhawani Shanker Kusum earned a Master's degree in sociology and has been engaged in rural development activities for the past 35 years.

He has served as NGO delegate for Asia Pacific in the UNAIDS PCB, NGO Observer in the CTF Committee of the World Bank and CSO representative from Asia in the UNCCD for 2 years.

He established 'Gram Bharati Samiti' an NGO in 1984 for "Establishing a society based on humanitarian, democratic values and ecologically balanced habitat" with a focus on empowering the women by making them aware of their rights and economically self-sustained and conserving natural resources.

The '**wasteland development project**' implemented by him popularly known as **Gandhivan**, in district Jaipur is a model work on restoration of degraded land, checking soil erosion and stabilizing sand dunes.

He was an expert in training, monitoring and evaluation on environmental issues, developing training materials, restoring rainwater harvesting structures.

JP movement

Inspired by the Gandhian philosophy of "*sarvodaya*" ("universal uplift" or "progress of all"), Bhawani Shanker Kusum resigned from the Government service and involved in **Sampoorn Kranti Aandolan** (Peaceful total revolution)under the leadership of Jay Prakash Narayan (J.P.) in 1974. He was nominatedby J.P. in the six members National Committee of the Non-party Students and Youth forum '**Chhatra Yuva Sangharsh Vahini**' in 1977 and mobilized the youth of India for "Transformation of the Society", a nonviolent revolutionary movement against the corrupt polity and political system.

With Baba Amte

He played vital role in coordinating the **Knit India March** with 200 youth on bicycles to establish ***ahimsa*** and other Gandhian values in all parts of India under the leadership of reverend humanist Baba Amte in 1985 (South to North) and 1987 (East to West) for raising awareness on human rights, peace and brotherhood among all sects of the society. He engaged in the rehabilitation of1,000 leprosy-affected people by emancipating from beggary and making them self-reliant.

At international level

He served as NGO delegate for Asia Pacific in the UNAIDS Program Coordinating Board (Geneva)for 2 years, NGO Observer for Asia Pacific in the Clean Technology Fund Committee of the World Bank for 2 years and CSO representative from Asia in The United Nations Convention to Combat Desertification (UNCCD). He is presently working as President, Gram Bharati Samiti and National Coordinator of Intersect Worldwide (an international Network of NGOs).

Prohibition

He actively engaged in the movement for prohibition in the slums of Jaipur under the leadership of Shri Gokul Bhai Bhatt, the reverend Gandhian and one of the founders of Rajasthan. Thirteen wine shops (*Thekas*) running in the midst of the slums closed after yearlong agitations, peaceful demonstrations and picketing. Also, he played a key role in organizing state level people's movement through various activities i.e. rally, demonstration, *dharna* etc. in support of Gokul Bhai's demand for total prohibition in Rajasthan in 1978.

Reclamation of Bhoodan land

In 19979-80 he went in the tribal area of Rajasthan bordering to M.P. to work on a project of developing Bhoodan land (Land donated to Vinoba a reverend Gandhian leader for further distributing it to the landless poor) for 'Sahariya' tribe in the remote of district Kota. While working for reclaiming infertile, stony and barren Bhoodan land he worked untiringly to promote Gandhian values among the tribal communities through multifaceted activities e.g. organizing tribal youth tostop extracting elicit liquor, which was very common in several villages, running night classes at their 'Sahrana' (a community place) for non-formal education, unionizing for protecting their human rights and violence against women and girls.

He organized '**PADYATRA**' (Walk on foot) for 'Gram Swaraj' (People's sovereignty) in hundreds of villages of the area under the leadership of Mr. Siddharaj Dhadda and Mr. Brahmdutta Sharma, the eminent Gandhian leaders of Rajasthan. He organized youth camps to sensitize them to stop having liquor and smoking, take care of health and hygiene and to be aware of their rights. He could close 10 breweries with support of local youth, women and community leaders. He accomplished the project successfully by allotting the land to 50 families of Sahariya tribe after making it cultivatable.

Countries visited

Indonesia, the Netherlands, Germany, Kenya, U.K., Philippines, Australia, Spain, France, Switzerland, Thailand, Canada, U.S.A., Zambia, Sri Lanka, South Africa, Morocco, Cambodia, Pakistan, Turkey, Nepal, China, Burkina Faso to participate and make presentation on various topics i.e. human rights, violence against women and girls, combating drought and land degradation, women's land rights etc..

Freelance journalism

He did freelance journalism for 20 years and wrote cover stories, articles, short write ups on contemporary issues in leading Hindi dailies and magazines including 'Dharmyug', 'Dinmaan',Navbharat Times, Rajasthan Patrika, Itwari Patrika etc. on contemporary issues and problems of the society.

Service: He has served as:

- **Convener, Sampoorn Kranti Rashtriya Manch (Forum for peaceful transformation of the society**) for last 5 years
- **Trustee** of Sarva Seva Sangh (A national organization established to spread Gandhian philosophy of peace, love, religious and communal harmony and resisting injustice in an on violent way among the younger generation)
- **NGO delegate** from Asia Pacific in the UNAIDS (2006-2007)
- **NGO representative** from Asia Pacific in the CTF (Clean Technology Fund) Committee of the World Bank (2010-2011)
- **Representative of CSO of Asia** in the CSO Panel of UNCCD (United Nations Convention to Combat Desertification) (2015-17)

Awards and appreciation:

- **Van Vistarak Puraskar** by the Ministry of Environment & Forests, Government of Rajasthan
- **Ford Conservation and Environment Award** by the Ford India Co.
- **Indira Priyadarshani Vrikshamitra Puraskar** by the MoEF&CC, Government of India
- **Jal Mitra Puraskar** given by the Divisional Commissioner, Jaipur
- **Jamnalal Bajaj Award**, prestigious award of India for constructive work in Gandhian way

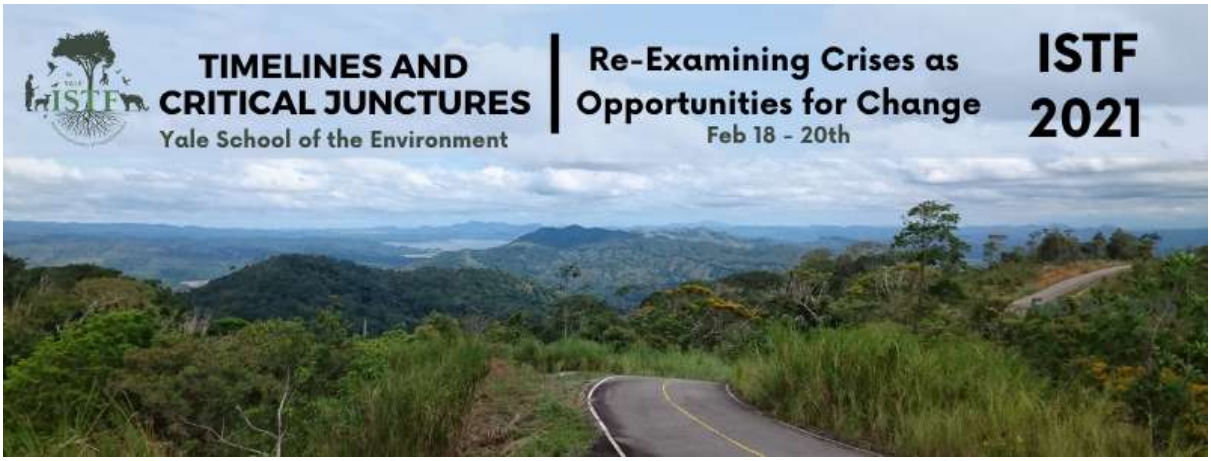
ARCHIVES

COIN FROM INDIA - "FORESTRY FOR DEVELOPMENT"

A 1985 "Forestry for Development" coin from India

ANNOUNCEMENTS/ EVENTS/MEETINGS/OPPORTUNITIES

FORTHCOMING SAF NATIONAL CONVENTIONS:



California SAF will host the 2021 SAF National Convention in Sacremento CA, November 3-7, 2021.

Allegheny SAF has been named host for the 2022 SAF National Convention to be held in Baltimore, MD on September 18-23, 2022.

SAVE THE DATE FOR THE 2021 VIRTUAL ISTF CONFERENCE AND SUBMIT YOUR PROPOSALS NOW!

The Yale Chapter of the International Society of Tropical Foresters (ISTF) invites you to register for our 27th Annual Conference: "*Timelines and Critical Junctures: Re-examining Crises as Opportunities for Change*."

- The conference will take place virtually on **February 18-20th, 2021.**
- Registration opens on **Friday, December 18th**.
- Abstract submissions for breakout sessions, posters and flash talks, and applications for the ISTF Innovation Prize, are **due Jan 8th, 2021**.

The Yale ISTF Chapter is dedicated to the advancement of tropical forest studies at the Yale School of the Environment, formerly known as the Yale School of Forestry & Environmental Studies. The ISTF conference has been hosted at Yale for 26 years and addresses a range of socio-ecological issues across the tropics. The 2021 conference will bring together an international community of academics, practitioners, activists, policy makers, artists, journalists, and community leaders to re-examine crises as opportunities for change. This year, the conference seeks to investigate crises as moments of learning and opportunities to set forth on new trajectories. Seizing these moments requires us to reflect on the interconnected nature of society, economy and the environment while motivating efforts to mitigate future events in light of our past successes and failures in capitalizing on these moments in time.

While the conference will unfortunately not be held in-person as per tradition, we hope that the online format will allow wider access and participation from attendees around the world, especially for participants and speakers that have historically faced difficulties with travel to the United States.

For more information and to registerafter December 18th, visit our website at https://istfconference.events.yale.edu/.

Follow ISTF on Facebook@yalefesistf, Twitter@YaleISTF and Instagram@yaleistf for updates as more conference details unfold! You can also join our mailing list here:https://istf.yale.edu/contact and email us at istf@yale.edu.

Yale's student chapter of the International Society of Tropical Foresters (ISTF) was first organized in 1989, as part of a network of natural resource professionals concerned with tropical resource management. ISTF provides a forum for students with interests and experiences in linking natural resource conservation and management with economic development.

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.

INTERNATIONAL SOCIETY OF TROPICAL FORESTRY NEWS

1. 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

---

2. ISTF membership

Accidental deletion of new people filling out ISTF membership form post 30 Nov 2020

If you filled out the form for membership in the International Society of Tropical Foresters after Nov 30 2020, please refill it at

https://docs.google.com/forms/d/1VkJMr0iwgXUJVY6vtvxqVIc_paghBht0AGsO0khEK1I/edit?usp=sharing

All the new entries from 30 November on were accidentally deleted. So sorry! Please pass this message on to anyone who might have filled out the form.

Sheila Ward, ISTF Coordinator

RECENT PUBLICATION AND RESEARCH NOTES

MAKING A MARK ON TROPICAL FORESTRY: THE JOURNAL OF TROPICAL FOREST SCIENCE (JTFS)

The year was 1988 when the Directorate of the Forest Research Institute Malaysia (FRIM) collectively agreed that the Institute needed to publish a refereed journal devoted to the development of tropical forests and forest products. That was the beginning of the *Journal of Tropical Forest Science* (JTFS). The Director-General of FRIM then was Tan Sri Dr Salleh Mohd. Nor and the management made a policy that all FRIM research officers should publish at least two research papers annually in refereed journals. Thus, establishing our own journal was the right call since, at that time, there were not many journals dedicated to tropical forestry research. Dr FSP Ng, the Deputy Director-General of FRIM was at the helm of the launching of JTFS and, his devotion never ebbed away, and we are honoured to have him as our consulting editor.

JTFS is an independent peer-reviewed journal not related to any commercial publishing house. It does require membership and does not charge any fee for publication and is well-supported by peer reviewers. Papers published in JTFS can be easily accessed via FRIM website,www.frim.gov.my. JTFS works hard to accommodate the needs of researchers, one of which is fast publication, but peer review takes time. Finding reviewers and getting good review reports are getting more difficult now. As the number of papers grow, we have to be more stringent in our initial screening. Many papers are rejected because they lack in originality, universality, readability or context. The average time from submission to publication is about 8 to 12 months. We welcome papers on original fundamental or applied research on tropical forest biology, ecology, chemistry, management, silviculture, conservation, utilization and product development. The journal is published four times a year, i.e. January, April, July and October. English is the official language of the journal. Only manuscripts with substantial scientific merit will be reviewed for originality, significance, relevance and quality. Submit your article via our online submission page: http://myjms.moe.gov.my/index.php/JTFS/.

It has now been 32 years since the inception of JTFS and the journal is now indexed in Clarivate Analytics. We have just published the October issue and the articles in the issue

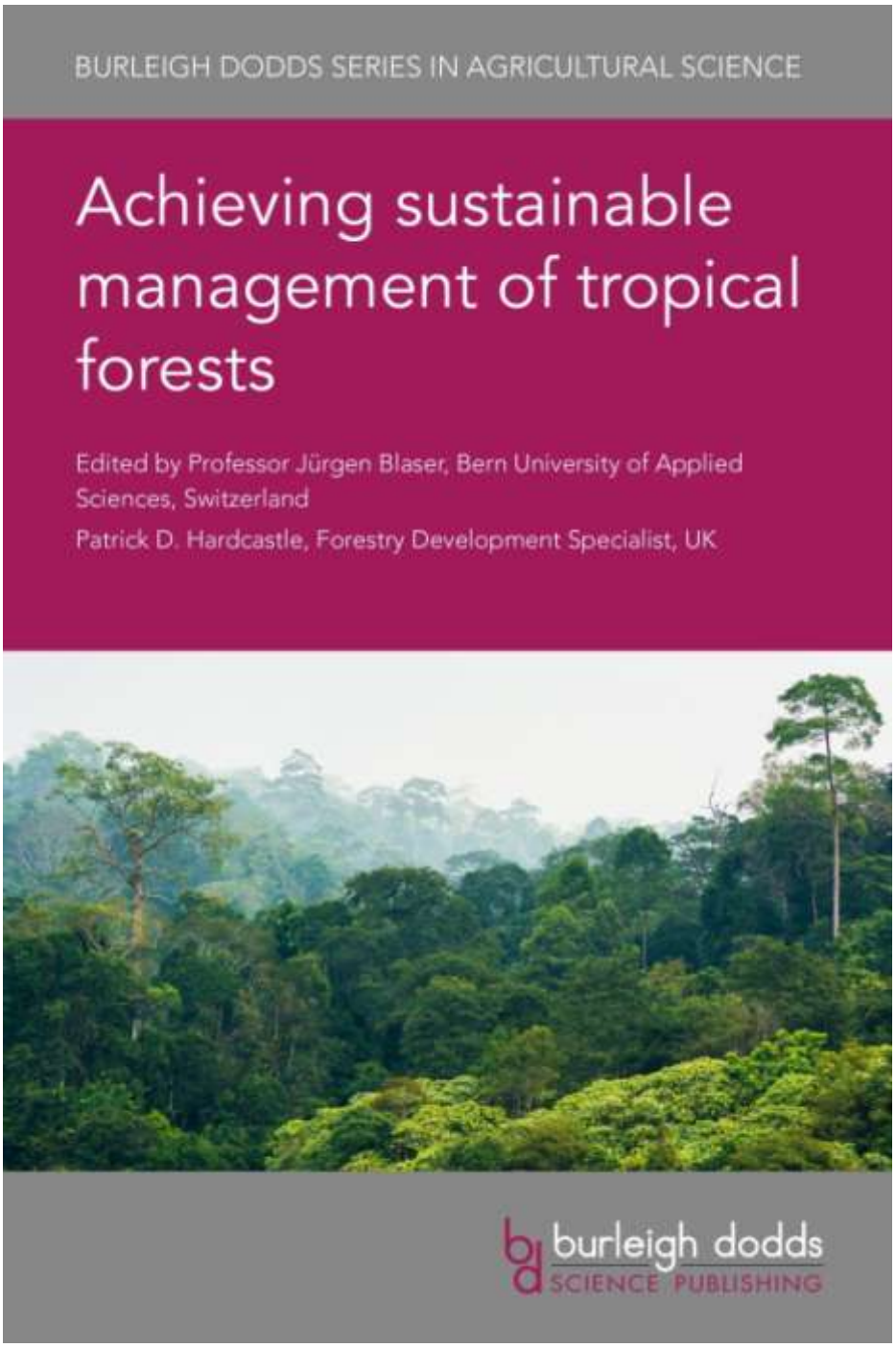
are listed below. This is our first time doing an announcement in ISTF Update and SAF-ISTF Newsletter and it is exciting. We look forward to receiving more submissions and expanding our readership.

Journal of Tropical Forest Science, Volume 32 Number 4

- CALONEGO FW, SEVERO ETD, SANSÍGOLO CA & DE BRITO AF. Physical and chemical changes in juvenile and mature wood of *Shizolobiumparahyba* caused by thermal modification
- LANSSANOVA RL, MACHADO SA, ORSO GA, PELISSARI AL, FIGUEIREDO FILHO A & SILVA FA. Calibration of a mixed-effect stem taper model for *Tectona grandis*
- ALWI A, LAPAMMU M, JARAPUDIN Y, MOLONY K, BODEN D, MACDONELL P, WARBURTON P, BRAWNER J & MEDER R. Importance of weed control prior to planting for the establishment of planted forests in Sabah, Malaysia
- YAHYA R, YANSEN & TAZURU-MIZUNO S. Fibre quality: length and slenderness ratio of fibre adjacent to small vessels of *Acacia mangium*
- KAMAL SF. Rationalising the role of Orang Asli in co-management of the Royal Belum State Park, Malaysia
- MARASIGAN OS, RAZAL RA & ALIPON MA. Effect of thermal treatment on the wettability of giant bamboo (*Dendrocalamus asper*) and kawayantinik (*Bambusa blumeana*) in the Philippines
- MOYA R, GAITÁN-ÁLVAREZ J, ORTIZ-MALAVASSI E, BERROCAL A & FERNÁNDEZSÓLIS D. Equations for predicting heartwood merchantable volume and tradable sawlog in *Tectonagrandis*
- RAFIDAH J, MOHD-SAHAID K, NORLIZA AR, AIDIL AH & MOHD-FARID A. Effect of sodium hydroxide pretreatment on chemical composition of treated *Acacia mangium* using response surface methodology
- JAYAWARDHANE J & GUNARATNE AMTA. Restoration success evaluation of a thinned and enriched pine plantation in Sri Lanka
- BALKRISHNA A, ARYA V & KUSHWAHA AK. Population structure, regeneration status and conservation measures of threatened *Cyathea* spp.

ACHIEVING SUSTAINABLE MANAGEMENT OF TROPICAL FORESTS

Burleigh Dodds Science Publishing are delighted to announce the publication of their exciting new title, *Achieving sustainable management of tropical forests*, edited by Dr Jürgen Blaser, Bern University of Applied Sciences, Switzerland and Patrick Hardcastle, Forestry Development Specialist, UK.



The book summarises and reviews the rich body of research on tropical forests and how this research can be utilised to make sustainable management of tropical forests a standard implementable strategy for the future.

Chapters feature expert discussions on the economic, political and environmental contexts needed for SFM to operate successfully, including coverage of the UN's Sustainable Development Goals (SDGs).

Find out more here.

SPECIAL OFFER

Benefit from **20%** off the purchase of the book if purchased via the Burleigh Dodds website.Enter code **TFOR20**at checkout to receive this discount.

ABSTRACTS AND KEY MESSAGES

NEW REPORT ON SOCIAL LEARNING FOR COMMUNITY-BASED FOREST MANAGEMENT IN BRAZILIAN AMAZONIA

Ana Violato Espada, Ana Luiza Violato and Kainer, Karen A.

Abstract:

Ana Violato Espada, a doctoral researcher at the School of Forest Resources and Conservation (SFRC)/University of Florida (UF), organized a community exchange among users of six Brazilian Amazon extractive reserves to emphasize collective inquiry, experimentation grounded in experience, and the wealth of social learning related to community timber management.

Community exchange among users of six Brazilian Amazon Extractive Reserves on September 18-20, 2019. Photo courtesy of Ana Violato Espada and Tropical Forest Institute.

The community exchange was part of Ana's 15 months of fieldwork (May 2018 to September 2019) for her thesis, which consisted of extensive data collection using diverse and complementary methods, including archival research, semi-structured individual interviews, group interviews (six community meetings with, in total, 167 participants), participant observation, and focus groups (a three-day community exchange). Drawing on a decade of experience working in community-based forest management in the Amazon, Ana applied a participatory action research approach, using multiple participatory tools to engage people and emphasizing participation and action towards Sustainable Forest Management.

This constituted an innovative methodological approach to participatory action research that is replicable in natural resource co-management contexts elsewhere.

Community members from six Brazilian Amazon Extractive Reserves participating in knowledge exchange. Photo courtesy of Ana Violato Espada.

Manejadoras*(female timber workers) participating in the community exchange among users of six Brazilian Amazon Extractive Reserves on September 18-20, 2019. Photo courtesy of Ana Violato Espada.*

The community exchange took place in the Verde para Sempre Extractive Reserve over three days (18–20 September 2019). It included 32 participants, of whom 27 were community members and five were from the Tropical Forest Institute - IFT (one environmental journalist, two forestry technicians and two newly graduated female foresters); the five IFT participants helped execute the logistics of the community exchange. Among the community members, ten were women working in timber co-management projects in their communities.

The methods supported social learning by sharing and reflecting on community logging experiences. The community exchange also created spaces for dialogue among community members and forestry extensionists that ultimately could lead to individual and collective empowerment processes and strategic actions to strengthen local governance and timber production in the tropics.

Some of the learnings from the exchange are that in extractive reserves in which community members have had high levels of involvement in decisions on how to manage forest resources for local benefit, we observed that:

- There is more local commitment to long-term forest use, which can promote forest conservation;

- Awareness is higher on how to distribute timber sales revenues to benefit people other than logging workers; and

- More community members participate in operational logging activities and forest management, which provides more autonomy and capacity to make decisions on community forests.

- Ultimately, the participation of community members in all stages of the decision-making process (before, during and after logging activities) promoted a process of community empowerment.

More lessons here:
https://www.itto.int/direct/topics/topics_pdf_download/topics_id=6529&no=1&disp=inline#page=20

Ana Violato Espada, PhD candidate at UF and Associate Researcher at IFT.

Key words: Amazon. Community Logging. Protected Areas. Social Learning.

Citation:

Espada, Ana Luiza Violato and Kainer, Karen A. (2020) "Fellowship Report: An ITTO Fellowship in the Brazilian Amazon has helped a doctoral researcher organize a community exchange among users of six sustainable-use forests and promote social learning on community-based forest management." *ITTO Tropical Forest Update* 29 (3): 20-24.

How to get the article: List a web page or an email address where people can get the full article:

https://www.itto.int/direct/topics/topics_pdf_download/topics_id=6529&no=1&disp=inline#page=20

ASSOCIATION COEFFICIENTS BETWEEN SPECIES: CALAKMUL, MEXICO.

Velázquez, A. G., Tadeo-Noble, A. E. T., Beltrán-Rodríguez, L., Nolazco, E. G., Martínez, M. A., and Ovalle, Á. L.
Email: alfredo.tadeo@itsvc.edu.mx

Summary

Association coefficients measure interrelation level between the attributes of two species within populations. The objective of this work was to analyze the association patterns among the 10 species with the highest importance value index (IVI) in a semi-evergreen forest of Calakmul, Mexico. The 10 taxa were expected to be independently distributed within the community, therefore no interspecific association would occur. Systematically, 479 sampling units were established on a 500-ha surface in the ejido Gustavo Díaz Ordaz, Calakmul. Eighty-five tree species, 36 genera and 32 families were recorded. IVI was estimated, and with the 10 most important species, an $\chi 2$ analysis was performed to test independence in 45 possible combinations of species pairs. Cole's interspecific association coefficient was considered based on the $\chi 2$ significance test. The 10 most important species represent 47.98 % of the IVI. The Cole association coefficient identified that 17 pairs, out of 45, were distributed in a dependent way regarding another species, while the rest were indifferent to the presence of these taxa. *Bursera simaruba*, the species with the highest IVI, was related to three species, while *Metopium brownei* (third position of IVI) was related to six taxa. It is proposed to apply this procedure as an independent though complementary statistical test to Ripley's K12(t), to establish numerical criteria for the selection and analysis of spatial data.

Key words: Cole coefficient, spatial ecology, importance value index, Ripley's K12(*t*), Synecology.

Resumen

Los coeficientes de asociaciónmiden el nivel de interrelación entre los atributos de dos especies dentro de las poblaciones. El objetivo de estetrabajofueanalizar los patrones de asociación entre las 10 especies con mayor índice de valor de importancia (IVI) en una selva medianasubperennifolia de Calakmul, México. Se esperaba que los 10 taxa se distribuyan de forma independiente dentro de la comunidad, por lo que no se presentaríaningúntipo de

asociacióninterespecífica. Se establecieron 479 unidades de muestreo de forma sistemáticaen una superficie de 500 ha en el Ejido Gustavo Díaz Ordaz, Calakmul. Se registraron 85 especiesarbóreas, 36 géneros y 32 familias Se estimó el IVI, y con las 10 especiesmásimportantes se realizó un análisis de $\chi 2$ para probar la independenciaen 45 combinacionesposibles de pares de especies; se utilizó el coeficiente de asociacióninterespecífica de Cole basadoen la prueba de significancia de $\chi 2$. Las 10 especiesmásimportantesrepresentaron 47,98 % del IVI. El coeficiente de asociación de Cole indicó que 17 pares de 45 se distribuyeron de forma dependienteaotraespecie, mientras que el resto fueindiferente a la presencia de estos taxa. *Bursera simaruba*, especie con mayor IVI, se relacionó con tresespecies, mientras que *M. brownei*(terceraposición de IVI) se relacionó con seis taxa. Se propone aplicaresteprocedimientocomo una pruebaestadísticaindependientepero complementaria a la K12(*t*) de Ripley, a fin de establecercriteriosnuméricos para la selección y análisis de datosespaciales.

Palabras clave: coeficiente de Cole, ecologíaespacial, índice de valor de importancia, K12(*t*) de Ripley, sinecología.

Velázquez, A. G., Tadeo-Noble, A. E. T., Beltrán-Rodríguez, L., Nolazco, E. G., Martínez, M. A., & Ovalle, Á. L. (2020). Coeficiente de asociación entre especies de selva mediana subperennifoliaen Calakmul, México.*Oficina de la Revista: Universidad Austral de Chile, Facultad de CienciasForestales y Recursos Naturales, Valdivia, Chile.*,*41*(3), 233-239. DOI:10.4067/S0717-92002020000300233

The article is available at:

https://www.researchgate.net/publication/346008868_Coeficiente_de_asociacion_entre_especies_de_selva_mediana_subperennifolia-2020

either online or author contact information:

alfredo.tadeo@itsvc.edu.mx

A DISCOUNTED CASH FLOW AND CAPITAL BUDGETING ANALYSIS OF SILVOPASTORAL SYSTEMS IN THE AMAZONAS REGION OF PERU

Chizmar, S.; Castillo, M.; Pizarro, D.; Vasquez, H.; Bernal, W.; Rivera, R.; Sills, E.; Abt, R.; Parajuli, R.; Cubbage, F.

Abstract:

Silvopasture is a type of agroforestry that could deliver ecosystem services and support local livelihoods by integrating trees into pasture-based livestock systems. This study modeled the financial returns from silvopastures, planted forests, and conventional cattle-pasture systems in Amazonas, Peru using capital budgeting techniques. Forests had a lower land expectation value (USD 845 per hectare) than conventional cattle systems (USD 1275 per hectare) at a 4% discount rate. “Typical” model silvopastures, based on prior landowner surveys in the Amazonas region, were most competitive at low discount rates. The four actual silvopastoral systems we visited and examined had higher returns (4%: USD 1588 to USD 9524 per hectare) than either alternative pure crop or tree system, more than likely through strategies for generating value-added such as on-site retail stands. Silvopasture also offers animal health and environmental benefits, and could receive governmental or market payments to encourage these practices.

Key words: silvopasture; economics; financial analysis; carbon payment; Peru

Citation: Chizmar, S.; Castillo, M.; Pizarro, D.; Vasquez, H.; Bernal, W.; Rivera, R.; Sills, E.; Abt, R.; Parajuli, R.; Cubbage, F. (2020). A Discounted Cash Flow and Capital Budgeting Analysis of Silvopastoral Systems in the Amazonas Region of Peru. Land, 9 (10).doi: 10.3390/land9100353

How to get the article: https://doi.org/10.3390/land9100353

INTEGRATED CLIMATE SENSITIVE RESTORATION FRAMEWORK FOR TRANSFORMATIVE CHANGES TO SUSTAINABLE LAND RESTORATION

Dhyani, Shalini & Bartlett, Debbie &Kadaverugu, Rakesh & Dasgupta, Rajarshi& Pujari, Paras & Verma, Parikshit.

Sustainable land restoration is the key to restore degraded land, halt biodiversity loss, and reinstate ecosystem services for human well-being. Restoration needs to be planned and conducted with due recognition to growing climate uncertainty with an evolved understanding of the future restoration targets. The present opinion article attempts to provide an overview on an integrated climate sensitive restoration framework that recognizes the local participation in mapping degraded lands, identification of species for supporting species modeling to better understand climate uncertainty. Involvement of citizen science-based restoration monitoring tools can contribute to big data analytics for ecological monitoring and policy support. The Framework potentially helps in sustainable land restoration by transformative changes for achieving the UN Decade on Ecosystem Restoration (2021–2030), Sustainable Development Goals 15, and addressing the post-2020 Global Biodiversity Framework. However, to realize success, climate finance mechanisms to drive restoration should be seriously considered for reducing bias and enhancing opportunities of equitable sharing in the era of corruption, authoritarianism, and regulatory capture.

Citation: Dhyani, Shalini & Bartlett, Debbie &Kadaverugu, Rakesh & Dasgupta, Rajarshi& Pujari, Paras & Verma, Parikshit. (2020). Integrated Climate Sensitive Restoration Framework for transformative changes to Sustainable Land Restoration. Restoration Ecology. 10.1111/rec.13230.

For details please visit:https://onlinelibrary.wiley.com/doi/abs/10.1111/rec.13230

PREDICTING IMPACTS OF CLIMATE VARIABILITY ON BANJ OAK (*Quercus leucotrichophora A. Camus*) FORESTS: UNDERSTANDING FUTURE IMPLICATIONS FOR CENTRAL HIMALAYAS

Dhyani, S., Kadaverugu, R. & Pujari, P.

Climate variability is one of the most powerful drivers that have resulted in loss of forest ecosystems. *Quercus leucotrichophora* (A. Camus) (Banj oak) is a keystone tree in moist temperate forests of Central Himalayas. Banj oak forests have high biodiversity, soil organic matter, and water holding capacity that supports human well-being. Climate variability coupled with anthropogenic pressure has affected the regeneration and succession patterns in these forests. Conservation of Banj oak is a socio-ecological challenge and will require an interdisciplinary approach. In the present study, we have assessed the impact of climate variability on the ecological niche of *Q. leucotrichophora* using the Maximum Entropy model (MaxEnt). The occurrence locations of the tree species were obtained from primary survey and published works (1984 to 2018). CMIP5 (Couple Model Inter-comparison Project)-derived bioclimatic variables were used as predictor variables in the modeling. The predictions were done following four IPCC RCP (Representative Concentration Pathway) scenarios for the future periods of 2050 and 2070. Our results show that the estimated potential habitats of the *Q. leucotrichophora* are likely to decline by 84–99%. Shift of the species from its present habitats due to climate variability reflects unusual patterns and demands climate adaptive management for forest landscape restoration (FLR) through active community involvement in the region. The study provides information about the suitable niches for the species of Banj oak forests and addresses the growing concern of spring-shed rejuvenation using climate adaptive FLR in Central Himalayas.

Citation: Dhyani, S., Kadaverugu, R. & Pujari, P. Predicting impacts of climate variability on Banj oak (*Quercus leucotrichophora*A. Camus) forests: understanding future implications for Central Himalayas.*Reg Environ Change* **20,**113 (2020). https://doi.org/10.1007/s10113-020-01696-5

For details please visit: https://link.springer.com/article/10.1007/s10113-020-01696-5#citeas

REMOTE SENSING FOR URBAN TREE CANOPY CHANGE DETECTION WITH LANDSAT SATELLITE DATA IN NNAMDI AZIKIWE UNIVERSITY AWKA –NIGERIA

Ogbodo, John A.; Obimdike, Loretta M. and Yason, Benison

Abstract:

Urban tree canopy within a university boundary is a measure of the university's tree cover as a percentage of its total land area. The overall objective of the present study is to conduct a Spatio-temporal change analysis of urban tree canopy in Nnamdi Azikiwe University Awka-Nigeria. Landsat data of years 1991, 2001, 2011 and 2019 were analysed using Maximum Likelihood Classifier and Confusion Matrix Spatial Analyst in ArcGIS 10.7.1 software. In terms of tree cover loss, there is a steady rate of decrease from -31.59 Hectares (ha) between 1991 and 2001; -82.32 ha (2001/2011) and -64.53 ha (2011/2019). Whereas, at an initial land area of 9.40 ha in 1991, physical infrastructural development is progressively increased with 16.92 ha between 1991 and 2001; 43.79 ha 2001/2011 and 12.37 ha between 2011 and 2019. The dominant drivers of tree cover change in the study area related to the expansion of physical infrastructures and sprawling agriculture as a result of encroachers into the study area. In conclusion, tropical forests within university campuses face many threats, such as those posed by unregulated physical infrastructural development and a lack of investment and management of forest relics. As a recommendation, Nigerian universities should invest and conserve their existing forested landscapes towards promoting land resources in line with Sustainable Development Goals number 15 (SDG-15) strategies.

PENGINDERAAN JAUH MENDETEKSI PERUBAHAN KANOPI POHON KAWASAN PERKOTAAN MENGGUNAKAN DATA SATELIT LANDSAT DI DI UNIVERSITAS NNAMDI AZIKIWI, AWKA - NIGERIA)

Kanopipohon di kawasanperkotaansepertikanopipohon di perbatasanwilayahsuatuuniversitasmerupakanukurantutupanpohonwilayahuniversitassebagaisuatupersentasedari total luaslahan. Penelitianinimenganalisisperubahanspatio-temporal darikanopipohonperkotaan di wilayahUniversitas Nnamdi Azikiwe Awka-Nigeria. Data Landsat tahun 1991, 2001, 2011, dan 2019 dianalisismenggunakan Maximum Likelihood Classifier dan Confusion Matrix Spatial Analyst pada perangkatlunak ArcGIS 10.7.1.

Dalamhalpenurunantutupanpohon, hasilnyamenunjukkanpenurunan yang stabildari -31,59 ha antaratahun 1991 dan 2001; -82,32 ha (2001/2011) dan -64,53 ha (2011/2019). Pada tahun 1991, luasanawalseluas 9,4 ha pada tahun 1991, pembangunanin frastrukturfisiksemakinmeningkat seluas 16,92 ha antaratahun 1991 dan 2001; 43,79 ha 2001/2011 dan 12,37 ha antaratahun 2011 dan 2019. Pendorongutamaperubahantutupanpohon di wilayahstuditerkaitdenganperluasaninfrastrukturfisik dan perladanganberpindahdaripendudukdesa yang bertetangga, melakukanperambahankewilayah yang dianalisis. Dari penelitiandapatdisimpulkanbahwahutantropis di kawasankampustermasuk yang menghadapibanyakancaman, seperti yang ditimbulkan oleh pembangunaninfrastrukturfisik yang tidakdiatur dan kurangnyainvestasi dan pengelolaanpeninggalanhutan. Untukitu, disarankan agar Universitas Nigeria berinvestasi dan melestarikanlanskaphutan yang adauntukmempromosikanpengelolaan sumberdayalahan, mengikutipen capaianstrategitujuanpembangunanberkelanjutannomor 15 (SDG-15).

Keywords

Change Detection; Kappa coefficient; Landsat Remote Sensing; Nnamdi Azikiwe University Awka; Tree Canopy; Urban sprawl

Kata kunci: Deteksiperubahan, koefisien Kappa, penginderaanjauh Landsat, Nnamdi Azikiwe University Awka, perluasankota

Citation:

Ogbodo, John A.; Obimdike, Loretta M. and Yason, Benison (2020). Remote Sensing For Urban Tree Canopy Change Detection with Landsat Satellite Data in Nnamdi Azikiwe University Awka –Nigeria. Indonesian Journal of Forestry Research Vol. 7, No. 2, October 2020, 99-112.

Access link: http://dx.doi.org/10.20886/ijfr.2020.7.2.99-112

GLOBAL FOREST EXPERT PANEL (GFEP)

Miller, D.C., S. Mansourian, and C. Wildburger

IUFRO convened a Global Forest Expert Panel (GFEP) on the interactions between forests and poverty. Their report, launched in October 2020, contributes to the implementation of the 2030 Agenda for Sustainable Development by highlighting the nexus between SDG 1 on ending poverty and SDG 15 on life on land, as well as relevant links to other SDGs. More than 50 scientists and experts contributed to this major assessment on forests, trees and the eradication of poverty. The full report and a policy brief are available from the GFEP website: https://www.iufro.org/science/gfep/gfep-initiative/panel-on-forests-and-poverty/

Citation:

Miller, D.C., S. Mansourian, and C. Wildburger (eds). 2020. *Forests, Trees and the Eradication of Poverty: Potential and Limitations*. IUFRO World Series V. 39. Available from: https://www.iufro.org/science/gfep/gfep-initiative/panel-on-forests-and-poverty/

THE CONTRIBUTION OF AGROFORESTRY TO RESTORATION AND CONSERVATION: BIODIVERSITY ISLANDS IN DEGRADED LANDSCAPES

Montagnini, F

Abstract:

Biodiversity islands can contribute to protect biodiversity in human-dominated landscapes. Agroforestry systems (AFS), as they can harmonize productivity with environmental functions, can be part of biodiversity islands, especially in the buffer zones of protected areas. AFS are heterogeneous in their design and management, with consequences for their restoration and conservation functions. This chapter discusses the role of AFS on restoration and conservation of biodiversity at the ecosystem and landscape levels, with emphasis on tropical Latin America and examples from other regions.

Multi strata AFS of home gardens and successional agroforestry hold the largest biodiversity. Home gardens can be as diverse in humid as in dry ecosystems as people in poorer areas take special care of these AFS that provide for their subsistence. Home gardens are rich in genetic resources as people domesticate preferred native species, and they are also sites for conservation of species that are only found in these AFS, while they have been extirpated from the wild. Development projects are currently working with farmers in identifying lesser known species of fruits and medicinals and other species from homegardens, helping farmers in nursery establishment as well as reaching specialized markets. Both traditional and modern successional AFS combine restoration and biodiversity objectives.

Prennial crops under shade (coffee, cacao, yerba mate) exist in a range from traditional multi strata assemblages to more simple designs with fewer tree species, and their function in biodiversity conservation varies accordingly. Differential prices paid for organic/biodiversity-friendly products from AFS may act as incentives for promotion of agroforestry-based systems.

Diversity of birds, arthropods, and other fauna is greater in silvopastoral systems (SPS) than in conventional pastures. Tree cover is the main factor associated with diversity in

SPS, and a compromise must be found to reach cover that sustains biodiversity while not decreasing productivity. Recent research and development of SPS has resulted in more complex designs such as the intensive SPS (ISPS) which use agroecological principles resulting in more productive and environmentally friendly systems. Payments for environmental services (PES) have been successful in Latin America to promote SPS and ISPS, including planting more native trees (focal species).

Living fences and windbreaks are often the only arboreal component in agricultural landscapes, and they serve roles in connectivity among forest patches. Adding more complexity to these linear systems contributes to their biodiversity value, but it may compromise their utilitarian functions. Recommendations are given to use AFS designs and practices to favor biodiversity and their inclusion as part of biodiversity islands.

Keywords: Buffer zones, Certification, Connectivity, Human-modified landscapes, Markets, Organic farming, Payments for environmental services.

Montagnini, F. 2020. The contribution of agroforestry to restoration and conservation: Biodiversity islands in degraded landscapes. In: JC Dagar, SR Gupta and D Teketay (Editors). Agroforestry for Degraded Landscapes: Recent Advances and Emerging Challenges. Vol. 1, Springer Nature, Singapore, https://doi.org/10.1007/978-981-15-4136-0_15 pp 445-479

TERRESTRIAL PROTECTED AREAS AND FOOD SECURITY: A SYSTEMATIC REVIEW OF RESEARCH APPROACHES

Jouzi, Zeynab, Yu-Fai Leung, and Stacy Nelson

Abstract:

Achieving food security is one of the most important sustainable development goals and is a major global concern, specifically in remote and rural areas of the developing world where high biodiversity can be found and many protected areas are located. The goals of food security and biodiversity conservation are two of the most critical challenges of our time. This study aims to better understand the state of research on protected areas and food security through a methodological lens. The literature search was conducted in the Web of Science core collection and the Centre for Agriculture and Biosciences International (CAB) abstracts database. The search results indicate that this is an understudied topic with only nineteen articles published in various research domains. The findings reveal that studies were explanatory research rather than confirmatory and most studies had a snapshot design with no control or baseline. National parks were the main category of protected areas reported in studies. Data collection commonly employed a combination of qualitative and quantitative methods at a household level. We also found that spatial data and methods are important yet underutilized.

Jouzi, Zeynab, Yu-Fai Leung, and Stacy Nelson. "Terrestrial Protected Areas and Food Security: A Systematic Review of Research Approaches." Environments 7.10 (2020): 83.

Open access, available at https://doi.org/10.3390/environments7100083

IMPORTANT URLs

Sign up for the ITTO Tropical Timber Market Report

The International Tropical Timber Organization (ITTO) releases the Tropical Timber Market Report two times per month. You can receive a free email subscription by signing up at their website:

http://www.itto.int/market_information_service/

IUFRO Electronic News

The newsletter is also available for download as a PDF or Word file at: http://www.iufro.org/publications/news/electronic-news/.

FAO InFO News

A newsletter from FAO Forestry

The Food and Agriculture Organization's Forestry newsletter is available at this link:

http://www.fao.org/forestry/infonews/en/

Unasylva

http://www.fao.org/forestry/unasylva/en/ - An FAO forestry publication going back to 1947.

Global Forest Information Service (GFIS)

https://www.gfis.net/gfis/en/en/(also available in Spanish and French) Global Forest Information Service contains up-to-date information on news, events, publications and job

vacancies (on the homepage) and lists other info resources such asdatabases, as part of the GFIS system.

Cámara Forestal DE BOLIVIA

http://www.cfb.org.bo/noticias
