Abstracts of

3rd International Symposium of Long-term Forest Monitoring Research in Asia:

"A research hub of long-term forest monitoring field centers on environmental changes and ecosystem responses: Collaborating for data, knowledge and young researchers"

March 6–10, 2023

PORTA by The Ambarrukmo Yogyakarta, Yogyakarta, Indonesia
&
Online

Organized by
Faculty of Forestry, Universitas Gadjah Mada
&
The University of Tokyo Forests,
Graduate School of Agricultural and Life Sciences, The University of Tokyo

Universitas Gadjah Mada
東京大学大学院農学生命科学研究科・農学部
Graduate School of Agricultural and Life Sciences / Faculty of Agriculture, The University of Tokyo
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日本学術振興会

Abstracts of 3rd International Symposium of Long-term Forest Monitoring Research in Asia: “A research hub of long-term forest monitoring field centers on environmental changes and ecosystem responses: Collaborating for data, knowledge and young researchers”

The Symposium is supported by the Japan Society for the Promotion of Science (JSPS) Core-to-Core Program (B. Asia-Africa Science Platforms) “A research hub of long-term forest monitoring field centers on environmental changes and ecosystem responses: Collaborating for data, knowledge and young researchers”.

Time Schedule of the Symposium

Sessions

March 6 (Mon)

13:00 Plenary Session in MINI ARUNG (1st FL)

15:45 Poster Session in the Hall in front of MINI ARUNG (1st FL)

17:00 House Keeping in MINI ARUNG (1st FL)

18:00 Dinner

March 7 (Tue)

08:00 Parallel Group Sessions

RG1 in Dewa Ruci (1st FL)

RG2 in Bima Suci (1st FL)

RG3 in Arung Samodra (1st FL)

15:15 Coffee Break and Poster Viewing

16:00 Wrapping-up Session in MINI ARUNG (1st FL)

16:30 Closing & Awarding Ceremony in MINI ARUNG (1st FL)

17:15 End of the Symposium

Excursions

March 8 (Wed)

Excursion to Waganama, University Forest of UGM (Whole day)

March 9 (Thu)

Excursion to Mt. Merapi (Whole day)

March 10 (Fri)

Excursion to Borobudur (AM)

Free time in downtown Yogyakarta (PM)

Program of Presentation and Index of Abstracts

Monday, March 6, 2023, 13:00–18:00 (GST+7:00hrs)

Plenary Session & Poster Session		
	Moderator: Dr. Sri RAHAYU	
13:00-13:30	**Opening,**	
	Greetings from Symposium Hosts	
	Dr. Sigit Sunarta, Dean Faculty of Forestry, Universitas Gadjah Mada	
	Prof. Kohei Kubota, Director, The University Tokyo Forests	
	Group Photo	
13:30-13:45	**Report from the Project Leader**	
PL-01	Prof. Naoto KAMATA (UTokyo) Seven-yr Activity of JSPS-C2C Project: Networking Long-term Monitoring of Forest Ecosystems in Asian University Forests	p.16
	Moderator: Prof. Naoto KAMATA	
13:45-15:45	**Report from Each University**	
PL-02 (13:45)	Prof. Zhiyiong WANG (HU) Introduction of School of Forestry, Hainan University	p.17
PL-03 (14:00)	Dr. Kobsak WANTHONGCHAI (KU) The International Economic Tree Research and Development Center (IETRDC) at The Sanm Chai Khet Research and Training Station	p.18
PL-04 (14:15)	Prof. Ming Jer TSAI (NTU) Monitoring the Long-term Experimental Site and Developing Sustainable Strategy of the Experimental Forest, National Taiwan University	p.19
PL-05 (14:30)	Prof. Hyun Seok KIM (SNU) Role of University Forest in the Era of Carbon Neutral	p.20
PL-06 (14:45)	Dr.WIDIYATNO (UGM) Developing the Long-term Ecological Research to Support Forestry Education and Sustainable Tropical Forest Management in Indonesia	p.21
PL-07 (15:00)	Prof. Mui-How PHUA (UMS) Forestry Education in Universiti Malaysia Sabah	p.22
PL-08 (15:15)	Dr. G.G.T. CHANDRATHILAKE (USJ) Environmental Flow Releasing Methodologies in Sri Lanka and a Way Forward	p.23
PL-09 (15:30)	Prof. Koichiro KURAJI (UTokyo) Forest DX/GX co-creation: The Challenge of the University of Tokyo Forests	p.24
15:45-17:00	**Poster Session**	
17:00-18:00	**House Keeping**	
18:00-	**Dinner**	

Please refer following abbreviated names of affiliation (in alphabetical order): HU: Hainan University, KU: Kasetsart University, NTU: National Taiwan University, SNU: Seoul National University, UGM:Universitas Gadjah Mada, UMS: Universiti Malaysia Sabah, USJ: University of Sri Jayewardenepura, UTokyo: The University of Tokyo.

Underlined presentation numbers indicate online presentations.

Tuesday, March 7, 2023, 8:00–17:15 (GST+7:00hrs)

Research Group Sessions

8:00-15:15	**Parallel Group Sessions: RG1 (Water & Climate)**	
8:00-10:00	Moderator: Dr. Hatma SURYATMOJO and Dr. G.G.T. CHANDRATHILAKE	
RG1-01 (08:00)	Dr. Kritsadapan PALAKIT (KU) Climate Reconstruction Derived from Annual and Intra-annual Rings of *Pinus kesiya* in Northern Thailand	p.25
RG1-02 (08:15)	Dr. Nobuaki TANAKA (UTokyo) Severe Drought in 2021 at the University of Tokyo Hokkaido Forest	p.26
RG1-03 (08:30)	Dr. Venus TUANKRUA (KU) Difference of Microclimate between Mixed Deciduous Forest and Maize Area	p.27
RG1-04 (08:45)	Dr. Hero MARHAENTO (UGM) Attribution of Streamflow Changes in the Bengawan Solo River to Land Use Change and Climate Change Using Excess Water and Energy Approach	p.28
RG1-05 (09:00)	Mr. B.M. GUNATHILAKE (USJ) Paleo-climatic Conditions of Late Jurassic to Early Cretaceous Andigama Gondwana Sediment in Sri Lanka	p.29
RG1-06 (09:15)	Ms. Xiu ZENG (HU) Untangling Winter Chilling and Spring Forcing Effects on Spring Phenology of Subtropical Tree Seedlings	p.30
RG1-07 (09:30)	Dr. Chiang WEI (NTU) Elementary Study on Ornamental Cherry Blossom Forecasting Using Heat Sum in Fenghuang Nature Education Area	p.31
RG1-08 (09:45)	Prof. Koichiro KURAJI (UTokyo) Temporal Variation of Stemflow Funneling Ratio during Heavy Precipitation in Japanese Cypress Plantation Forest	p.32
10:00-10:15	Break	
10:15-12:00	Moderator: Dr. Nobuaki TANAKA and Dr. Venus TUANKRUA	
RG1-09 (10:15)	Ms. Taehyun KIM (SNU) Post-fire Changes of Throughfall Quantity and Quality in *Pinus densiflora* Forest	p.33
RG1-10 (10:30)	Ms. Jeman LEE (SNU) Developing the Reach-average Flow Velocity Relationship of Mountain Streams Using Dye-tracer Method	p.34
RG1-11 (10:45)	Dr. Yen-Jen LAI (NTU) Assessing the Impacts of Climate Change on Water Resources among the Asian Experimental Forests: a Case Study on the Lienhuachih Watershed, Taiwan	p.35
RG1-12 (11:00)	Dr. Anand NAINAR (UMS) Water Resource Availability in Primary Rainforest, Logged Forests, and Oil Palm Catchments in Sabah, Malaysia: Implications for Management under Climate Change	p.36
RG1-13 (11:15)	Prof. Daham Taranga JAYAWARDANA (USJ) Groundwater Quality Implications from Geology of Sri Lanka: A way Forward	p.37
RG1-14 (11:30)	Dr. G.G.T. CHANDRATHILAKE (USJ) Spatial and Temporal Variation of Surface Water Quality of Selected Reservoirs in Mahaweli Cascade of Sri Lanka	p.38

RG1-15 (11:45)	Mr. A.N. SARANGUHEWA (USJ) Quantifying Stemflow Volume and Assessing Water Quality Changes in Selected Urban Tree Species	p.39
12:00-13:30	Lunch	
13:30-15:15	Moderator: Dr. Yen-Jen LAI and Dr. Anand NAINAR	
RG1-16 (13:30)	Dr. Patchares CHACUTTRIKUL (KU) The Effect of Climate Change on Groundwater Recharge at Nadi and Kabinburi Districts, Prachinburi Province	p.40
RG1-17 (13:45)	Dr. Hatma SURYATMOJO (UGM) Hydrological Response of Modified Intensive Forest Management System in Tropical Rainforest of Central Kalimantan, Indonesia	p.41
RG1-18 (14:00)	Dr. Ambar KUSUMANDARI (UGM) Water Balance Analysis as a Base for Proposing Land Use in Blongkeng Watershed	p.42
RG1-19 (14:15)	Ms. U.S. DISSANAYAKE (USJ) Membranous Filter with Thermally Activated Laterite Soil-filled for Instantly Removing Ions from Contaminated Water	p.43
RG1-20 (14:30)	Ms. R.M.U.B. RATHNAYAKE (USJ) A Correlation Analysis of Water Quality and Habitat Types of Kolonnawa Marsh, Colombo, Sri Lanka	p.44
RG1-21 (14:45)	Mr. P.L. HERATH (USJ) Diurnal Variation Pattern of Trace Gases Concentration on Landfill Surface Layer under Tropical Climatic Conditions	p.45
RG1-22 (15:00)	Dr. Jetsada WONGPROM (KU) Effect of *Acacia mangium* Plantation on Soil Properties in Abandoned Tin Mining Area	p.46
8:00-15:15	**Parallel Group Sessions: RG2 (Ecosystem & Biodiversity)**	
8:00-9:00	Moderator: Dr. Triyogo ANANTO	
RG2-01 (08:00)	Mr. Syaiful Amri SARAGIH (UMSU) Comparison of Microbe Communities in the Mycangium of Ambrosia Beetle *Xylosandrus crassiusculus* (Coleoptera: Curculionidae) between Middle and Late Dispersal Seasons	p.47
RG2-02 (08:15)	Prof. Naoto KAMATA (UTokyo) Geographical Clines in Bark and Ambrosia Beetle Diversity in East and Southeast Asia	p.48
RG2-03 (08:30)	Dr. Li-Wei WU (Tunghai Univ.) Molecular Phylogeny of Bark and Ambrosia Beetles (Curculionidae: Scolytinae): Revealing Well-supported Groupings Based on Mitogenomic Sequences	p.49
RG2-04 (08:45)	Dr. Maria Lourdes T LARDIZABAL (UMS) Species Diversity of Bark and Ambrosia Beetles at Ulu Padas Forest Reserve, Sipitang, Sabah, Malaysia	p.50
9:00-10:00	Moderator: Dr. Maria LOURDES	
RG2-05 (09:00)	Dr. Chun-lin LI (NTU) A four-year Monitoring Investigation on Bark and Ambrosia Beetle Assemblages in Central Taiwan	p.51
RG2-06 (09:15)	Mr. Jae-Woo LEE (SNU) Nationwide Precision Monitoring of *Matsucoccus matsumurae* Kuwana (Hemiptera: Matsucoccidae) in Korea Using Pheromone-based Trap and Deep Learning Object Detectors	p.52
RG2-07 (09:30)	Dr. Ananto TRIYOGO (UGM) Beneficial Insects Abundance on Different Land Uses	p.53
RG2-08 (09:45)	Ms. Eungjeong KIM (SNU) An Application of Acoustic Indices for Monitoring Seasonal and Diurnal Diversity of Songbirds in Korean Forests	p.54

10:00-10:15	Break	
10:15-11:15	Moderator: Dr. Sri RAHAYU	
RG2-09 (10:15)	Dr. Muhammad Ali IMRON (UGM) Assessing Biodiversity Conditions in KHDTK UGM Getas Ngandong: Spatial Modelling and Field Survey Approaches	p.55
RG2-10 (10:30)	Dr. Jephte Sompud (UMS) Terrestrial Wildlife in the Universiti Malaysia Sabah Hill Forest, Malaysia	p.56
RG2-11 (10:45)	Dr. Azniza Mahyudin (UMS) Bats' Diversity in Different Landscape Matrices	p.57
RG2-12 (11:00)	Mr. Weichen HOU (HU) Functional Traits of Soil Nematodes Define their Response to Nitrogen Fertilization	p.58
11:15-12:15	Moderator: Prof. Naoto KAMATA	
RG2-13 (11:15)	Dr. Sri RAHAYU (UGM) Occurrence and Severity of *Ganoderma* spp. on the Trees in Urban Forest of Universitas Gadjah Mada, Yogyakarta Indonesia	p.59
RG2-14 (11:30)	Dr. Satoshi SUZUKI (UTokyo) Long-term Directional Changes in Hemiboreal Mixed Forests in the University of Tokyo Hokkaido Forest	p.60
RG2-15 (11:45)	Mr. Seunguk KIM (SNU) What Causes the Spatial Distribution of the Four Forest Communities in South Korea?	p.61
RG2-16 (12:00)	Dr. Siti Fatimah MD.-ISA (UMS) Biodiversity of Jewel Orchid from Crocker Range Park, Sabah	p.62
12:15-13:30	Lunch	
13:30-14:30	Moderator: Prof. B.M.P. SINGHAKUMARA	
RG2-17 (13:30)	Prof. Dokrak MAROD (KU) Long-term Ecological Research on Tropical Seasonal Dry Forest Dynamics During 30 years at Western Thailand	p.63
RG2-18 (13:45)	Dr. Ni Putu Diana MAHAYANI (UGM) Phylogenetic Approaches on Plant Community Assembly: A case from the Logged-over Bornean Tropical Rain Forest of East Kalimantan, Indonesia	p.64
RG2-19 (14:00)	Dr. Sapto INDRIOKO (UGM) Genetic Diversity of Sandalwood in the Central Zone of Gunung Sewu after Land Clearing in 2020, and its Impact on the Offspring Quality	p.65
RG2-20 (14:15)	Dr. Yeni WN RATNANINGRUM (UGM) Genetic Infusion and Soil Improvement to Support Outcrossing and Natural Regeneration of Sandalwood in Isolated Population in The Western Zone of Gunung Sewu	p.66
14:30-15:15	Moderator: Dr. Satoshi SUZUKI	
RG2-21 (14:30)	Ms. Woojin HUH (SNU) Fine-root Temporal Dynamics and Longevity in a *Pinus koraiensis* Plantation and a Natural Oak Forest in Taehwa Mountain, Korea	p.67
RG2-22 (14:45)	Ms. Xinran TANG (HU) Phenology: Effects of Winter-chilling and Photoperiod on Phenological Functional Traits and the Mid-domain Effect in Flowering Phenology	p.68
RG2-23 (15:00)	Mr. Min-Woo LEE (SNU) Acaricidal and Insecticidal Activities of Essential Oils and Constituents of *Tasmannia lanceolata* (Poir.) A.C.Sm. (Canellales: Winteraceae) Against *Tetranychus urticae* Koch (Trombidiformes: Tetranychidae) and *Myzus persicae* Sulzer (Hemiptera: Aphididae)	p.69

8:00-14:45	**Parallel Group Sessions: RG3 (Sustainable Management)**	
8:00-9:00	Moderator: Dr. Toshiaki OWARI	
RG3-01 (08:00)	Dr. Sathid THINKAMPHEANG (KU) Forest Restoration Dynamics Based on Natural and Artificial Practices in Lower Montane Forest at Doi Suthep-Pui National Park, Thailand	p.70
RG3-02 (08:15)	Prof. Priyan PERERA (USJ) Biomass Estimation of Native Tree Species in a Tropical Dry-mixed Forest of Sri Lanka: Inventory Data from a Recently Initiated Forest Restoration Project	p.71
RG3-03 (08:30)	Dr. Elia GODOONG (UMS) Forest Structure and Aboveground Carbon Storage of Taliwas River Conservation Area, East Coast Sabah, Malaysia	p.72
RG3-04 (08:45)	Dr. Ismenyah MUSRI (UMS) Preliminary Assessment of Above Ground Carbon Storage at Restored Post-fire Peat Swamp Forest	p.73
9:00-10:00	Moderator: Prof. Priyan PERERA	
RG3-05 (09:00)	Ms. Huiqing PEI (UTokyo) Identifying Spatial Variation of Carbon Stock in A Warm Temperate Forest in Central Japan Using Sentinel-2 and Digital Elevation Model Data	p.74
RG3-06 (09:15)	Dr. Chieh-Ting WANG (NTU) *Taiwania cryptomerioides*: a Potential Species for Fast Carbon Sequestration	p.75
RG3-07 (09:30)	Dr. Tomy LISTYANTO (UGM) Biomass Productivity of *Gliricidia sepium* (Jacq) Steud for Energy	p.76
RG3-08 (09:45)	Dr. Toshiaki OWARI (UTokyo) Stand Structure and Growth of a 115-year-old Japanese Larch Plantation in the University of Tokyo Hokkaido Forest	p.77
10:00-10:15	Break	
10:15-11:00	Moderator: Dr. Chieh-Ting WANG	
RG3-09 (10:15)	Mr. Kwang Hyun NAM (SNU) Monitoring of Natural Broadleaved Forests on Taehwa University Forests from 2012-2022	p.78
RG3-10 (10:30)	Dr. Mandy MAID (UMS) The Growth Performance of 28-month old *Terminalia subspathulata* King under Silviculture Treatments in an Enrichment Planting in Sabah, Malaysia	p.79
RG3-11 (10:45)	Dr. Eny FARIDAH (UGM) Growth and Physiological Characteristics of *Avicennia marina* plantation with different densities in Taman Pesisir Mangrove Conservation Area, Bantul, Yogyakarta	p.80
11:00-12:00	Moderator: Prof. Mui-How PHUA	
RG3-12 (11:00)	Dr. WIDIYATNO (UGM) Effect of Silvicultural Treatment to Increase Growth and Wood Quality of Clonal Teak Plantation	p.81
RG3-13 (11:15)	Ms. Lee Ting CHAI (UMS) Monitoring Changes at Riparian Areas Affected by Earthquake-induced Landslides Using Unmanned Aerial Vehicle (UAV)	p.82
RG3-14 (11:30)	Ms. Mega Trishuta PATHIASSANA (SNU) The Effect of Storage Temperature on Honey Physicochemical Properties of *Apis dorsata* and Evaluation on Farmer Group for Honey Productivity	p.83

RG3-15 (11:45)	Dr. Juan LUO (HU) Comprehensive Evaluation and Ecological Restoration Strategy of Tourism-oriented Rural Landscape: A case study of Zahan Village, Qiongzhong County, Hainan Province	p.84
12:00-13:30	Lunch	
13:30-14:45	Moderator: Dr. WIDIYANTO	
RG3-16 (13:30)	Mr. Fiqri ARDIANSYAH (UGM) Fire Severity and Vegetation Structure in Ex-Burnt Area of Ijen Nature Park	p.85
RG3-17 (13:45)	Dr. SAWITRI (UGM) Application of Advanced Genomic Technology to Improve Timber Productivity and Wood Quality of *Shorea platyclados*, a Commercial Timber Species in Southeast Asia	p.86
RG3-18 (14:00)	Ms. Jacqueline JOSEPH (UMS) In-situ Assessments of Wood Density Variability in Tropical Forest Trees of Southwest Sabah using Resistograph Technology	p.87
RG3-19 (14:15)	Dr. Theerat ARDSAMANG (KU) Anatomical and Mechanical Properties of the Highland 30 year-old Pine Tree in Northern Thailand	p.88
RG3-20 (14:30)	Dr. Ismawati PALLE (UMS) Studies on *Acacia mangium* Polyol and its Application as Polyurethane Products	p.89
15:15-16:00	**Coffee Break and Poster Viewing**	
16:00-16:30	**Wrapping-up Session**	
16:30-17:15	**Closing & Awarding Ceremony**	
17:15	**End of the Symposium**	

Underlined presentation numbers indicate online presentations.

List of Poster Presentation and Index of Abstracts

Core Time: Monday, March 6, 2023, 16:00–17:00 (GST+7:00hrs)

Poster Session

P-01	Ms. Ibtisam Binti MOHD GHAUS (UTokyo) Effects of Pre-commercial Thinning on Runoff Characteristics in a Dense Japanese Cypress Plantation	p.90
P-02	Ms. Wei-Ling CHEN (NTU) Analysis of the Radial Profile of Sap Flow in Japanese Cedar Trees	p.91
P-03	Ms. AYE MYAT MYAT PAING (UTokyo) Diversity of Soil Fungal Communities Associated with *Betula ermanii* in Five Transplanted Sites	p.92
P-04	Ms. Galuh ANGGARA (UGM) Macro Fungi in Urban Forest of Universitas Gadjah Mada and Their Potential Uses as Medicinal Fungi	p.93
P-05	Ms. Eva LUTFIANA (UGM) Characterization and Pathogenicity Evaluation of *Ceratocystis* spp. Isolates from Different Tree Hosts to *Acacia crassicarpa*	p.94
P-06	Mr. Bayu Anggita WIRABUMI (UGM) Diseases of Stem and Leaves of Eucalyptus Hybrid *E. pellita* x *E. urophylla* at Wanagama Educational Forest	p.95

Underlined presentation numbers indicate online presentations.

Presentations marked with an asterisk are not presentations by students.

DETAIL SCHEDULE OF EXCURSIONS
Yogyakarta, March 8th-10th, 2023

MAR 08 (WED): Wanagama, University Forest of UGM

Wanagama is an educational forest managed by Faculty of Forestry, Universitas Gadjah Mada (UGM) located in Gunungkidul regency, Special Region of Yogyakarta. The name of Wanagama is consist of two Javanese words, *Wana* means forest and *Gama* is an abbreviation of the name of Universitas Gadjah Mada. The name of Wanagama came out on 10th July 1966 when Faculty of Forestry UGM was granted 10 Ha area in Compartment 5 for *Morus* sp. cultivation as silkworm feed. The old Wanagama was a critical land in Gunungkidul then started to be rehabilitated in 1960s. From 1964-1989, the foresters conducted rehabilitation experiments on this degraded land. During 1990-2014, the area of Wanagama was expanded to 622 ha consisting of 8 compartments. In that span of the year, the tree improvement programs of various commercial species have started. Wanagama also played a role in the invention of Intensive Silviculture Technology. Moreover, Wanagama also developed a nursery and Jati Mega (=mega teak) Nursey which is the result of trees improvement program.

The facilities related to conservation, research, education, culinary, and eco-tourism was developed during 2014-present. The name of Wanagama also refined to become Wanagama Science Eco Edu Forest. For conservation and research purposes, Wanagama Paksi Bird Dome and Soil and Water Conservation Compartment 17 have been built. Tourist objects in Wanagama also serve as educational and culinary facilities which Timber Museum in Compartment 16 (Museum Kayu), Pawon Alas in Compartment 16, landscape of Oyo River, and Cano on the Oyo River in Compartment 13. Moreover, Wanagama is used for various tree tests, including progeny tests, provenance tests, species tests, variety tests, and clone tests. Wanagama also has breeding area, agroforestry area, demonstrative plant breeding area, germplasm conservation area etc.

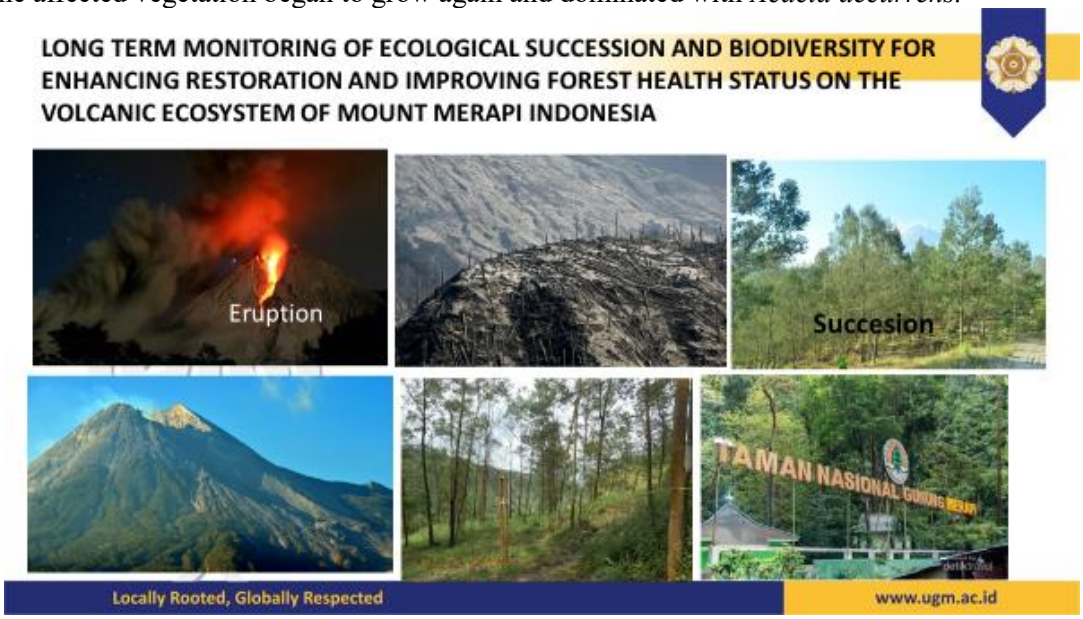
Faculty of Forestry UGM through Wanagama also contributed to develop community around forest by assist forest honey farmer group to release product Wanagama Forest Honey (Madu Hutan Wanagama). The species of bee that is cultivated is *Apis cerana* with a feed source of nectar and pollen from Acacia, Eucalyptus, and Melaleuca species.

The success story of Faculty of Forestry UGM in developing critical land to beautiful Wanagama, is well known and acknowledged by many parties. Moreover, several world leaders have visited Wanagama.

Time	Activity
07.30	Starting from Porta Hotel
07.30–09.30	Moving to Wanagama, Wonosari, Gunungkidul
09.30–10.00	Introduction of Wanagama with Welcome Tea
10.00–12.00	Visiting Sedang Tahunan as water catchment in the rocky area
12.00–13.00	Lunch at Wanagama
13.00–15.00	Visiting Teak Plantation, Eucalyptus distillery (if possible), and honey harvesting (if possible) in Compartment 17 of Wanagama
15.00–16.45	Moving to UGM
16.45–17.30	Tour in and around UGM campus
17.30–19.30	Dinner at Faculty of Forestry, UGM with Acoustic Music by Students' Community
19.30–20.00	Moving to Porta Hotel

MAR 09 (THU): Mount Merapi National Park

Mount Merapi, *Gunung Merapi* (literally Fire Mountain in Indonesian and Javanese), is an active stratovolcano located on the border between the province of Central Java and Special Region of Yogyakarta, Indonesia. Mount Merapi is the most active volcano in Indonesia and has erupted regularly since 1548. It is located approximately 28 km north of Yogyakarta city with villages as high as 1.700 m above sea level.
In 2004, an area of 6.410 hectares around Mount Merapi was established as a national park. Mount Merapi National Park (MMNP) is a natural conservation area with the main function of preserving the diversity of plants, animals, and their ecosystem. In 2010, Mount Merapi suffered a large eruption which caused damage to the ecosystem inside. After the eruption, the affected vegetation began to grow again and dominated with *Acacia decurrens.*



Time	Activity
08.00	Starting from Porta Hotel
08.00–09.30	Moving to Mount Merapi National Park
09.30–12.00	Visiting *Acacia decurrens* stands infected by bug beetle in Mount Merapi National Park
12.00–13.00	Lunch box in the field
13.00–15.00	Visiting water catchment “Umbul Lanang”
15.00–15.30	Moving to Tourist Village “Ledok Sambi”
15.30–16.30	Visiting Tourist Village “Ledok Sambi”
16.30–17.30	Moving to Jejamuran Restaurant
17.30–19.00	Dinner at Jejamuran Restaurant
19.00–19.30	Moving to Porta Hotel

MAR 10 (FRI): Borobudur Temple and Downtown Malioboro

Borobudur Temple is a 9th-century Mahayana Buddhist Temple in Magelang regency. It is the world's largest Buddhist temple. Approximately 40 km northwest of Yogyakarta, Borobudur is located in an elevated area between two twin volcanoes, Sundoro-Sumbing and Merbabu-Merapi, and two rivers, the Progo and the Elo. Built in the 9th century during the reign of the Sailendra Dynasty, the temple design follows Javanese Buddhist architecture, which blends the Indonesian indigenous tradition of ancestor worship and the Buddhist concept of attaining nirvāna.

The temple consists of nine stacked platforms, six square and three circulars, topped by a central dome. It is decorated with 2,672 relief panels and originally 504 Buddha statues. The central dome is surrounded by 72 Buddha statues, each seated inside a perforated stupa. Worldwide knowledge of its existence was sparked in 1814 by Sir Thomas Stamford Raffles, then the British ruler of Java, who was advised of its location by native Indonesians. Borobudur has since been preserved through several restorations. The largest restoration project was undertaken between 1975 and 1982 by the Indonesian government and UNESCO, followed by the monument's listing as a UNESCO World Heritage Site.

Borobudur is the largest Buddhist temple in the world and ranks with Bagan in Myanmar and Angkor Wat in Cambodia as one of the great archeological sites of Southeast Asia. Borobudur remains popular for pilgrimage, with Buddhists in Indonesia celebrating Vesak Day at the monument. Borobudur is Indonesia's single most visited tourist attraction.

Other than enjoying the temple, tourist also could enjoy tour around Borobudur called VW Tour Borobudur. This is an official of the VW Classic tour trip in Borobudur, Magelang. This tourist attraction provides tour packages with various destinations. People can enjoy beautiful views of Borobudur as well as enjoy educational and shopping tours, including batik, *gamelan* (Javanese traditional musical instrument), *grabah* (earthenware crafts), honey home industry, etc.

Borobudur Temple

VW Safari Borobudur Tour

Malioboro. *Jalan Malioboro* is a major shopping street in Yogyakarta, Indonesia; the name is also used more generally for the neighborhood around the street. It lies north–south axis in the line between Yogyakarta Kraton and Mount Merapi. The street is the center of Yogyakarta's largest tourist district surrounded with many hotels, restaurants, and shops nearby. In the evening several open-air street side restaurants, called *lesehan*, operate along the street. This is the street of the artists. Street musicians, painters, and other artists exhibit their creations on this road. Less obvious to the tourist, but more for the local population, side streets, lanes and structures that lead on to Malioboro are as important as the street itself.

Time	Activity
06.00	(For participants who depart from YIA in the morning of MAR 10) Departing from the Hotel to YIA.
07.30	Starting from Porta Hotel **Important Notice:** Participants who depart from YIA in the afternoon of MAR 10 must check out before the departure and bring all the luggage to the bus in the morning
07.30–09.30	Moving to Borobudur Temple
09.30–12.00 (Depending on date of Departure)	Option #1: Surroundings of Borobudur Temple Option #2: VW Tour around Borobudur **NOTES:** Unfortunately, it is **not** allowed to climb up the temple at present but only the surrounding area. The VW Tour needs reservation in advance. **Participants who want enjoy VW Tour need sign-up by replying to query email by noon of MAR 07.** Participants who depart from YIA in the afternoon of MAR 10 can enjoy one the two options due to time.
11.00–13.00 (Depending on date of Departure)	Lunch at Balkondes Giritengah, Borobudur **NOTES: Participants who depart from YIA in the afternoon of MAR 10 need to start lunch at 11.00 and depart for YIA at 11.30.** The others can enjoy sightseeing longer and start lunch by 12.00.
For participants who will overnight at Porta Hotel in the evening of MAR 10	
13.00–14.30	Moving to downtown Malioboro
14.30–18.00	Visiting around Malioboro by your own **NOTES:** Come back to the bus before 18.00
18.00–18.30	Moving to Bumbu Desa for dinner
18.30–20.00	Dinner at Bumbu Desa
20.00–20.30	Moving to Porta Hotel
End of Session	

Abstracts

PL-1

Seven-yr activity of JSPS-C2C project: Networking long-term monitoring of forest ecosystems in Asian university forests

Naoto KAMATA

The University of Tokyo Chiba Forest, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, kamatan@uf.a.u-tokyo.ac.jp

Abstract

The University of Tokyo Forests has adopted the research exchange project for the Core-to-Core Program (B. Asia-Africa Science Platforms) by the Japan Society for the Promotion of Science FY2016 (1st period) and FY2019 (2nd period). Due to the pandemics of COVID-19, our project lasted for 7 years. These projects were implemented in collaboration with core institutions in five and eight countries in the 1st and 2nd periods, respectively, which hold or manage university forests and research sites in different climate and vegetation zones of the Asian monsoon region. It aimed to promote the development of long-term research field stations for stable and continuous monitoring and to establish a multilateral research cooperation network between core institutions through close collaboration. Collaborative research has been done by the three research groups: Climatology and hydrology (RG2), Ecology and biology (RG2), and forest management (RG3). Six times of plenary symposia, three times of plenary workshops, and two times of interim symposia were held. In 2019, two RG workshops with specific topics for hydrology and bark and ambrosia beetles were held in Korea and Taiwan, respectively. Unfortunately, activities shrank down after the pandemic of COVID-19. Through the two projects, two special issues in scientific journals, “Journal of Forest Research” and “Water”, and three books were issued. The RG1 issued a booklet introducing experimental watersheds and weather stations in Asian University Forests Consortium.

PL-2

Introduction of School of Forestry, Hainan University

Zhiyong WANG[1], Huaiyue LIANG[2]

[1]School of Forestry, Hainan University, China, wangzhiyong@hainanu.edu.cn
[2]School of Forestry, Hainan University, China, lianghuaiyue@hainanu.edu.cn

Abstract

Hainan University (HU) is a comprehensive key university formed by a merger with the former South China University of Tropical Agriculture in 2007. It is jointly administered by the Ministry of Education and the Hainan Provincial People's Government. Forestry is a basic discipline of the former South China University of Tropical Agriculture, which was established in 1954. Taking advantage of the rich tropical forest resources of Hainan Island, School of Forestry focuses on the Genetics and Breeding of Forest Trees, Forest Cultivation, Conservation and Restoration of Tropical Forestry Biodiversity, etc.. Until 2022, School of Forestry of HU has trained more than 1,000 forestry undergraduates, more than 300 postgraduates, and more than 20 forestry-related doctoral students. The graduates are widely accepted as forestry professionals for Hainan and tropical regions of China.

PL-3

The International Economic Tree Research and Development Center (IETRDC) at The Sanm Chai Khet Research and Training Station

Kobsak WANTHONGCHAI

[1]Faculty of Forestry, Kasetsart University, Bangkok, 10900, Thailand
*e-mail: fforksw@ku.ac.th

Abstract

Kasetsart University, Faculty of Forestry has setup 8 research stations covering most ecosystem of the country. Recently, Sanam Chaikhet Station, the latest research station is positioned to be the "International Economic Tree Research and Development Center (IETRDC)". This station has 300 ha of economic tree plantation, mostly is eucalyptus. Plantation managements, including silvicutural practices have been applied to ensure optimum productivities as well as sustainability. Community participation around this station is also important that KUFF concerns. In addition, we are setting up research facilities to support international research and training program. Capacity building on economic tree plantation via training courses and research cooperation. Collaboration from JSPS Core to Core members are very welcome.

PL-4

Monitoring the Long-term Experimental Site and Developing Sustainable Strategy of the Experimental Forest, National Taiwan University

Ming Jer TSAI[1]

[1]Director/Professor/Associate Dean, TAIWAN, Experimental Forest/ School of Forestry and Resource Conservation/ College of Bioresources and Agriculture, National Taiwan University, tmj@ntu.edu.tw

Abstract

Two long-term experimental sites for the growth study of *Cryptomeria japonica* was established in Xitou tract in 1912, there still are 62 sites remaining and six sites last over 100 hundred years which provide valuable and crucial data for the related researches. For the upcoming policy "zero carbon in 2050" became an urgent task and goal, how to efficiently evaluate and identify the forest carbon sequestration, develop new methodology and calibrate the parameters of timber mensuration is still challenging. NTUEF organized a work group since 2020, by reviewing the initial protocol of each site, evaluating the recent condition of each site and using the newest instrument, the precious recorded and new data for the long-term experiment sites was examined and checked regularly. To meet the Sustainable Development Goals (SDGs), NTUEF had adopted Co-Prosperity Program, Understory Economy, Friends and Neighbours, Smart Forestry, Net-Zero Emission and other strategies for the forest management.

PL-5

Role of University Forest in the Era of Carbon Neutral

Hyun Seok Kim[1,2,3], Hojin Lee[3], Minsu Lee[1], Sukyung Kim[1], Woojin Huh[1]

([1]Department of Agriculture, Forestry and Bioresources, Seoul National University, [2]Research Institute for Agriculture and Life Sciences, [3]Interdisciplinary Program in Agricultural and Forest Meteorology)

The frequency and intensity of extreme climate events are dramatically increasing with climate change. Such a consistent but substantial increase of atmospheric CO_2 concentration resulted in the worldwide agreement in carbon neutral. Carbon neutral aims to the net zero carbon fluxes by 2050. However, global carbon effluxes are continuously increasing and breaking records almost every year. In fact, Seoul National University ranked as No 1carbon source facility in Seoul for ten years in a row. However, Seoul National University Forests are absorbing CO_2. Our research are intended to quantify the CO_2 balance of SNU and to see how SNU forests contribute for carbon neutral of SNU. Over 140 permanent sites were continuously monitored since 1993 and two eddy covariance system monitored since 2015. Our results showed SNU Forests absorbing 340,000 ton CO_2 per year, which is about 1.8 times larger than SNU CO_2 production.

PL-6

DEVELOPING THE LONG-TERM ECOLOGICAL RESEARCH TO SUPPORT FORESTRY EDUCATION AND SUSTAINABLE TROPICAL FOREST MANAGEMENT IN INDONESIA

WIDIYATNO[1]

[1]Departement of Silviculture, Faculty of Forestry, UGM, Indonesia, email: widiyatno@ugm.ac.id

Abstract

Indonesia's tropical forest is one of the most species-rich in terrestrial ecosystem in term species richness and endemics that support the 18.7% of the world's plant biodiversity. However, the forest degradation on in Indonesia reduce forest cover, plant biodiversity, and ecosystem services. Faculty of Forestry UGM established in 1963 responsibility developing rehabilitation technique to improve the degraded forest area. Thus, Faculty of Forestry UGM established Wanagama in 1964 as education forest and established various plots including tree genetic trials, conservation, silviculture tests, food security, and social economic research. On the other hand, Faculty of Forestry is developing tree breeding of teak and dipterocarp that could increase forest productivity and absorb carbon > 200 ton C per ha in 20 year after planting. It suggested that reforestation increases the carbon stored, food security as climate change mitigation for reducing emission and sustainable forest ecosystem.

PL-7

Forestry Education in Universiti Malaysia Sabah

Mui-How PHUA

Faculty of Tropical Forestry, Universiti Malaysia Sabah, MALAYSIA,
pmh@ums.edu.my

Abstract

Malaysia has about 18.27 million ha of forested areas or 55.3 % of total land area. Nearly 70% of the Malaysia total forest area are found in Sabah and Sarawak, which are internationally recognized as biodiversity hotspots. The School of International Tropical Forestry (SITF) was founded in 1996 to produce forestry graduates equipped with up-to-date and interdisciplinary knowledge related to forest ecosystems. With four Bachelor of Forestry Science programs (International Tropical Forestry, Nature Park & Recreation, Forest Plantation & Agro-Forestry, and Wood Technology and Industry) developed in 1997, student intake had grown into over 100 per year. The SITF was merged with the School of Science and Technology to form the Faculty of Science and Natural Resources in 2014. However, student intake suffered a significant decline from 146 per year in 2015 to less than 100 per year within two years. In March 2021, the Faculty of Tropical Forestry was formed, with conservation biology program joined as the new member program. Interestingly, the student intake had drastically increased to over 200 per year in the following year. The forestry programs emphasize field-based learning, which is conducted mainly in the UMS Kota Kinabalu Campus, especially at the arboretum, the nursery as well as the forest areas (62 ha) near the UMS Hill entrusted to the faculty in November 2021. Field visits are also conducted in other parts of the country and abroad. With the co-operation and support of various stakeholders, forestry curriculums in UMS have been continuously revised to fulfil the needs of industry and society.

PL-8

Environmental Flow Releasing Methodologies in Sri Lanka and a Way Forward

G.G.T Chandrathilake.and K.G.N. Thathsarani

Department of Forestry and Environmental Science, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka.thilakawansha@sjp.ac.lk

Abstract

In Sri Lanka, human activities have severely altered the natural flow regime of rivers and streams, leading to ecological degradation. The maintenance of Environmental flow (E Flow) has thus become important for sustaining biodiversity and ecosystems. This study aimed to identify the vital features for regulating stream flow and selecting the best methods for estimating E Flow for Sri Lankan Water Resource Development Projects (WRDPs). A retrospective cross-sectional study of 30 WRDPs was conducted to compare and contrast three common E Flow calculation methods: Q90, International Water Management Institute (IWMI) E flow calculator (FIWMI), and Central Environmental Authority (CEA) E flow guidelines (FCEA). Results showed that there was no significant difference in E Flow rates between Q90 and FIWMI, whereas FCEA produced higher E Flow rates than both Q90 and FIWMI. The high FCEA values highlight the need for higher E Flow in Sri Lankan WRDPs. It is recommended to adopt the FCEA method with modification to ensure the sustainability.

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PL-9

Forest DX/GX co-creation: The Challenge of the University of Tokyo Forests

Koichiro KURAJI

The University of Tokyo Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, kurajikoichiro@g.ecc.u-tokyo.ac.jp

Abstract

Digital Transformation (TX) and Green Transformation (GX) are, in a broader sense, defined as a social change to prudently manage the global environment, which is the common property of humankind, and to pass it on to future generations. The University of Tokyo Forests is taking on TX/GX challenges in the areas of forest management, forestry, and forest industry. Those challenges can be categorized as: 1) Development of forest carbon-fixation monitoring technology, including elaboration and visualization of carbon accumulation and fixation calculations. 2) Development of forest management technologies that promote carbon fixation, while considering organic matter decomposition, runoff, and soil carbon, and various possibilities not limited to clear-cutting and reforestation; 3) Human resource development across disciplines necessary for a decarbonized society; 4) Promotion of "decarbonization of the University of Tokyo," including distribution of traceable wooden products within the University of Tokyo; and 5) Joint creation of local decarbonization plans, including collaboration with local governments where each Regional University Forest is located.

RG1-1

Climate reconstruction derived from annual and intra-annual rings of *Pinus kesiya* in northern Thailand

Kritsadapan PALAKIT[1] & Nathsuda Pumijumnong[2]

[1]Laboratory of Tropical Dendrochronology (LTD), Department of Forest Management, Kasetsart University, THAILAND, e-mail: fforkpp@ku.ac.th
[2]Faculty of Environment and Resource Studies, Mahidol University, THAILAND, email: nathsuda.pum@mahidol.ac.th

Abstract

The research aims to reconstruct the past climate by using the annual and intra-annual ring indices of *Pinus kesiya* growing in northern Thailand. It was found that mean temperature (MT) and relative humidity (RH) in April-July performed a highly significant correlation with the annual ring index for r = -0.47 and -0.45, respectively, while the mean maximum temperature (MMT) in March and extreme minimum temperature (EMT) in April showed a highly significant correlation with the intra-annual ring index for r = -0.48 and -0.49, respectively. Based on the reconstructed climate using the annual ring index in 1936-2018, it was found that the MT in April-July was gently increased from 29.18°C to 29.26°C, while the RH gently declined from 72.21% to 71.72%. The reconstructed climate using the intra-annual ring index indicated the MMT in March and the EMT in April increased from 35.84°C and 18.41°C to 36.38°C and 19.39°C, respectively.

RG1-2

Severe drought in 2021 at the University of Tokyo Hokkaido Forest

Nobuaki TANAKA[1], Hitomi OGAWA[1], Satoshi FUKUOKA[4] & Susumu GOTO[5]

[1]The University of Tokyo Hokkaido Forest, The University of Tokyo Forests,
Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
tnk-nobu@g.ecc.u-tokyo.ac.jp
[2]Education and Extension Centre, The University of Tokyo Forests,
Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
gotos@uf.a.u-tokyo.ac.jp

Abstract

A severe drought in the growing season was observed in 2021 at the University of Tokyo Hokkaido Forest, in which the highest mortality rate was recorded for conifer saplings in the nursery. Precipitation and mean air temperature for the 3-month period (from June to August) was fewer (245.5 mm) and higher (19.9ºC), respectively, than long term averages (407.6 mm and 18.6 ºC). In order to understand how frequent such a drought occurred, we investigated historical water balance (precipitation minus evaporation) during the growing season, using a 37-year dataset of monthly precipitation and air temperature, and potential evaporation. As a result, we found that, in addition to the 2021 growing season, other three years (1993, 2007 and 2013) also showed similar levels of water deficit (<-100 mm per three months). We further explored the historical water balance using widely-used drought indices, such as standardised precipitation index and such standardised precipitation evapotranspiration index.

RG1-3

Difference of Microclimate between Mixed Deciduous Forest and Maize Area

[1]*Faculty of Forestry, Kasetsart University, Bangkok, 10900, Thailand
*e-mail: ffor.venus@gmail.com, fforvnt@ku.ac.th

Abstract

The microclimate of maize area and mixed forest area were analysed and compared during 2014 to 2018, including rainfall, mean maximum and minimum air temperature, wind speed, relative humidity and evaporation. The results of study were found that in forest areas rather than maize areas have little difference in average annual rainfall and average rainy days. So, the average minimum air temperature had the greatest difference, especially in January to April, about 3.03-4.67 degrees Celsius. In addition, the evaporation in the maize area was significantly higher than the forest area, ranging between 21.86 to 33.50% due to the fact that the wind speed was higher about 0.96-1.57 times, especially in April. Microclimate of the both areas are likely to change and diverge more in the future.

RG1-4

Attribution of streamflow changes in the Bengawan Solo River to land use change and climate change using excess water and energy approach

Hero MARHAENTO[1], Martijn J. BOOIJ[2] & Naveed AHMED[3]

[1] Faculty of Forestry, Universitas Gadjah Mada, Yogyakarta 55281, INDONESIA, marhaento@ugm.ac.id

[2] Water Engineering and Management Group, Faculty of Engineering Technology, University of Twente, THE NETHERLANDS

[3] Key Laboratory of Mountain Surface Process and Ecological Regulations, Institute of Mountain Hazards and Environment, Chinese Academy of Sciences, Chengdu, CHINA

Abstract

This study investigated the influence of land use change and climate change on changes in streamflow in the Bengawan Solo River (BSR, 16,000 km^2) basin, Indonesia. We applied the excess water and energy approach to three tributaries of the BSR namely Pidekso, Madiun and Kening River, which represents the up-, mid-, and downstream part of the BSR, respectively. This study used hydrological data from 1982-2013 and land use data for the years 1994 and 2013. The results show that from 1982 to 2013, annual streamflow of the Pidekso and Madiun River has increased, while in the Kening River it has decreased. Based on attribution measures, the increasing streamflow trend in the Pidekso and Madiun River was mainly attributed to land use change, while the decreasing streamflow trend in the Kening River was mainly attributed to climate change. These attribution results were validated by statistical analyses and land use change analysis.

RG1-5

Paleo-climatic Conditions of Late Jurassic to Early Cretaceous Andigama Gondwana Sediment in Sri Lanka

B.M. Gunathilake[1], D.T. Jayawardana[2], A.S. Ratnayake[3], A.M.N.M. Adikaram[4]

1,2 *Department of Forestry and Environmental Science, Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka*
3 Department of Applied Earth Sciences, Faculty of Applied Sciences, Uva Wellassa University, Sri Lanka
4 *Department of Physical Sciences, Faculty of Applied Science, South-Eastern University, Sri Lanka*
*Correspondence: [1]bhanukagunathilake@sjp.ac.lk

Abstract

Bulk mineralogy and whole-rock geochemical analyses have been performed on the Late Jurassic to Early Cretaceous 90 m sediment core obtained from the pre-rift Gondwana Andigama Basin, Sri Lanka, to determine the paleoenvironment, provenance, paleoclimate, and tectonic settings. The present study looked at this study's sedimentological findings, whole-rock geochemistry, and organic geochemical proxies. Geochemical properties of core samples, East Gondwanaland's weathering, tectonic setting, and paleoenvironment can be reconstructed. Due to the reflected diverse hydrodynamic conditions, seven major lithological types were identified from top to bottom with varying thicknesses of calcareous sandstones and carbonaceous shales in alternating layers. X-ray diffraction patterns (XRD) show a notably high content of kaolinite distribution in the Andigama basin sediments. According to images taken with a scanning electron microscope (SEM), chemical precipitates and detrital particles with a predominance of quartz, carbonate, and aluminosilicates improved cementation by lowering the porosity and permeability of sealing interfaces. Concentrations of major oxides and trace elements are like Upper Continental Crust (UCC) values, but they are enriched in immobile elements (Fe3+, Ti4+) and depleted in mobile elements (Na+, K+). A hot and humid climate during Late Early Cretaceous to Jurassic is suggested by the high Chemical Index of Alteration (CIA), Plagioclase Index of Alteration (PIA), Index of Compositional Variability (ICV), and high content of kaolinite peaks. The Late Jurassic to Early Cretaceous period at high latitudes in the Southern Hemisphere was characterized by this hot and humid climate, which is the primary governing factor for intense chemical weathering and creates the swamp bog-forming environment. The calculated values for the mean annual precipitation (1120 mm) and paleo land surface temperature (24.7 °C + 5) align with how weathering indices and global oxygen isotopic studies have been interpreted. According to discrimination diagrams, mafic igneous sources would deposit under a passive margin setting. Furthermore, organic geochemical analyses point to nutrient-rich (average total organic carbon = 4.67 wt% 1.04 and total nitrogen = 3.13 wt% 3.39) and oxic to oxygen-poor reducing (average total sulfur = 2.13 wt% 1.43) swamp environments. Finally, new knowledge from this research allows for simulations of the global Late Jurassic–Early Cretaceous deglaciation and comparisons with other Gondwana sedimentary basins.

Keywords: Andigama, East Gondwana, Climate, Weathering, Jurassic Sediments

RG1-6

Untangling winter chilling and spring forcing effects on spring phenology of subtropical tree seedlings

Xiu Zeng[1], Yanjun Du[2, *], Yann Vitasse[3]

[1]School of Tropical Crops, Hainan University, Haikou 570228, CHINA, zengxiu18@163.com

[2]Key Laboratory of Genetics and Germplasm Innovation of Tropical Special Forest Trees and Ornamental Plants (Ministry of Education), College of Forestry, Hainan University, Haikou 570228, CHINA, yanjundu1981@gmail.com

[3]WSL Swiss Federal Institute for Forest, Snow and Landscape Research, Birmensdorf CH-8903, Switzerland, vitasse.yann@gmail.com

Abstract

Global warming is having an unprecedented impact on plant phenology and vitality worldwide. Environmental drivers explaining spring phenology, mainly including chilling, forcing and photoperiod, have been extensively investigated in temperate trees, but rarely in subtropical forests. We sought to test the effects of chilling (low vs. high) and forcing (20 vs. 25°C) on spring phenology for seedlings of five subtropical woody species using six climate chambers. We compared forcing requirements for budburst and leaf-out in the different treatments by calculating the number of degree days. This suggests that the seedlings experienced a non-linear accumulation of forcing with generally a higher efficiency at 25°C than at 20°C. This study confirms that the spring leaf phenology sensitivity to chilling and forcing is not only found in temperate plants but also in subtropical trees and offers new perspectives for a comprehensive analysis of subtropical plant phenology in response to global climate change.

RG1-7

Elementary study on ornamental cherry blossom forecasting using heat sum in Fenghuang Nature Education Area

Chiang WEI[1], Yen-Jen LAI[2] & Wei Ting LIU[3]

[1]Research Fellow/Deputy Director, TAIWAN, Experimental Forest, National Taiwan University, weichiang@ntu.edu.tw
[2] Research Fellow/Supervisor, TAIWAN, Experimental Forest, National Taiwan University, alanlai@ntu.edu.tw
[3] Research Assistant, TAIWAN, Experimental Forest, National Taiwan University, wtliou@ntu.edu.tw

Abstract

This study collected the historic meteorological data, elapse photos, in-situ photo, phenology monitoring to predict the 2020 and 2021 full blooming date of cherry tree using average heat sum and newest coming data in Fenghuang Nature Education Area of Qingshuigou Tract of National Taiwan University Experimental Forest. The result from two and six predictions shows the nearest blooming date predicted by the heat sum is three and ten days from actual blooming day in 2020 and 2021, respectively. In other hand, the percentage of full blooming from field investigations of sample trees shows significant discrepancies in different trials in the park. It also exists time difference of reaching maximum blooming for different standard trees. However, further analysis for acquiring the real-time meteorological data, growing heat sum model, blooming rate of different cherry species is yet to be evaluated to improve the prediction accuracy.

RG1-8

Temporal variation of stemflow funneling ratio during heavy precipitation in Japanese Cypress plantation forest

Koichiro KURAJI[1], Nobuaki TANAKA[2], Yuya OTANI[2], Moein FARAHNAK[2], Takanori SATO[3], Anand NAINAR[4]

[1] The University of Tokyo Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, kurajikoichiro@g.ecc.u-tokyo.ac.jp
[2] The University of Tokyo Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN
[3]Faculty of Regional Environment Science, Tokyo University of Agriculture, JAPAN
[4]Faculty of Tropical Forestry, Universiti Malaysia Sabah, MALAYSIA

Abstract

In general, forests have a function to reduce peak and direct hydrograph runoff through the dual functions of temporarily storing precipitation, evaporating some of it during and after precipitation, and retarding the runoff of the remaining water. In forests, precipitation reaches the ground surface in two forms: rainfall in the forest and tree trunk flow, with the leaves, branches and bark serving as a temporary water retention site in the process. During the initial phase of precipitation, the stemflow is consumed to moisten the dry canopy bark, reducing the amount of stemflow reaching the ground surface. This phenomenon continues until the canopy bark is saturated with water. On the other hand, even before the barks are saturated with water, as precipitation intensity increases, water that exceeds the maximum possible flow rate in the water channels formed in the trunks drips and detaches, and is converted to throughfall. Although previous studies have shown a negative correlation between precipitation intensity and funneling ratio of stemflow, there have been no previous studies on temporal changes in funneling ratio during heavy rainfall events exceeding 50 mm. In this study, the relationship between funneling ratio and rainfall intensity was analysed by observing tree trunk flow during heavy rainfall exceeding 50 mm per event in a Japanese cypress plantation in the Obora experimental watershed, Toyota City, Aichi Prefecture.

RG1-9

Post-fire Changes of Throughfall Quantity and Quality in *Pinus densiflora* Forest

Taehyun Kim(A)[1], Yu Gyeong Kim[1], Jungyoon Kim[1], Jeman Lee[1], Chulwon Lee[1], Myounghwan Oh[1], Tae-hyun Kim(B)[1], Sangjun Im[1,2]

[1]Department of Agriculture, Forestry and Bioresources, Seoul National University, Seoul 08826, Republic of Korea, kta40@snu.ac.kr(T.K(A).; 60_kim@snu.ac.kr(Y.G.K.); jyoonk99@snu.ac.kr(J.K.); jemahn@snu.ac.kr(J.L.); lcw6419@snu.ac.kr(C.L.); ohmydh@snu.ac.kr(M.O.); thkim96@snu.ac.kr(T.K(B).); junie@snu.ac.kr(S.I.)
[2]Research Institute of Agriculture and Life Sciences, Seoul National University, Seoul 08826, Republic of Korea, junie@snu.ac.kr(S.I.)

Abstract

When rainfall occurs in a forest, rainfall is partitioned into throughfall through the canopy and stemflow along the trunk. Nutrients that constitute the vegetation are eluted from the leaves in the canopy, including dissolved organic carbon (DOC), K^+, Ca^{2+}, Mg^{2+}, and Na^+. Meanwhile, wildfire is one of forest disasters that burn the canopy and surface organic matters in the forest. Tree canopy including branches, leaves, and barks are also incompletely burned by forest fires and form ash particles. The ash is easily washed and leached by throughfall and stemflow to the soil, directly and indirectly affecting soil chemistry and altering nutrient cycling. In this study, the quantitative and qualitative analysis of the throughfall were conducted in wildfire-damaged areas after the wildfire in 2022. For 6 months after the wildfire occurred, funnels were installed to collect throughfall. The amount of water for a specified period was continuously measured and analyzed the water quality components (TOC, Ca^{2+}). As a result, the ratio of throughfall to total rainfall was maintained constant as the accumulated rainfall increased. The quantity of the throughfall increased by up to 10% in the wildfire-damaged area compared to the unburned forest. In addition, the eluted amounts of Ca^{2+} and TOC in wildfire-damaged areas were larger than those of the control area after the fire, and there were not significant difference on 3 months after the fire. Through this study, the changes in the amount and water quality of throughfall by wildfire were confirmed, and it would provide fundamental data for nutrient cycling management of the wildfire-damaged soil.

Acknowledgement

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RG1-10

Developing the Reach-average Flow Velocity Relationship of Mountain Streams Using Dye-tracer Method

Jeman LEE[1], **Tae-hyun KIM**[1] & **Sangjun IM**[1,2]

[1]Department of Agriculture, Forestry and Bioresources, Seoul National University, KOREA, jemahn@snu.ac.kr; thkim96@snu.ac.kr; junie@snu.ac.kr
[2]Research Institute of Agriculture and Life Sciences, Seoul National University KOREA, junie@snu.ac.kr

Abstract

The average flow velocity of the mountain stream is a major factor in determining the hydraulic characteristics of stream, and is used to track pollutants transported downstream through the stream or to design erosion structures. However, it is practically difficult to calculate the average flow velocity of a certain section using a general flow meter because mountain streams have irregular channel shapes and accordingly, the flow velocity varies greatly locally. Recently, many studies have been conducted to identify the relationship between discharge and average flow velocity using discharge data, which are relatively easy to obtain. In this study, we tried to develop an equation for estimating the average flow velocity of a mountain stream considering the shape of the mountain stream. For this purpose, the flow velocity measured using the rhodamine tracer method and shape factor acquired through LiDAR survey were used. In order to use the optimal stream roughness height, a dimensionless relationship between discharge and flow velocity was derived, and for the roughness height, D_{50}, D_{84} of the riverbed materials and surface roughness factors of stream, Ra, Rmax, and Rz, were used. The model equation was constructed with Rz having the lowest RMSE, and R^2 was calculated as 0.39.

This study was carried out with the support of 'R&D Program for Forest Science Technology (Project No. 2021343C10-2323-CD01)' provided by Korea Forest Service(Korea Forestry Promotion Institute).

RG1-11

Assessing the impacts of climate change on water resources among the Asian experimental forests: a case study on the Lienhuachih watershed, Taiwan

Yen-Jen LAI[1], Chun-Wei TSENG[2]

[1]Experimental Forest, National Taiwan University, TAIWAN, alanlai@ntu.edu.tw
[2]Watershed Management Division, Taiwan Forestry Research Institute, TAIWAN, a1211@tfri.gov.tw

Abstract

Climate change may impact forest ecosystems and forest land management, among which water resources are one of the most important influencing factors. Most of the experimental forests are well-managed forests, which can be regarded as the baseline for water resource changes under climate change. Therefore, this study aims to conduct a complete water resource assessment of the Asian experimental forests. According to the opinions of the JSPS RG1 team at the international symposium in March 2022, the domestic Lianhuachi data will be used for evaluation first, and then discuss whether to promote the complete evaluation of the Asian experimental forests.

The Generalized Watershed Loading Function model (GWLF; Haith et al. 1992) was used in this study. The results showed that GWLF can effectively simulate the monthly flow, and the R2 value reaches 0.78. The CNs corrected by the probabilistic method (Im et al., 2020) can improve the simulation results when applied to the GWLF hydrological model, but the improvement is not large. The simulation data provided by the CODEX-EA data can be used to assess long-term seasonal water resources. The results showed that there will increase and decrease in 2030-2069 and 2070-2100 (the 2080s), separately. In addition, the occurrence of drought under the RCP85 scenario may increase significantly in the 2080s. Based on this study, we propose to assess the Asian experimental forests by the same procedures.

RG1-12

Water resource availability in primary rainforest, logged forests, and oil palm catchments in Sabah, Malaysia: implications for management under climate change

Anand NAINAR[1], Rory P. D. WALSH[2], Kawi BIDIN[3], Nobuaki TANAKA[4], Robert M. EWERS[5] & Glen REYNOLDS[6]

[1]Faculty of Tropical Forestry, Universiti Malaysia Sabah, MALAYSIA, nainar@ums.edu.my
[2]Department of Geography, Swansea University, UNITED KINGDOM, r.p.d.walsh@swansea.ac.uk
[3]Faculty of Science & Natural Resources, Universiti Malaysia Sabah, MALAYSIA, kbidin@ums.edu.my
[4]The University of Tokyo Hokkaido Forest, The University of Tokyo Forests, Graduate School of Agricultural & Life Sciences, The University of Tokyo, JAPAN, tnk-nobu@g.ecc.u-tokyo.ac.jp
[5]Georgina Mace Centre, Department of Life Sciences, Imperial College London, UNITED KINGDOM, r.ewers@imperial.ac.uk
[6]South East Asia Rainforest Research Partnership, MALAYSIA, glen.searrp@icloud.com

Abstract

Although floods and erosion have been well-studied in the tropics, little attention has been given to water resource availability because it was rarely a problem. However, the situation has been changing where droughts have been getting longer and drier. Baseflow magnitude and persistence were compared between catchments on an increasing gradient of disturbance (a primary forest, virgin jungle reserve, twice-logged forest, multiple-logged forest, and mature oil palm catchment) in Sabah, Malaysian Borneo, to gain insights on water resource availability. The primary forest had the highest baseflow quantity and persistence followed by the virgin jungle reserve, multiple-logged forest, twice-logged forest, and oil palm. Forests (primary or logged) should be conserved in the headwaters while oil palm planting should take into consideration planting density and downstream water demand.

RG1-13
Groundwater Quality Implications from Geology of Sri Lanka: A way Forward

[1]Daham Taranga Jayawardana

[1]Department of Forestry and Environmental Science, University of Sri Jayewardenepura, Sri Lanka, daham@sjp.ac.lk

Abstract

The geological setup of Sri Lanka is well known for its Precambrian high-grade metamorphic basement. Ninety percent of the basement comprises meta-sedimentary and meta-igneous rocks, with ten present sedimentary rocks. The Precambrian basement has a significant level of geologically and geochemically variations. Therefore, this study aims to evaluate the major groundwater quality implications based on rock and soil water interactions, according to past research on water quality, soil, and basement geochemical. Studies revealed that fluoride is the dominant groundwater contaminant throughout Sri Lanka. According to the observations dry zone of the country has a higher level of groundwater, which reflects the uneven distribution around the country due to changes in basement geology. However, with a higher concentration of fluoride in groundwater, deficient soil concentrations have been reported. According to most of the associated trace metals, It has been recognized that trace metals are enriched with the soil than the water. Groundwater movements of shallow regolith aquifers in the country are mainly controlled by joint and fault systems in the partially weathered basement. This study observed that their variation in the dry and wet zones is a major parameter for the control of fluoride levels in the groundwater. Weathering of heavy minerals such as zirconium, apatite, fluorite, monazite, and garnet is the main source for the soil in the fluoride-rich groundwater. In fluoride-rich areas, Zr, Nb, and Th are immobile relative to the basement, and F, CaO, and P2O5 are depleted. Conversely, soils in the relatively fluoride-poor district are enriched in TiO2, Fe2O3, MnO, Cr, V, and Sc, denoting the weathering of biotite, hornblende, garnet, and pyroxenes in the basement. Primary minerals present in the soils are the main cause of the enrichment of those elements. Further, fluoride levels in the soils and the groundwaters show links with the original magmatic contrast between the basement formations in each area. Soil geochemistry suggests that a fluoride-rich residual melt may have influenced the meta-igneous rocks in the fluoride-rich districts.

RG1-14

Spatial and temporal variation of surface water quality of selected reservoirs in Mahaweli cascade of Sri Lanka

Chandrathilake G.G.T.[1] and Kumara P.A.[1 & 2]

[1]Department of Forestry and Environmental Science, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka. thilakawansha@sjp.ac.lk
[2]Mahaweli Authority of Sri Lanka, 500 T. B. Jayah Mawatha, Colombo, Sri Lanka. anuruddha.env.masl@gmail.com

Abstract

Initiated in 1977, the Accelerated Mahaweli Development Project (AMDP) is a large-scale program in Sri Lanka that aims to develop the Mahaweli River basin, the country's longest river. This is done by constructing a series of dams, reservoirs, trans-basin water diversions for irrigation, hydroelectric power generation, and flood mitigation. This study evaluated monthly physiochemical parameters from 32 locations in five selected reservoirs in two river basins of AMDP over a five-year period, from January 2015 to December 2019. The results indicated that most physiochemical parameters did not exceed surface water quality standards, and neither exhibited significant temporal nor spatial variation. However, when water flows from upstream reservoirs to downstream reservoirs, there is a notable temporal variation and a progressive increase in the concentration of total dissolved solid, electrical conductivity, hardness, and alkalinity. Furthermore, downstream reservoirs exhibit higher concentrations of phosphate and nitrate, with significant spatial variations, indicating adverse impacts on reservoir ecology.

RG1-15

Quantifying Stemflow Volume and Assessing Water Quality Changes in Selected Urban Tree Species

SARANGUHEWA A.N[1], CHANDRATHILAKE G.G.T[1], COORAY A.T[2]

[1]Department of Forestry and Environmental Science, University of Sri Jayewardenepura, Nugegoda, SRI LANKA, nimantha.saranguhewa@gmail.com, thilakawansha@sjp.ac.lk

[2]Department of Chemistry, University of Sri Jayewardenepura, Nugegoda, SRI LANKA, atcooray@sjp.ac.lk

Abstract

Stemflow is the part of precipitation that comes into contact with a tree's canopy and flows down the stem of the tree. Stemflow volume vary with tree characteristics and atmospheric pollutants can alter the chemical composition of stemflow. Thus, this study aims to evaluate the stemflow of five selected urban tree species. Stemflows for ten rain events were collected from December 3rd, 2022, to January 24th, 2023 stemflow water quality compared to uninterrupted rainfall. Stemflow volumes varied depending on rainfall intensity and tree morphological characteristics. A strong positive correlation was observed between rainfall and stemflow. *Mesua ferrea* produced the highest stemflow, while *Mangifera indica* produced the lowest. Both Na+ and K+ contents were greatly increased in *Mangifera indica*, while the smallest changes in stemflow water quality were observed in *Mesua ferrea*. These findings are valuable for understanding the importance of stemflow for urban trees and urban forest management.

RG1-16

The effect of climate change on groundwater recharge at Nadi and Kabinburi districts, Prachinburi Province

Patchares Chacuttrikul[1] & Supattra Thueksathit[2]

[1]Faculty of Forestry, Kasetsart University, THAILAND, fforprc@ku.ac.th

[2]Faculty of Forestry, Kasetsart University, THAILAND, fforstt@ku.ac.th

Abstract

Due to climate change problems that affect natural resources in many aspects including soil water storage, thus, this research aimed to study the impact of climate change on groundwater recharge at Nadi and Kabinburi district, Prachinburi province by applying the H08 model to assess groundwater recharge from climate change scenarios.

The results suggested that the current situation, the scenario that increase and decrease 10% of rainfall, had the 5-year average (2016-2020) groundwater recharge $7.33x10^{-4}$, $7.35x10^{-4}$, $7.32x10^{-4}$ m^3/s. The groundwater recharge from the climate change scenarios were slightly change, which was an increase of 63.07 and a decrease of -31.54 m^3/year, or 0.22 and -0.10% of the average groundwater recharge from the current situation. From the results of the study, it was concluded that rainfall affects groundwater recharge but climate change under a 10% increase or decrease in rainfall simulation, has not clearly affected groundwater recharge in the study area.

RG1-17
Hydrological Response of Modified Intensive Forest Management System in Tropical Rainforest of Central Kalimantan, Indonesia

Hatma SURYATMOJO[1], Ken'ichiro KOSUGI[2]

[1]Laboratory of Watershed Management, Faculty of Forestry, Bulaksumur, Yogyakarta, INDONESIA, hsuryatmojo@ugm.ac.id
[2]Laboratory of Erosion Control, Graduate School of Agriculture, Kyoto University, JAPAN, kos@kais.kyoto-u.ac.jp

Abstract

Sustainable forest management (SFM) is the management of natural forests in such a way as to minimize the negative impacts associated with timber extraction. To achieve SFM and maintain forest productivity, the management of tropical Indonesian rainforests then changed to an Intensive Forest Management System (IFMS). The IFMS primarily involves selective logging and intensive rehabilitation with line-planting to enrich the forest's standing stock in the next harvesting period. This study used three paired small catchments. Catchment A was monitored as a control. Catchment B was supervised and treated with standard IFMS. Catchment C was supervised and treated with modified IFMS. During the post selective logging (post-SL) period, total runoff of catchments B and C increased by 68.8% and 47.3%, respectively, in comparison with catchment A. During the post-SL period, SS yields for catchments A, B, and C were estimated to be 0.6, 34.0, and 14.5 t ha^{-1} y^{-1}, respectively. Implementation of an modified IFMS is effective in controlling hydrological response in the catchment level.

Keywords: tropical rainforest, intensive forest management system, direct runoff, peak discharge, suspended sediment.

RG1-18

Water Balance Analysis as a Base for Proposing Land Use in Blongkeng Watershed

Uswatun Chasanah[1] & Ambar Kusumandari[2]

[1]Alumni of Faculty of Forestry, Universitas Gadjah Mada, Indonesia
[2]Senior lecturer of the Faculty of Forestry, Universitas Gadjah Mada, Indonesia,
e-mail corresponding author: ambar_kusumandari@ugm.ac.id

Abstract

Water is an essential thing for human life. The need for water keeps rising along with the population growth. Rapid growth in population will be linear with pressures on land use. To meet their needs for daily life, living places, business area, etc., humans tend to explore and exploit the existing natural resources. This research aims to identify water balance condition, aridity index, run off coefficient and to simulate the optimal form of land use to increase water storage capacity and decrease run off in the Blongkeng watershed area. We used Thornthwaite-Mather model to analysis water balance. The optimal land use change simulation is proposed by adopting agroforestry system and considering the direction of the area function to increase water storage capacity and decrease run off. The results showed that the water balance in the Blongkeng watershed at each land use tended to experience a water surplus. Overall, each land use for the aridity index results tends to low on water shortage (Ia <16.5%). Meanwhile, the run off coefficient value for each land use is quite high, ranging from 0.40 to 0.68. The simulation of land-use change shows positive results to reduce run-off and increase water storage capacity. Another effort made to control run off is the application of the Soil and Water Conservation (SWC) technical design. The SWC technique inside the conservation area was designed in the form of vegetative techniques, including natural existing plant growth, agroforestry, and replanting/afforestation, whereas the SWC technical plan outside conservation area was designed in the form of a combination of technical civilians, terraces establishment (flat, credit, mounds, gardens), constructing retaining structures such as retaining gully plugs, and controlling dam or making some channels, making infiltration wells or biopores and combined with using vegetative techniques in the form of natural plant growth, mulching, agroforestry, and replanting or afforestation.

Keywords : Blongkeng, Thornthwaite-Mather, aridity index, soil, conservation

RG1-19

Membranous Filter with Thermally Activated Laterite Soil-filled for Instantly Removing Ions from Contaminated Water

Uditha Sandali DISSANAYAKE [1], Daham Tharanga JAYAWARDANA [1], Sandani Buddhima VIDANAPATHIRANA [1], Bhanuka Mahesh GUNATHILAKE [1]

[1] Department of Forestry and Environmental Science, Faculty of Applied Sciences, University of Sri Jayewardenepura, Gangodawila, Nugegoda, SRI LANKA, sandalidissanayake@sci.sjp.ac.lk, daham@sci.sjp.ac.lk, sandaniv95@gmail.com, bhanukagunathilake@sjp.ac.lk

Abstract

This study used membranous bag/pouch filled with thermally activated laterite to instantly remove ions from the contaminated water. The collected soil was cleaned, dried, crushed, and sieved to produce 2 mm powder. Thermally activated soil samples were created by heating for three hours at 300 °C. The adsorbent material's physiochemical properties were identified. The removal efficiencies of the selected ions were evaluated using batch experiments. Such device was a proven high pollutant removal efficiency. The optimum dosage and time are 0.50 g and 2 minutes. At the optimum soil dosage and contact time, the removal efficiencies of fluoride, phosphate, chromium, cadmium, and lead ions were over 70% and 69%, respectively. The device revealed constant removal efficiencies for all the ions from over the course of 20 dippings. The pouch is reusable, possible to make contaminated water safe to drink and the preferred method for quickly removing ions from water systems.

Keywords: Thermally activation, Laterite, Adsorption, Instant, Membranous bag/pouch, Optimum conditions

RG1-20

A correlation analysis of water quality and habitat types of Kolonnawa Marsh, Colombo, Sri Lanka

Rathnayake R.M.U. B.[1] *, Chandrathilake G.G. T.[1], Jayawardana D.T.[1] and Nobuaki Tanaka[2]

[1]*Department of Forestry and Environmental Science, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka.*
[2]*The University of Tokyo Hokkaido Forest, Graduate School of Agricultural and Life Sciences, The University of Tokyo*

**umandarathnayaka@yahoo.com*

Kolonnawa Marsh (KM) is an important urban wetland ecosystem in Colombo, Sri Lanka, that provides valuable ecosystem services. The KM encompasses seven main vegetation types, which consist of five predominant habitat types, including Herb-dominated low vegetation, herb-dominated high vegetation, mixed woodland, water with floating vegetation, and open water. Despite being surrounded by highly populated and industrialized areas, the KM is continuously impacted by the discharge of household and industrial wastewater. To investigate the correlation between water quality and habitat types, 15 physiochemical parameters were analyzed at 47 sample sites throughout the year from November 2021 to November 2022. The results revealed that Herb-dominated low vegetation and mixed woodland reduced the initial physiochemical parameter levels by approximately 50%. Water with floating vegetation, herb-dominated high vegetation, and open-water habitat types showed reductions of 30%, 15%, and 5% in nutrient levels, respectively, within the KM.

KEYWORDS: Urban wetland, Habitat types, Vegetations, Kolonnawa Marsh, Physiochemical parameters

RG1-21

Diurnal variation pattern of trace gases concentration on landfill surface layer under tropical climatic conditions

Herath P.L. [1]*, Gunathilake B. M. [1], Jayawardana D.T[1,2]., Bandara N.J.G.J. [1,2]

[1]*Department of Forestry and Environmental Science, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka.*
[2] Center for Forestry and Environment, University of Sri Jayewardenepura
**priyathpriyara@gmail.com*

Abstract

Landfill gas emission with Municipal solid waste (MSW) generation is increasing daily worldwide due to population growth, urbanization, and global economic development. Methane and Carbon dioxide are the main components in landfill gases, and hundreds of gaseous compounds in trace levels are generated within the waste, creating negative consequences on the environment and human health. Numerous investigations on landfill gas generation, emission, and impact have been observed, but only a few have documented the patterns of fluctuation in gas concentration on the landfill surface layer. The current study aimed to fulfill this research gap by investigating some selected malodourous trace gases variation patterns on the Karadiyana landfill, including ammonia (NH_3), Sulfur dioxide (H_2S), and Total Volatile Organic Compound (TVOC), which has been operational for more than 30 years in Sri Lanka under tropical climatic conditions. The study used three gas wells made of perforated PVC tubes established on the old mixed waste area with vegetation cover. The depth of the wells was 2.5 m, and each gas concentration within the wells was measured. Twelve samplings were done with a two-hour gap throughout the day, with five sampling campaigns monthly. The main climatic factors, such as atmospheric pressure, temperature, and relative humidity, were measured with the sampling. The results indicate that the average concentration value of NH_3, H_2S, and TVOC within the surface layer was 1.7, 3.3, and 0.4 mg m^{-3} throughout the day; fluctuations were 0.6 to 3.5, 2.5 to 5.0, and 0.2 to 0.5 mg m^{-3}, respectively. The highest NH_3 and H_2S were reported in the daytime, mainly at 11.00 to 15.00 hours, and TVOC fluctuation is very low throughout the day. According to the Pearson correlation ($p < 0.05$), NH_3 and H_2S concentrations show a significant relationship (0.73), and both gas concentrations are positively correlated with atmospheric temperature (0.99, 0.71) and a negatively correlated with relative humidity (- 0.98, - 0.82). Present study revival that atmospheric fluctuations, mainly temperature and relative humidity, decided the surface layer concentration of NH_3 and H_2S. It explained the studied malodourous trace gases accumulation pattern within the surface layer throughout the day, and it may be closer to the generation and emission pattern from the old mixed waste wasteyard with plant cover.

Keywords: landfill, surface layer concentrations, trace gasses, the diurnal variation pattern

RG1-22

Effect of *Acacia mangium* Plantation on Soil Properties in Abandoned Tin Mining Area

Jetsada WONGPROM[1*], Pattama SANGVISITPIROM[1], Wasan CHANDAENG[1] & Nathawat KHLANGSAP[1]

[1]Forestry Research Center, Faculty of Forestry, Kasetsart University, Bangkok, Thailand
*e-mail: fforjdw@ku.ac.th

Abstract

This study was carried out in *A. mangium* plantation,which was abandoned mining area at Phangnga Forestry Research Station, southern Thailand. The physical and chemical properties of soil were investigated in the1st, 2nd rotation and 27-year-old *A. mangium* plantations (27AMP). In addition, abandoned mining area (AB) and primary forest were also investigated. The results showed that soil bulk density of the 1st, 2nd *A. mangium* and 27AMP was improved. Organic matter of 1st, 2nd rotations and 27AMP was obviously higher than that in AB. Soil nutrients, including N and avi. P increased with rotations. The total N of 2nd rotation was similar to 27AMP. However, soil nutrients of the 2nd rotation and 27AMP was lower than that in primary forest. These results indicated the development of soil property of restored and commercial plantations was relatively slow. However, higher nutrients and organic matter of soil was positively influenced from *A. mangium* plantation.

RG2-1

Comparison of microbe communities in the mycangium of ambrosia beetle *Xylosandrus crassiusculus* (Coleoptera: Curculionidae) between middle and late dispersal seasons

Syaiful Amri SARAGIH[1], Shuhei TAKEMOTO[2], Dai KUSUMOTO[3], & Naoto KAMATA[4]

[1]Faculty of Agriculture, Universitas Muhammadiyah Sumatera Utara, INDONESIA, akhi_amree@yahoo.com
[2]Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, ts35@g.ecc.u-tokyo.ac.jp
[3]Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, kusumoto@uf.a.u-tokyo.ac.jp
[3]Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, kamatan@uf.a.u-tokyo.ac.jp

Abstract

In this study, we identified the microbe communities in the mycangium of the ambrosia beetle, *Xylosandrus crassiusculus* (Coleoptera: Curculionidae) and observed the microbe diversity in the mycangia at middle and late dispersal seasons of beetles. A sectioning technique with resin embedding was used to identify the position of the mycangium. The results showed that all the samples of *X. crassiusculus* had one mycangium located at the mesonotal. Eight species of fungi were identified, of which two species were yeasts. The microbe community in the mycangium of *X. crassiusculus* was dominated by *Ambrosiella roeperi* as a primary ambrosia fungus and may vary locally and seasonally via the composition of auxiliary fungi. This study showed that the microbe diversity in the mycangium was influenced by the timing of beetle sampling during the flight dispersal season, with more diverse microbe communities was identified in the late dispersal season.

RG2-2

Geographical clines in bark and ambrosia beetle diversity in East and Southeast Asia

Naoto KAMATA[1,2,10], Sunisa SANGUANSUB[2], Yong PENG[3,4], Syaiful Amri SARAGIH[3,5], Anut BURANAPANICHPAN[3,6], Zi-Kai LIN[3,7], Sawai BURANAPANICHPAN[8,9], Teerapong SAOWAPHAK[8], Chu-Lin LI[10], Li-Wei WU[10,11], Maria Lourdes T LARDIZABAL[12], Roger A. BEAVER[13]

[1] The University of Tokyo Chiba Forest, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, kamatan@uf.a.u-tokyo.ac.jp
[2] Faculty of Agriculture at Kamphaeng Saen, Kasetsart University, THAILAND
[3] Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN
[4] Institute of Botany, Chinese Academy of Sciences, CHINA
[5] Faculty of Agriculture, Universitas Muhammadiyah Sumatera Utara, INDONESIA
[6] Department of Agricultural Extension, THAILAND
[7] Haid group, Guangzhou, CHINA
[8] Faculty of Agriculture, Chiang Mai University, THAILAND
[9] 13/8 Moo 10, Suthep Sub-district, Mueang District, Chiang Mai, THAILAND
[10] The Experimental Forest, National Taiwan University, TAIWAN
[11] Department of Life Science, Tunghai University, TAIWAN
[12] Faculty of Tropical Forestry, Universiti Malaysia Sabah, MALAYSIA
[13] 161/2 Mu 5, Soi Wat Pranon, T. Donkaew, A. Maerim, Chiangmai, THAILAND

Abstract

Bark and ambrosia beetles (BB and AB, respectively), which include some important forest and wood pests, are ecological guilds found in the subfamilies Scolytinae and Platypodinae in the family Curculionidae (COLEOPTERA). The order and the family are the most diverse groups on the globe. There were many studies on geographical gradients in biodiversity. In this study, we captured BB and AB by bait traps and trap logs/branches at seven sites in four countries (northern Japan (NJ, 43°N), two sites in central Japan (CJ, 35°N), two sites in central Taiwan (TW, 24°N), northern Thailand (TH, 14°N), and Sabah, Malaysia (SB, 3°N)) and analyzed geographical gradients in the diversity by multiple indicators and methods. Latitudinal gradients in species diversity were recognized in all the analyses: namely, species diversity tended to decrease with latitude. Stochasticity also decreased with latitude. Large changes in species diversity were found between NJ/CJ and between TH/SB. The large decrease in diversity from CJ to NJ probably depends on insufficient heat units in NJ for many species to complete one generation a year.

RG2-3

Molecular phylogeny of bark and ambrosia beetles (Curculionidae: Scolytinae): revealing well-supported groupings based on mitogenomic sequences

Li-Wei WU[1], Chun-Lin LI[2], Ming-Jr TSAI[3], Maria Lourdes LARDIZABAL[4], Sunisa SANGUANSUB[5], Teerapong SAOWAPHAK[6], Sawai BURANAPANICHPAN[7], Anut BURANAPANICHPAN[8], Yong PENG[9], Roger A BEAVER[10], and Naoto KAMATA[11]

[1] Department of Life Science, Tunghai University, TAIWAN, liweiwu@go.thu.edu.tw
[2] The Experimental Forest, National Taiwan University, TAIWAN,chunlinli@gmail.com
[3] The Experimental Forest, School of Forestry & Resource Conservation, National Taiwan University, TAIWAN, tmj@ntu.edu.tw
[4] Faculty of Tropical Forestry, Universiti Malaysia Sabah, MALAYSIA, mlourdes@ums.edu.my
[5] Department of Entomology, Faculty of Agriculture at Kamphaeng Saen, Kasetsart University, THAILAND, agrssss@ku.ac.th
[6] Department of Plant Science and Natural Resources, Chiang Mai University, THAILAND, teerapong.s@cmu.ac.th
[7] 13/8 Moo 10 Suthep Sub-district, Mueang District, Chiang Mai, THAILAND, sawai1955@gmail.com
[8] Department of Agricultural Extension, THAILAND, anut.brnp@gmail.com
[9] Institute of Botany, Chinese Academy of Sciences, CHINA, penyom@hotmail.com
[10] 161/2 Mu 5, Soi Wat Pranon, T. Donkaew, A. Maerim, Chiangmai 50180, THAILAND, rogerbeaver6@gmail.com
[11] The University of Tokyo Chiba Forest, The University of Tokyo, JAPAN, kamatan@uf.a.u-tokyo.ac.jp

Abstract

Bark and ambrosia beetles (Curculionidae: Scolytinae and Platypodinae) form a large and diverse group, some of which are notorious pests in forests. Identifying them is the first step in controlling them. However, this is not an easy task based on either morphological characters or barcode sequences due to their small bodies and low DNA quantity. To establish a well-supported phylogeny of this group, we have used the genome skimming method to produce 58 new mitogenomes. Combining these with public Curculionidae mitogenomes, the 257-taxon ML trees show strong support on most nodes. The results generally confirm earlier studies. The Platypodinae are not closely related to the Scolytinae but rather to the Dryophthoridae. The Scolytini are not closely related to the remainder of the Scolytinae. The clades within the latter group are mostly highly resolved and reflect many of the tribes in the current classification. This study supports the idea that mitochondrial genomes are excellent markers for investigating the phylogenetic relationships of bark and ambrosia beetles.

RG2-4

Species Diversity of Bark and Ambrosia Beetles at Ulu Padas Forest Reserve, Sipitang, Sabah, Malaysia

Maria Lourdes T LARDIZABAL[1], Evahtira GUNGGOT[1], Tyrone MOJIKON[1], Jonathan Jimmey LUCAS[2], WONG Haoen[3] , Wilson Vun Chiong WONG[1] , Roger A BEAVER[4] & Naoto KAMATA[5]

[1]Faculty of Tropical Forestry, Universiti Malaysia Sabah, MALAYSIA,
mlourdes@ums.edu.my, evahtira_gunggot_mf21@iluv.ums.edu.my,
tyrone_mojikon_mf21@iluv.ums.edu.my, w.wilson@ums.edu.my
[2]Forest Research Center, Sepilok, Sandakan, MALAYSIA,
jonathanjlucas98@gmail.com
[3]Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, MALAYSIA,
bryanwonghaoen@gmail.com
[4]161/2 Mu 5, Soi Wat Pranon, T. Donkaew, A. Maerim, Chiangmai 50180, THAILAND
rogerbeaver6@gmail.com
[5]Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
kamatan@uf.a.u-tokyo.ac.jp

Abstract

Bark and ambrosia beetles (Curculionidae: Scolytinae and Platypodinae) are still poorly documented in the tropical montane regions of the island of Borneo, Sabah, Malaysia. To address this research gap, a three-year study (April 2017 - May 2020) was conducted at Ulu Padas Forest Reserve (UPFR), Sabah, Malaysia to assess the diversity of bark and ambrosia beetles, which were compared using ethanol trap (ET) and trap logs (TL) methods. For ET, beetle diversity was examined between three land-use types (primary forest, disturbed forest, plantation forest) while for TL, beetle diversity was assessed among 95 tree species from 109 sampled logs. Findings from the study showed that the sampling method influenced the number of individuals captured, with TL recording higher numbers in taxa and beetle abundance (221 species from 8,982 individuals) compared to ET (154 species from 7,257 individuals). Specifically, the abundance of platypodine beetles was found to be higher in the TL method (102 species from 6,046 individuals) than the ET method (15 species from 25 individuals). Conversely, the ET method captured a higher abundance of scolytine beetles (139 species from 7,232 individuals) compared to the TL method (119 species from 2,936 individuals). In general, results from this three-year study recorded a remarkable bark and ambrosia beetle diversity at UPFR, Sabah. However, continuous monitoring and sampling is required to gain a better overview of the bark and ambrosia beetle community at the research area.

RG2-5

A four-year monitoring investigation on bark and ambrosia beetle assemblages in central Taiwan

Chun-lin LI[1], Li-Wei WU[2] & Naoto KAMATA[3]

[1] The Experimental Forest, National Taiwan University, TAIWAN

chunlinli@gmail.com

[2] Department of Life Science, Tunghai University, TAIWAN

chiladessp@gmail.com

[3]The University of Tokyo Chiba Forest, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN

kamatan@uf.a.u-tokyo.ac.jp

Bark and ambrosia beetles (Coleoptera: Curculionidae: Scolytinae) are a group of insects that are economically and ecologically important to the health of forests. A long-term investigation on the beetles were conducted using ethanol baited traps set up within a secondary forest in Heshe of central Taiwan from 2019 to 2022. A total of 2285, 2109, 2539 and 2319 specimens in 40 species were collected by years, respectively, with the most dominant species, *Phloeosinus pertuberculatus*, in total of 3,971 specimens (approximately 43% of the whole). The secondary dominant species was *Xylosandrus mancu* with 2902 specimens (31.5%). Two of them were consistency of appearance in number for the past four year and accounted for 74% of the total beetle specimens. The results indicated that the weather condition distinctly affected the number and species in flight period of beetle having a higher tendency in dry season and being lower in wet season.

RG2-6

Nationwide precision monitoring of *Matsucoccus matsumura*e Kuwana (Hemiptera: Matsucoccidae) in Korea using pheromone-based trap and deep learning object detectors

Jae-Woo LEE[1], Il NAM[1], Dongho LEE[1], Minwoo LEE[1],
Kyungjoo HWANG[1], Jong-Kook JUNG[2], Seong-Chul MOON[3], Dong-Woon LEE[4],
Sang-Myung LEE[5], Sang-Gil LEE[6], Yong-Hoon KIM[7] & Il-Kwon PARK[1,8]

[1]Department of Agriculture, Forestry and Bioresources, Seoul National University, REPUBLIC OF KOREA, gudbud@snu.ac.kr
[2]Department of Forest Environment Protection, Kangwon National University, REPUBLIC OF KOREA
[3]Sumok Tree Clinic, REPUBLIC OF KOREA
[4]Department of Applied Biology, Kyungpook National University, REPUBLIC OF KOREA
[5]SM BioVision Co., REPUBLIC OF KOREA
[6]Tree Diagnostic Center, Sunchon National University, REPUBLIC OF KOREA
[7] Forest Pests & Diseases Control Division, Forest Pests & Diseases Monitoring Headquarters, Korea Forestry Promotion Institute, REPUBLIC OF KOREA
[8]Research Institute of Agriculture and Life Sciences, Seoul National University, REPUBLIC OF KOREA, parkik1@snu.ac.kr

Abstract

The Japanese pine bast scale, *Matsucoccus matsumurae* (= *M. thunbergianae*), is a serious insect pest to *Pinus thunbergii* and *P. densiflora* in Korea. Despite its severe damages, nationwide monitoring of this species has not been conducted yet in Korea. Herein, we report the results of the nationwide monitoring of *M. matsucoccus* using its diastereomeric pheromone, (2*E*,4*E*,6*R*,10*R/S*)-4,6,10,12-tetramethyl-2,4-tridecadien-7-one, and a CNN-based automatic counting model, covering 164 local administrative districts in 2022. The occurrence of adults was first observed at the southeast coastal regions in early February and subsequently spread to the Southeast and Midwest coastal regions. The capital area showed the peak occurrence from late April to May, and Northeast regions showed the peak in early June. In total, 666,098 of adults were captured, occurring throughout the country. However, further investigation is required on the locational difference in degree-days and the genetic makeup for a better understanding of this pest.

RG2-7

Beneficial Insects Abundance on Different Land Uses

Ananto TRIYOGO, **Akbar Zhafran ADRIANSYAH**, & **Dwi Tyaningsih ADRIYANTI**

Department of Silviculture, Faculty of Forestry, Gadjah Mada University, Jl. Agro No. 1, Bulaksumur, Sleman, Indonesia 55281, triyogo99@yahoo.com

Abstract

Land use and management must be carried out to ensure the sustainability of land ecological function. The presence of natural enemies that suppress pest populations is an essential component of the ecological function. Monitoring the presence of natural enemies and avoiding silvicultural activities that threaten the presence of natural enemies are important aspects of land management. This study investigates the presence of natural enemies on three different land uses: agroforestry, community forests, and pioneer lands. Insect monitoring was carried out at an established plot (20 m × 20 m) for three months using passive sampling (pitfalls and sticky traps) placed using a grid and a diagonal method. The study surveyed phytophagous insects, such as leafhoppers, flies, thrips, and aphids. However, most specimens captured were represented by the natural enemies; Hymenoptera consists of predators (Formicidae) and parasitic wasps (Trichogrammatidae and Scelionidae). The results show that community forests and pioneer lands support the existence of Formicidae. This study indicates that in agroforestry, there are variations in the population of Formicidae based on the period of ongoing land management. Agroforestry provides a more suitable place for the existence of Trichogrammatidae and Scelionidae.

RG2-8

An application of acoustic indices for monitoring seasonal and diurnal diversity of songbirds in Korean forests

Eunjeong Kim[1], Jongbin Go[1] & Chang-Yong Choi[2]

[1]Graduate School of Agriculture and Life Sciences, Seoul National University, Korea, eunjng1017@snu.ac.kr
[2] College of Agriculture and Life Sciences, Seoul National University, Korea, sub95@snu.ac.kr

Abstract

As uniform and quantitative data collection is necessary to identify long-term trends in biodiversity, an approach to measure biodiversity using soundscape has been recently suggested. Therefore, we applied five acoustic indices, ACI, AEI, BI, NDSI, ADI, to examine time series diversity of songbirds during the breeding season in Mt. Jumbong, Korea. In our study, ACI and BI better reflected temporal and regional changes in biodiversity than others. From the changes in those indices from April to June, we confirmed that avian diversity tended to decrease with time showing a sharp decline in June and in the diurnal cycle, diversity was high in 6:00, 13:00 and 19:00. However, we also confirmed that various noises could influence the interpretation and quality of results. Therefore, this study demonstrated great possibilities of applying acoustic indices using soundscape in a temperate forest region, suggesting some consideration as well to minimize effect of background noises.

RG2-9

Assessing Biodiversity Conditions in KHDTK UGM Getas Ngandong: Spatial Modelling and Field Survey Approaches

Muhammad Ali IMRON[1*], Muhammad TAFRICHAN[1,2], Farah Dini RACHMAWATI[1,2], Rahma Ayu NABILA[1,2], Widyatno WIDYATNO[1,2]

[1]Faculty of Forestry, Universitas Gadjah Mada, INDONESIA, maimron@ugm.ac.id
[2]Javan Wildlife Institute, INDONESIA

Abstract

Production forest in Central Java has important roles for ecosystem services for Java island. However, various models showed that the central forest also critical for biodiversity conservation. We conducted biodiversity baselining for a teaching forest of Universitas Gadjah Mada, Kawasan Hutan Dengan Tujuan Khusus (KHDTK) for both flora and fauna. We employed wildlife biodiversity hotspots to determine survey plots in the study area. We applied line transects to survey mammals and herpetofauna; point counts to survey birds; and nested and protocol sampling for vegetation. We performed the Shanon-Wiener diversity index, and species abundance, along with canopy and understory cover analysis following biodiversity hotspot classes. We found there is a gap between predicted and actual diversity in the study area. The KHDTK is divers for birds, followed by herpetofauna and mammals. Vegetation at sapling is the highest among others. Generalist species is predominantly as common species in the ex-teak forest plantation.

Keywords: biodiversity, biodiversity hotspots, bird, mammal, herpetofauna, vegetation, KHDTK Getas Ngandong

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RG2-10

Terrestrial Wildlife in the Universiti Malaysia Sabah Hill Forest, Malaysia

Jephte SOMPUD[1*], Cynthia BOON[2], Carmen ADROS[1], Nurhidayah SAHAR[1], Evelyn RICHARD[1]

[1] Forest Plantation and Agroforestry Program, Faculty of Tropical Forestry, Universiti Malaysia Sabah, 88400, Jalan UMS, Kota Kinabalu Sabah MALAYSIA. e-mail jephte@ums.edu.my

[2] Wildlife Sentinels, No. 25, Kian Hap Industrial Centre, Lorong Durian 3, Jalan Kolombong, Inanam 88450, Sabah MALAYSIA. email bslcynthia@gmail.com

ABSTRACT

The Universiti Malaysia Sabah (UMS) Hill Forest, located at the fringe of the capital of Sabah, is one of the essential green lungs for urban areas. A wildlife survey was conducted using a camera traps survey. The data was analysed using descriptive analysis. Several wildlife species were recorded; one was the Sunda pangolin. This discovery propels UMS as the first University in Malaysia with a critically endangered wildlife in the forest campus. Wise steps must be deliberated to manage and sustain the wildlife in UMS Hill Forest.

RG2-11

Bats' Diversity in Different Landscape Matrices

Azniza Mahyudin[1,7], Nurul Ain Elias[2], Malborn Solynsem[1], Kamlisa Uni Kamlun [1], Juliana Senawi[4], Isham Azahar[5], Nor Aifat A Rahman[1], Ho Qiong Mei[1], Siti Nuriy Syuhada[1], Tan Jia Sin[4], Batrisyia Adzrena Sabri[4], Hairul Hafiz Mahsol[1], Mohamad Zahirul Hoque[6] and Vijay Kumar Subbiah[7]

[1] Faculty of Tropical Forestry, Universiti Malaysia Sabah, Jalan UMS, 88400, Kota Kinabalu, Sabah
[2] School of Biological Sciences, Universiti Sains Malaysia, 11800 Gelugor, Pulau Pinang
[3] Faculty of Science and Natural Resources, [6]Faculty of Medical and Health Sciences, [7] Biotechnology Research Institute Universiti Malaysia Sabah, Jalan UMS, 88400, Kota Kinabalu, Sabah
[4] Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor
[5]Department of Biological Sciences, Texas Tech, 2901 Main St, Lubbock, Texas 79409, United States

Abstract

Bat diversity was substantially negatively impacted by the conversion of forest areas to agricultural landscapes and tourist destinations, which resulted in population decreases and corresponding losses of ecosystem services. Current trends in land-use changes in Sabah also create fragmented forest reserves and conservation areas. By using both primary data from fieldwork by researchers and secondary data from published data, we intend to clarify the composition of bat species across various landscape matrices in Sabah to understand the impact of land-use change on bat diversity. Additionally, we look for species that could be developed as ecosystem indicator species.

This study received financial support through FRGS/1/2019/WAB13/UMS/03/1-15871 from the Malaysian Ministry of Higher Education (MOHE), which awarded to Azniza Mahyudin and Hairul Hafiz Mahsol, Universiti Malaysia Sabah funds, SDK0074-2019 awarded to Vijay Kumar Subbiah and SBK0375-2018 awarded to Azniza Mahyudin and Vijay Kumar Subbiah.

RG2-12

Functional traits of soil nematodes define their response to nitrogen fertilization

Weichen Hou[1], **Yakov Kuzyakov**[2], **Yanwen Qi**[1], **Xiang Liu**[3], **Hui Zhang**[1*] and **Shurong Zhou**[1*]

[1] Key Laboratory of Genetics and Germplasm Innovation of Tropical Special Forest Trees and Ornamental Plants (Hainan University), Ministry of Education, School of Forestry, Hainan University, China,20095400210012@hainanu.edu.cn

[2] Department of Agricultural Soil Science, Department of Soil Science of Temperate Ecosystems, Georg-August University of Göttingen, Germany,Kuzyakov@gwdg.de

[3] State Key Laboratory of Grassland Agro-Ecosystem, Institute of Innovation Ecology, Lanzhou University, China,15538084325@163.com

Abstract

The effects of N fertilization and warming on nematode communities in soil are inconsistent across ecosystems. One key reason may be that the commonly used taxonomic diversity to environmental changes are less sensitive than the seldom used trait-based indicators. To verify this, we collected an extensive dataset consisting of (i) six traits relating to the nematode performance,(ii) the taxonomic richness and abundance of each nematode functional group, and (iii) the total taxonomic richness and abundance of plant, bacterial and fungal feeding communities in an field experiment. N fertilization altered several key nematode behaviors instead of demographic characteristics. So, the functional diversity was the main response to N fertilization, whereas taxonomic diversity remained unaffected. In contrast to N fertilization, warming had no effects on taxonomic and functional diversity. Thus, trait-based indicators are more powerful for predicting nematode behavior, which helps reconcile the debate about environmental effects on nematode communities.

RG2-13

Occurrence and Severity of *Ganoderma* spp. on the trees in Urban Forest of Universitas Gadjah Mada, Yogyakarta Indonesia

Sri RAHAYU[1], Siti Husna NUROCHMAH[1], Dony Satrio UTOMO[1], Dwi Tyaningsih ADRIYANTI[1], Salsa Yumna FARAZIKA[1], Nias Putri Marta NINGKRUM[1]

[1] Silviculture Department, Faculty of Forestry, Universitas Gadjah Mada, Jalan Agro 1 Bulaksumur, Yogyakarta 55281, Indonesia, E-mail: sri.rahayu2013@ugm.ac.id

Abstract

Ganoderma spp. fungus has been attacking the urban trees at UGM. The research aims: to identify the tree species infected by ganoderma, and to evaluate their severity status. Monitoring and data collection were conducted on April, October 2021, and April 2022. Monitoring of Ganoderma was done using the complete survey method across the urban trees of UGM with DBH ≥ 10 cm. The number of Ganoderma basidiocarp on each tree and the foliage condition were used for categorize the status. There was an increased number of infected trees from 68 to 124 trees with 20 and 26 species respectively. Based on the literature review, the 18 species have been reported as Ganoderma hosts, while 8 species including *Barringtonia asiatica, Dimocarpus longan, Handroanthus chrysotrichus, Hura crepitans, Khaya anthoteca, Manilkara kauki, Muntingia calabura,* and *Stelecchocarpus burahol* were to be the first report. The severity status was range from low to very severe.

Key words: ganoderma, Universitas Gadjah Mada, urban trees, *Manilkara kaukii*, severity

RG2-14

Long-term directional changes in hemiboreal mixed forests in the University of Tokyo Hokkaido forest

Satoshi SUZUKI

[1]The University of Tokyo Hokkaido Forest, the University of Tokyo, JAPAN,
s-suzuki@uf.a.u-tokyo.ac.jp

Abstract

Under current climate warming, forest tree communities are expected to show shift upward along an elevation gradient. To test this prediction, I analysed data from long-term permanent plots, where trees had been measured since 1960s or 1970s, along an elevation gradient between 480-1290 m in the Maeyama reserved forest in the University of Tokyo Hokkaido Forest. The expected result is that relative dominance of deciduous broadleaves (DBs) will increase at lower elevation but decrease at higher elevation because relative dominance of DBs is large at low and high elevation and smallest at mid-elevation around 800 m a.s.l. in the study site. However, the observed results showed unexpected changes; relative dominance of DBs increased in all elevations. This suggest that some environmental changes other than climate warming have contributed to the increase of DBs.

RG2-15

What causes the spatial distribution of the four forest communities in South Korea?

Seunguk KIM[1] & Hyeyeong CHOE[1]

[1]Department of Agriculture, Forestry and Bioresources, Seoul National University, REPUBLIC OF KOREA, adrenaline@snu.ac.kr

Abstract

Plant distribution patterns are the basis for understanding the forest ecosystems, so many researchers are seeking proactive conservation measures by understanding them. We identified four distinct forest communities in South Korea and assessed the impacts of environmental factors on vegetation patterns. We applied c-means clustering to convert a forest type map into a forest community map. We then analysed the relationship between bioclimatic variables, terrain properties, and species richness and vegetation distribution. We found that South Korean forests can be classified into four clusters, each with a predominant tree species: *Quercus* species, *Pinus densiflora, Pinus thunbergii*, and other broadleaved tree species. Summer precipitation and winter temperature were the primary climatic factors that restricted the range and altitude of vegetation types, while high-altitude and north-facing areas had relatively higher species richness than lower and south-facing areas. Anthropogenic activities may be responsible for the decline of the species number in lowlands.

RG2-16

Biodiversity of Jewel Orchid from Crocker Range Park, Sabah

Siti Fatimah MD.-ISA[1], Matelda De Avesha SUDIN[1], Vanielie Terrance JUSTINE & Nor Azizun RUSDI[3]
[1]Faculty of Tropical Forestry, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, MALAYSIA, sitifatimahmdisa@ums.edu.my and mateldasudin@gmail.com
[2]Kinabalu Park P.O. Box 6, 89308 Kundasang, Ranau, Sabah, MALAYSIA, vanielie90@gmail.com
[3]Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, MALAYSIA, azizun@ums.edu.my

Abstract

Sabah is well known for its diversity richness and is home to various species of orchids worldwide, including jewel orchids. Crocker Range Park is one of the diversity hotspots in Sabah, with a long history of scientific studies covering many aspects, including the studies of orchids. Members of the subtribe Goodyerinae, mostly known as the "jewel orchid," are highly recognised due to their foliage. Opportunistic sampling method was used in this study due to the scattered location of the species. Eight genera and ten species of jewel orchid have been recorded and three endemic species were also found in Crocker Range Park, including *Anoectochilus monicae*, *Goodyera condensate* and *Goodyera rostellata.* The vegetation of jewel orchids in the park is influenced by the pristine condition of the park. However, the status of these jewel orchids is still unidentified and may threaten their population.

RG2-17

Long-term Ecological Research on Tropical Seasonal Dry Forest Dynamics During 30 years at Western Thailand

Dokrak MAROD[1], Warong SUKSAVATE[2], Sathid Thinkamphaeng[3], Tomoyuki SAITO[4] & Tohru NAKASHIZUKA[5]

[1]Faculty of Forestry, Kasetsart University, Bangkok 10900, THAILAND, e-mail: dokrak.m@ku.ac.th
[2]Faculty of Forestry, Kasetsart University, Bangkok 10900, THAILAND, e-mail: fforwos@ku.ac.th
[3]Faculty of Forestry, Kasetsart University, Bangkok 10900, THAILAND, e-mail: kawlica_70@hotmail.com
[4]Forestry and Forest Products Research Institute, Tsukuba 300-1244, JAPAN, e-mail: tsaitoh@ffpri.affrc.go.jp
[5]Forestry and Forest Products Research Institute, Tsukuba 300-1244, JAPAN, e-mail: toron@ffpri.affrc.go.jp

Abstract

Climate changes were recognized that caused on biodiversity loss, in particular, increased mass mortality of flora and fauna. This study aimed to clarify the influenced of climate change on tropical seasonal dry forest (TSDF) dynamics during 1992-2022. The results showed the drought condition based on standardized precipitation-evapotranspiration index (SPEI) had occurred every El Niño event (Figure 1A). The net average of recruitment rate for all species had slightly higher than mortality rate (7.12±7.24 and 6.07±2.84 %.y^{-1}, respectively), however, it varied among periods (Figure 1B). Mortality rate had increased almost two times under drought conditions. In contrast, high recruitment rate was also found under drought events., Because the gregarious flowering of bamboo species in 1992-94 and 1998-20, respectively. Large vacant spaces provided to tree species regeneration, including, bamboo itself. Thus, it is not only the climate changes but also the occasional events such as bamboo flowering had influenced on TSDF dynamics.

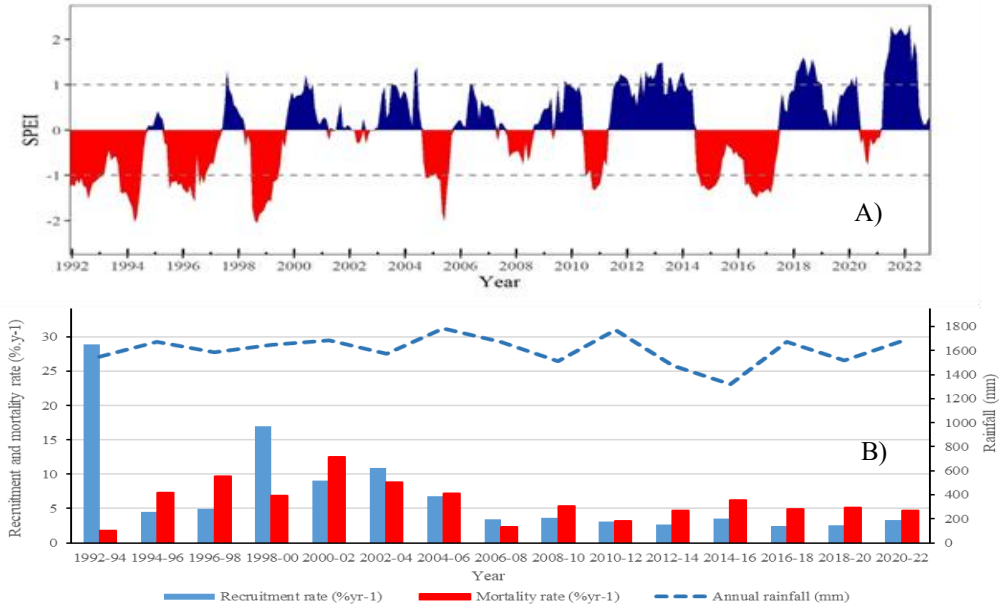

Figure 1 Standardized precipitation-evapotranspiration index, SPEI, (A) and the recruitment and mortality rate (B) of TSDF at western Thailand.

RG2-18

Phylogenetic Approaches on Plant Community Assembly: A Case from the Logged-Over Bornean Tropical Rain Forest of East Kalimantan, Indonesia

Ni Putu Diana MAHAYANI

Faculty of Forestry, Universitas Gadjah Mada, Jalan Agro No. 1 Bulaksumur, Yogyakarta 55281, INDONESIA, diana.mahayani@ugm.ac.id

Abstract

Demographic-based rule is limited for understanding the sequential process of community assemblage. However, phylogenetic diversity and community analyses may provide such a possible approach because it views plant communities as entities composed of species that are linked through their evolutionary history. Phylogenetic approach can differentiate between closely and distantly related species, which, due to phylogenetic conservatism in plant traits and ecological niches, providing an opportunity to determine the underlying functional diversity and community structure. The phylogenetic community assembly of logged-over Bornean Forest marked increase in phylogenetic clustering after 10 years of logging. A small set of closely related short- and long-lived pioneer species, e.g. *Macaranga spp* that established in the canopy gaps after logging likely contributed to the development of phylogenetic clustered communities. Logging can result in replacement of lineages, most likely by the establishment of pioneer species capable of exploiting the increased light availability caused by canopy openings.

RG2-19

Genetic diversity of sandalwood in the Central Zone of Gunung Sewu after land clearing in 2020, and its impact on the offspring quality

Ayudewi PRISKA[1], Avritania S. PUTRI[1], Sapto INDRIOKO[1], Yeni W.N. RATNANINGRUM[1]

[1]Faculty of Forestry, Universitas Gadjah Mada, Yogyakarta, INDONESIA

Abstract

The existence of sandalwood landraces in Gunung Sewu, Yogyakarta, Indonesia, is promising for alternative sources of genetic materials. In Gunung Sewu, landscapes varied with the differences on the formation history of each zone. This research was conducted using isozyme genetic markers and aimed to determine the genetic diversity of sandalwood parents and the offspring in the Bleberan and Giring landraces, in the Central Zone of Gunung Sewu during the 2021/2022 flowering period. The results showed that the proportion of flowering parents in Bleberan was much less (2.7%) than in Giring (23.6%). Giring landrace shows a tendency to maintain genetic diversity from parent to offspring. In contrast, the Bleberan landrace experienced a drastic decrease in genetic diversity. It indicated that Giring landrace could keep the alleles which were rare or missing from the Bleberan landrace. The decrease in genetic diversity is mainly possibly due to logging activities in recent years.

RG2-20

Genetic infusion and soil improvement to support outcrossing and natural regeneration of sandalwood in isolated population in The Western Zone of Gunung Sewu

Anggi Dwi Cahya PUTRI[1], Damas Yittan AWANGGA[1], Ibnu Ahmad RIZAL[1], Sapto INDRIOKO[2] & Yeni Widyana Nurchahyani RATNANINGRUM[3]

[1]Undergraduate School of Faculty of Foresty, Universitas Gadjah Mada, INDONESIA
[2]Forest Tree Improvement Laboratory, Silviculture Department, Faculty of Foresty, Universitas Gadjah Mada, INDONESIA
[3]Forest Seed Technology Laboratory, Silviculture Department, Faculty of Foresty, Universitas Gadjah Mada, INDONESIA

Abstract

Low reproductive success and poor seedling recruitments are a typical of isolated population. The small, isolated sandalwood populations grew in several mountainery areas along The Western Zone of Gunung Sewu. This study was conducted in 2020 to 2022, aimed to improve the genetic diversity and natural regeneration of sandalwood. Genetic diversity and outcrossing rate were improved by genetic infusion using selected genotypes originated from other landraces. Since the lack of seed bed is the main issue, therefore in December 2020, seed bed was prepared by applying cattle dung, legume litters and topsoil onto the rocky soils. In April 2021, the genetic infusion was conducted by planting selected genotypes originated from Gunung Sewu and Sumba Islands. The genetic infusion improved the parental heterozygosity from H_o 0.283 to be H_o 0.470. The soil improvement increased the seedling survival rate (84%) in compared to the untreated sites (35%).

Keywords: genetic infusion, soil improvement, genetic diversity, natural regeneration, sandalwood population in The Western Zone of Gunung Sewu

RG2-21

Fine-root Temporal Dynamics and Longevity in a *Pinus koraiensis* Plantation and a Natural Oak Forest in Taehwa Mountain, Korea

Woojin Huh[1]*, Seohyun Kim[1], Minsu Lee[1], Jeonghyun Hong[1], Siyeon Byeon[1,4], Mega Trishuta Pathiassana[1], Hojin Lee[3], Chanoh Park[1], Tae Kyung Kim[1], Sukyung Kim[1], Hyun Seok Kim[1,2,3]

([1]Department of Agriculture, Forestry and Bioresources, Seoul National University, [2]Research Institute for Agriculture and Life Sciences, [3]Interdisciplinary Program in Agricultural and Forest Meteorology, [4]Department of Forest Bioresources, National Institute of Forest Science)

Fine roots take up about 33% in global terrestrial Net Primary Production (NPP). However, only limited studies are conducted on the fine root phenology of evergreen and deciduous forests. Therefore, this study aimed to quantify temporal fine-root dynamics with non-destructive minirhizotron method, in temperate *Pinus koraiensis* plantations (TCK) and natural oak-dominated broad-leaved forests (TBK) in Taehwa mountain. TCK had bimodal pattern of root production, two peaks in May and October, whereas TBK showed concentrated unimodal pattern, with one peak in June. Annual fine root production showed decreasing trend from 2021 to 2022, TCK from 1.17 to 0.88 mm cm^{-2} $year^{-1}$ and TBK from 3.16 to 1.13 mm cm^{-2} $year^{-1}$, with significant difference in TBK (P=0.031). Fine-root longevity was shorter in TCK than TBK (P<0.001). This study quantified fine root responses of two adjacent forests and is expected to contribute to predicting soil carbon sequestration in the face of climate change.

RG2-22

Phenology :effects of winter-chilling and photoperiod on phenological functional traits and the mid-domain effect in flowering phenology

Xinran Tang[1],Yanjun Du[1*]

[1] Key Laboratory of Genetics and Germplasm Innovation of Tropical Special Forest Trees and Ornamental Plants (Ministry of Education), College of Forestry, Hainan University, Haikou, China

Abstract:

Accurate forecasting of spring plant phenology is critical for understanding structural and functional changes in plant communities and their ecosystems in light of global warming. To date, the relative importance of winter chilling and photoperiod for leaf-out and flowering phenology remains unknown in subtropical and tropical forests. Here, we established a climate chamber experiment to test the effects of photoperiod and chilling on the timing of leaf-out and flowering for 37 subtropical woody species using dormant twigs. We found that most cuttings reached leaf-out, but only a few cuttings reached flowering.

RG2-23

Acaricidal and Insecticidal Activities of Essential Oils and Constituents of *Tasmannia lanceolata* (Poir.) A.C.Sm. (Canellales: Winteraceae) Against *Tetranychus urticae* Koch (Trombidiformes: Tetranychidae) and *Myzus persicae* Sulzer (Hemiptera: Aphididae)

Min-Woo Lee[1], Dong-Ho Lee[1], Jae-Woo Lee[1], Il Nam[1], Min-jung Huh[1] and Il-Kwon Park[1,2]

[1]Department of Agriculture, Forestry and Bioresources, Seoul National University

[2]Research Institute of Agriculture and Life Sciences, Seoul National University

Abstract

The negative side effects of synthetic pesticides have drawn attention to the need for environmentally friendly agents to control arthropod pests. To identify promising candidates as botanical pesticides, we investigated the acaricidal and insecticidal activities of 44 plant-derived essential oils (EOs) against *Tetranychus urticae* Koch and *Myzus persicae* Sulzer. Among the tested EOs, *Tasmannia lanceolata* (Poir.) A.C.Sm. (Tasmanian pepper) essential oil (TPEO) exhibited strong acaricidal and insecticidal activity. Mortality rates of 100% and 71.4% against *T. urticae* and *M. persicae*, respectively, were observed with TPEO at a concentration of 2 mg/ml. Polygodial was determined to be the primary active component after bioassay-guided isolation of TPEO using silica gel open-column chromatography, gas chromatography, and gas chromatography–mass spectrometry. Polygodial demonstrated acaricidal activity against *T. urticae* with mortality rates of 100%, 100%, 61.9%, and 61.6% at concentrations of 1, 0.5, 0.25, and 0.125 mg/ml, respectively. Insecticidal activity against *M. persicae* was also evident, with mortality rates of 88.5%, 85.0%, 46.7%, and 43.3% at respective concentrations of 1, 0.5, 0.25, and 0.125 mg/ml. Insecticidal and acaricidal activities of TPEO were greater than those of Eungjinssag, a commercially available organic agricultural material for controlling mites and aphids in the Republic of Korea. These findings suggest that TPEO is a promising candidate for mites and aphids control.

RG3-1

Forest Restoration Dynamics Based on Natural and Artificial Practices in Lower Montane Forest at Doi Suthep-Pui National Park, Thailand.

Sathid THINKAMPHEANG[1], Warong SUKSAVATE[2] & Dokrak MAROD [3]

[1] Faculty of Forestry, Kasetsart University, Bangkok 10900, THAILAND, e-mail: kawlica_70@hotmail.com
[2]Faculty of Forestry, Kasetsart University, Bangkok 10900, THAILAND, e-mail: fforwos@ku.ac.th
[3] Faculty of Forestry, Kasetsart University, Bangkok 10900, THAILAND, e-mail: dokrak.m@ku.ac.th

Abstract

The restoration ecosystem is needed to be done due to increase of deforestation. This study aimed to monitor the forest recovery in degraded areas based on different restoration practices. A 1-ha permanent plot was established in each practice; natural forest restoration with 17 and 37 year olds (NFR-17y and NFR-37y, respectively), mono-species planting (MNP-31y) and multi-species planting (MUP-31y). The results showed recovery process varied among practices. The highest species diversity was found in the NFR-17 (137 species) and followed by MNP-31-y, NFR-37y, MUP-31y, respectively. The forest dynamics showed that net mean mortality rate had higher than net mean survival rate during 2011-2022 (5.14±0.65 and 3.94±1.12 %.y-[1], respectively), resulting low tree density. MUP had highest similarity index within the lower montane forest and followed by NFR-37y, MNP-31y, and NFR-17. Indicating MUP had high success to induced the original forest structure and needed to concerned as main priority on forest restoration program.

RG3-2

Biomass Estimation of Native Tree Species in a Tropical Dry-mixed Forest of Sri Lanka: Inventory Data from a Recently Initiated Forest Restoration Project

Priyan Perera[1*], Rajitha Rupasinghe[1], Oshan Rathnapala[1] and Kosala Gunawardana[1]
[1]Department of Forestry and Environmental Science, University of Sri Jayewardenepura, Sri Lanka
Correspondence: *priyan@sjp.ac.lk

Tropical Dry-mixed forests accounts for the largest share of natural forest cover in Sri Lanka, representing a significant biomass carbon sink. However, limited studies have attempted to estimate the carbon sequestration capacity of these forests. The University of Sri Jayewardenepura's Carbon Neutral Project is an initiative to estimate the institutional carbon footprint and offset through reforestation. In line with this, a carbon sink in the form of a forest restoration project on a 400-acre area in Wanniyagama, Puttlam District was initiated in 2019. Accordingly, this study assessed the potential of carbon sequestration biomass in climax native tree species used in the restoration process. The assessment was based on a total inventory for woody stems of ≥30 cm height and 10cm stem circumference at 10cm above the ground surface. at ≥ 4.5 cm diameter at breast height (DBH). Aboveground biomass was estimated using allometric equation and aboveground carbon stock was calculated by applying a 0.445 conversion factor to the biomass. The project is further aimed at generating long-term data on growth performance, biomass accumulation and survival of tree species to accurately estimate the carbon sequestration potential and to better understand the growth dynamics.

Key words: biomass, carbon sequestration, dry-mixed forests

RG3-3

Forest structure and aboveground carbon storage of Taliwas River Conservation Area, East Coast Sabah, Malaysia

Elia Godoong[1], Hamzah Tangki[2], Jadda Suhaimi[2] and Waidi Sinun[2]

[1]Faculty of Tropical Forestry, Universiti Malaysia Sabah, Kota Kinabalu
[2]Conservation & Environmental Management Division, Yayasan Sabah, Level 12, Tun Mustapha Tower Yayasan Sabah, Likas Bay P.O.Box 11622,
88400 Kota Kinabalu, Sabah, Malaysia.

Correspondent Author: Elia Godoong, PhD
Email: elia@ums.edu.my

Abstract

Forest provides various type of services and products particularly in mitigating the global warming. The lowland dipterocarp forest appears to be very important functional ecosystem and habitat to various biodiversity. In order to understand more on its ecology, variation of study should be continuously conducted in this forest which partly comprises a unique lowland and ultramafic fores. The objectives of this study are i) to assess the diversity of plant species and ii) to examine the variation of carbon storage in tree species present at the Taliwas River Conservation Area, Sabah, Malaysia. In this study, 46 families with 216 species were documented. Dipterocarpaceae recorded higher number of species (38 species), Euphorbiaceae (17 species) and Malvaceae (17 species), Phyllanthaceae (14 Species), Lauraceae (11 Species) and Rubiaceae (11 Species). *Parashorea malaanonan* (Dipterocarpaceae) is the most dominant species, follow *Hopea beccarian*, *Shorea johorensis*, *Syzygium* sp. (Myrtaceae), *Aglaia* sp. (Meliaceae), *Malottus* sp. (Euphorbiaceae) and *Dipterocarpus caudiferus* (Diptercarpaceae). The study shows Diptercarpaceae trees range from medium sized trees with highest mean of 25 m tall and 33 cm dbh with basal area ranging between 4 to 18 m^2 ha^{-1} indicated that the forest area has been disturbed before and is regenerating naturally. The total Aboveground carbon is also estimated as Mg C ha^{-1} and presented in the paper. Such important forest ecosystem is now considered rare and vulnerable due to increasing pressure of land use conversion for agriculture and settlement nearby. However, the results details result of this study shows, it is worth to protect and conserve the area for a long-term monitoring and manage the natural resources sustainably.

Keywords: Aboveground carbon, selectively logged forests, forest profile, forest management, forest restoration

RG3-4

Preliminary assessment of above ground carbon storage at restored post-fire peat swamp forest

I. Musri*, M. Joeanne, D. Shakillah, M. Allester, A. Azhari, D. Hanif & Andy R.M.

Faculty of Tropical Forestry, Universiti Malaysia Sabah, Jalan UMS, 88400, Kota Kinabalu Sabah, Malaysia

***Corresponding email:** mrieyza@ums.edu.my

Abstract

Peat swamp forests are a type of tropical forest that grows in areas with a lot of rain but little drainage. These forests are known to contain significant amounts of carbon, which is stored in the form of living biomass, dead biomass, and soil organic matter (peat). When a peat swamp forest is degraded or converted to a different land use, such as forest fire or agricultural land, the carbon pools of an ecosystem are drastically reduced. This study intent to estimate the carbon storage at three different area of peat including pristine, restored, and non-restored post-fire areas. Research was conducted at Klias Peat Swamp Field Centre, Beaufort, Sabah, Malaysia. The preliminary results show that actively restored areas serve as the primary carbon store when compared to naturally restored areas. Research discussion will emphasize more on impact of restoration on carbon storage at post-fire peat swamp forest ecosystem.

Keywords: carbon, Peat swamp forest, forest fire, forest restoration, biomass,

RG3-5

Identifying Spatial Variation of Carbon Stock in A Warm Temperate Forest in Central Japan Using Sentinel-2 and Digital Elevation Model Data

Huiqing Pei [1], Toshiaki Owari [2], Satoshi Tsuyuki [1] & Takuya Hiroshima[1]

[1]Department of Global Agricultural Sciences, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan; peihq@g.ecc.u-tokyo.ac.jp; tsuyuki@fr.a.u-tokyo.ac.jp; hiroshim@g.ecc.u-tokyo.ac.jp
[2]The University of Tokyo Hokkaido Forest, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan; owari@g.ecc.u-tokyo.ac.jp

Abstract

The accurate estimation of carbon stocks in natural and plantation forests is a prerequisite for the realization of carbon peaking and neutrality. In this study, the potential of optical Sentinel-2A data and a digital elevation model (DEM) in estimate the spatial variation of carbon stocks was investigated in a mountainous warm temperate region in central Japan. Four types of image preprocessing techniques and datasets were used: spectral reflectance, DEM-based topography indices, vegetation indices, and spectral band-based textures. A random forest model combined with 103 field plots as well as remote sensing image parameters were applied to predict and map the 2160-ha University of Tokyo Chiba Forest. Structural equation modeling was used to evaluate the factors driving the spatial distribution of forest carbon stocks. Our study shows that Sentinel-2A data in combination with topography indices, vegetation indices, and shortwave-infrared (SWIR)-band-based textures resulted in the highest estimation accuracy. The spatial distribution of carbon stocks was successfully mapped and stand age- and forest type-level variations were identified. SWIR-2-band and topography indices were the most important variables for modeling, while forest stand age and curvature were the most important determinants of the spatial distribution of carbon stock density. These findings will contribute to more accurate mapping of carbon stocks and improved quantification in different forest types and stand ages.

Keywords: forest carbon stock; remote sensing imagery; carbon density by stand age and forest type, structural equation model.

RG3-6

Taiwania cryptomerioides: a potential species for fast Carbon sequestration

Chieh-Ting WANG[1], Yung-Chih CHEN[1] , Hong-Chyi JHOU[1] & Ming-Jer TSAI[1]

[1]The Experimental Forest, National Taiwan University, TAIWAN

Abstract

Taiwania cryptomerioides is one of the most valuable timber species in Taiwan. In natural forests, Taiwania trees 50 meters tall and one meter in diameter are common. With a dominant central stem, the species is known for its high timber recovery rate for saw logs. Its fine-grained wood is easy to process and is suitable for high value products. This species is also very productive; it can sustain over 1 cm diameter growth past age 40 and produces over 600 m3/ha at age 40. Silviculture treatments such as space control can give rise to more volume and a higher percentage of large-diameter trees. It has been a major species for planting with over 6,440 ha of plantations in Taiwan. We compared different ages plantations of Taiwania to estimate its capacity to sequestrate carbon and data showed that it can be a great species for fast carbon sequestration.

RG3-7

Biomass Productivity of Gliricidia sepium (Jacq) Steud for Energy

Tomy LISTYANTO[1,2], Ekrar WINATA[2] & Erlangga ABDULLAH[3]

[1]Faculty of Forestry, Universitas Gadjah Mada , INDONESIA,
tomy.listyanto@gadjahmada.edu
[2]Pusat Studi Energi, Universitas Gadjah Mada, INDONESIA,
ekrarwinata@mail.ugm.ac.id
[3]Perhutani Forest Institute, INDONESIA, erlangga.abdillah.jhe@gmail.com

Abstract
The objective was to investigate the productivity of Gliricidia sepium (Jacq) Steud biomass in different seasons. Biomass productivity was calculated by the measuring diameter and weight of the trees. A plot area of 0.1 ha was established as a sampling unit to measure dimeter of the stem at 30 cm above the ground. Five trees that represent the variation and distribution of the diameter were cut. The stems were bucked and scaled. A formula for the relationship between diameter and weight was determined. The selected formula was used to estimate the productivity of biomass in the area based on the sampling unit. The result showed that the dry-mass biomass productivity of trees between dry and wet seasions was similar. The difference of green weight was due to a different green moisture content that different between the wet and dry season.

RG3-8

Stand structure and growth of a 115-year-old Japanese larch plantation in the University of Tokyo Hokkaido Forest

Toshiaki OWARI[1], Masaki MATSUI[1], Noriyuki KIMURA[1], Nozomi OIKAWA[1] & Jeyavanan KARTHIGESU[2]

[1]The University of Tokyo Hokkaido Forest, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, owari@g.eccc.u-tokyo.ac.jp; matsuima@uf.a.u-tokyo.ac.jp; kim@uf.a.u-tokyo.ac.jp; nozomi@uf.a.u-tokyo.ac.jp
[2]Department of Global Agricultural Sciences, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, karthigesu-jeyavanan543@g.ecc.u-tokyo.ac.jp

Abstract

Japanese larch (*Larix kaempferi* (Lamb.) Carrière) is a major but non-native plantation species in Hokkaido, northern Japan. Due to its relatively short planting history, data on the stand and growth parameters of old larch plantations is scarce in the region. The University of Tokyo Hokkaido Forest (UTHF) has one of the oldest larch plantations in Hokkaido, planted in 1908. We examined the stand structure and growth process of the larch plantation 115 years after planting. A total of 134 planted larch trees in 1.02 ha were measured twice in 2007 and 2022. At 115 years of age, mean DBH and mean tree height were 60.7 cm, and 35.2 m, respectively. DBH and tree height increased steadily in the last fifteen years, while tree height growth was partly suppressed probably due to snow damage. We also estimated the stand parameters of the larch plantation using unmanned aerial vehicle photogrammetry.

RG3-9

Monitoring of natural broadleaved forests on Taehwa University Forests from 2012-2022

Kwang Hyun NAM[1*], Pil Sun PARK[1]

[1]Department of Agriculture, Forestry and Bioresources, Seoul National University, REPUBLIC OF KOREA, iost0712@snu.ac.kr

Abstract

Long-term monitoring has been conducted to understand changes in tree species composition and forest structure in a secondary broadleaved forest in Taehwa University Forest. Four permanent plots (20m x 20m) were established for stand inventory, and annual monitoring was conducted on tree species, diameter at breast height (DBH), and tree demographics (death and ingrowth). The forest structure was analyzed with DBH distribution, and basal area. The importance value (IV) of each species and diversity indices were also calculated to assess changes in species composition. The dominant species were *Quercus mongolica* and *Castanea crenata*. The DBH distribution was a reverse J-shaped. The findings provide insights into changes in temperate secondary broadleaved forest, contributing to the knowledge and management of natural broadleaved forests in the central region of the Korean peninsula.

RG3-10

The growth performance of 28-month old *Terminalia subspathulata* King under silviculture treatments in an enrichment planting in Sabah, Malaysia

Mandy MAID[1], Ade Esah Azzahra JOBIN[1], Julius KODOH[1], Jephte SOMPUD[1], Paul LIAU[2] & Darrysie SALAPAN[2]

[1] Faculty of Tropical Foresty, University Malaysia Sabah, MALAYSIA, mandy21@ums.edu.my
[2] KTS Plantation Sdn Bhd, MALAYSIA, ktsplantation@gmail.com

Abstract

Terminalia subspathulata King is an introduced fast-growing tree species planted in silviculture trials in degraded forests in Segaliud Lokan Forest Reserve, Sandakan, Malaysia. The study assessed the survival and growth performance of *T. subspathulata* under different spacing and fertiliser treatments in moderately and severely degraded areas, and to determine the relationship between meteorological data and growth performance. A Randomised Complete Block Design trial with three block replicates (spacing and fertiliser) was established on severely and moderately degraded forest sites. The height, DBH and live crown ratio and meteorological data were analysed 28 months after planting using descriptive analysis, ANOVA and Pearson Correlation. *Terminalia subspathulata* that were planted in severely degraded forest showed the highest height (433.85 cm), DBH (68.19 mm), and live crown ratio (73.31 %) in the 4 m x 4 m spacing and ERP 125 g with NPC 50 g fertilisers. *Terminalia subspathulata* perform better under area with no canopy cover.

RG3-11

Growth and Physiological Characteristics of *Avicennia marina* plantation with different densities in Taman Pesisir Mangrove Conservation Area, Bantul, Yogyakarta

Hajar Utami Putri SYAURI[1], **Dwi Tyaningsih ADRIYANTI**[2] & **Eny FARIDAH**[2*]

[1]Faculty of Forestry, University of Gadjah Mada, INDONESIA,
[2]Department of Silviculture, Faculty of Forestry, University of Gadjah Mada, INDONESIA
[2]Department of Silviculture, Faculty of Forestry, University of Gadjah Mada, INDONESIA, [*]enyfaridah@ugm.ac.id

To rehabilitate Baros coast, Taman Pesisir Mangrove Conservation Area was developed in Bantul by planting 10 Ha *Avicennia marina* in 2003. However, each year parts of the areas are damaged due to natural phenomena e.g. tidal floods, leaving *A. marina* growing in different densities. The study aims to determine the effect of density on the growth and physiological characteristics of *A. marina*. Three circular plots (14m diameter) were established in each stand groups (close, medium, sparse) and growth parameters were measured, together with Specific Leaf Area, leaf Nitrogen content, and physical and chemical soil analyses. ANOVA results showed that close *A. marina* tended to grow better morphologically and physiologically, while soil analyses did not different significantly. The possible cause for denser and better growth of *A. marina* is the plot position related to fresh water inlet, demanding a better area management for future rehabilitation activities.

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Note: The first author is Syauri HUP, the presenter is Faridah E

RG3-12

Effect of Silvicultural Treatment to Increase Growth and Wood Quality of Clonal Teak Plantation

Widiyatno[1], Gama Widya Seta[1], Rika Bela Rahmawati[1], Fanny Hidayati[1], Suryo Hardiwinoto[1], Budiadi[1], Aris Wibowo[2], Moh. Na'iem[1]

[1]Faculty of Forestry, Universitas Gadjah Mada, INDONESIA,
[2]Department of Research and Innovation of Perhutani Forestry Institute, INDONESIA
corresponding author: widiyatno@ugm.ac.id

Abstract

Teak is the most dominated tree in the forest plantation of lowland tropical forest in the Java Island. The tree improvement of teak in Indonesia was conducted through the selection of over 680 plus trees to establish the progeny and clonal test producing the best clone to establish clonal teak plantations. The silvicultural treatments could be applied to produce the high productivity clonal teak plantation i.e., spacing and thinning. The wider spacing increases diameter, crown, and root density due to lower tree density and competition index among individual. However, wider spacing decreases height, bole height, and volume per ha of clonal teak. On the other hand, thinning would increase diameter and the economic value of the remnant tree. However, spacing and thinning don't effect on physical and mechanical properties of clonal teak wood. It suggests that spacing and thinning as a silvicultural treatment could be applied to increase productivity and sustainability of clonal teak plantation.

RG3-13

Monitoring changes at riparian areas affected by earthquake-induced landslides using Unmanned Aerial Vehicle (UAV)

Lee Ting CHAI[1], Mui-How PHUA[1] & Wilson Vun Chiong WONG[1], Kamlisa Uni KAMLUN[1]

[1]Faculty of Tropical Forestry, Universiti Malaysia Sabah, MALAYSIA, c.leeting272@gmail.com

Abstract

The rapid development of Unmanned Aerial Vehicle (UAV) based photogrammetry enables the creation of real-time high resolution topographic data to monitor the spatial and temporal changes in a particular region. On 5th June 2015, an earthquake with a moment magnitude (Mw) of 6.0 hit Ranau, Sabah Malaysia which led to intense ground shaking and caused significant damage to the environment in the epicentral and surrounding regions. Widespread of rockfalls and landslides were triggered around the UNESCO World Heritage Site, Mt. Kinabalu slopes from the mainshock and a series of aftershocks. After the destructive disaster, a remarkable number of loose materials and debris were washed into the river systems during heavy rain and banked up at the riverbed. The most significant land cover change was the formation of bars along the river channel. Thus, a detailed land cover spatial-temporal change due to the destructive disaster is crucial for effective ecosystem monitoring, land use planning, and management.

RG3-14

The Effect of Storage Temperature on Honey Physicochemical Properties of *Apis dorsata* and Evaluation on Farmer Group for Honey Productivity

Mega Trishuta Pathiassana[123*], Nila Adelina Saputri[1], Nuriman[1], Nurul Gaibi[1], Kim Hyun Seok[345*]

[1]Department of Agroindustrial Technology, Sumbawa University of Technology, Indonesia

[2]Department of Natural Resource Conservation, Sumbawa University of Technology, Indonesia

[3]Department of Agriculture, Forestry, and Bioresources, Seoul National University, South Korea

[4]Research Institute for Agriculture and Life Sciences, South Korea

[5]Interdisciplinary Program in Agricultural and Forest Meteorology, Seoul National University, South Korea

*) 202233528@snu.ac.kr/cameroncrazies@snu.ac.kr

Abstract

Sumbawa is a region in Indonesia which is famous for producing forest honey produced by *Apis dorsata* bees. However, study on the forest honey is still limited. This study aims to analyze the honey properties, such as pH value, sugar, moisture, ash content, and color, including the effect of temperature on viscosity and density. Other side, it also measured the perception of honey farmers on the role of their association. The research results showed a pH value 3.44; total sugar content 68^{o}brix; water content 32%; and ash content 0.4%. Meanwhile, color testing presented a value of L*>50 (bright color) at various temperature treatments: 5^{o}C, 26^{o}C, and 35^{o}C. The best temperature for honey storage was 5^{o}C compared to other temperature treatments on the density value (1.48 g/m^{3}) and viscosity value (1.38 poise). At last, the role of honey farmer association had reached 3 indicators issued by Indonesian Ministry of Agriculture optimally.

Keywords: honey properties, forest, apis dorsata, farmer association, productivity

RG3-15

Comprehensive Evaluation and Ecological Restoration Strategy of Tourism-oriented Rural Landscape: A case study of Zahan Village, Qiongzhong County, Hainan Province

Juan LUO[1], Guoji FU[2]

[1]College of Forestry, Hainan University, CHINA, 993956@hainanu.edu.cn
[2]School of Tourism, Hainan University, CHINA, fuguoji_570818@163.com

Abstract

Taking tourism-oriented rural landscape in China as the research object, the research on the systematic analysis, comprehensive evaluation and ecological restoration was implemented. Firstly, the composition, relationship, evolution law and driving mechanism of tourism-oriented rural landscape elements were analyzed based on the system science method. Secondly, according to the screening principle and basis of landscape comprehensive evaluation indicators, through the use of various methods such as questionnaire survey, entropy value, analytic hierarchy process, fuzzy mathematics, etc., the indicator system and model of tourism-oriented landscape comprehensive evaluation were constructed. Moreover, the current ecological restoration model was analyzed, the theoretical basis of a tourism-oriented rural landscape ecosystem was established, the ecological restoration model with a multi-level system was proposed, and the ecological restoration strategies and technologies were provided. Finally, taking Zahan Village, Hainan Province as a case, the relevant empirical researches were carried out to propose targeted ecological restoration strategies and measures.

RG3-16

Fire Severity and Vegetation Structure in Ex-Burnt Area of Ijen Nature Park

Fiqri Ardiansyah[1]*, Ananto Triyogo[1], Iqbal Nur Kholiq[2]

[1]Faculty of Forestry, Silviculture Department, Universitas Gadjah Mada, INDONESIA
*fiqri.ardiansyah@ugm.ac.id
[2]Undergraduate student of Forestry, Faculty of Forestry, Universitas Gadjah Mada, INDONESIA

Abstract

Wildfires can transform forest structure and its compositions. Ijen Crater Nature Park in East Java is a mountain forest ecosystem that burnt in 2019. This ecosystem dominated by *Casuarina junghuhniana* and having roles in ecotourism. Wildfires burned more than 50% of park's area. Fire damage could trigger invasive plant species and potentially inhibit the natural succession by suppressing native species. This research aims to identify spatial pattern of fire severity in mountain forest ecosystem, and assess the composition and health condition of forest structure after fires. Fires severity analysed using *Normalized Burnt Ratio (NBR)* and vegetation structure analysed using nested sampling method in various severity level. Results shows that this ecosystem dominated with high severity condition, related to slope condition and accessibility. Invasive plant species (IPS) found within the area were *Ageratina riparia,* and *Acacia deccurrens*. The presence of IPS increased by fires severity.

RG3-17

Application of Advanced Genomic Technology to Improve Timber Productivity and Wood Quality of *Shorea platyclados*, a Commercial Timber Species in Southeast Asia

Sawitri[1], Naoki Tani[2,3], Yoshihiko Tsumura[2], Mohammad Na'iem[1], Widiyatno[1], Sapto Indrioko[1], Kentaro Uchiyama[4], Kevin Kit Siong Ng[5], Soon Leong Lee[5]

[1] Faculty of Forestry, Gadjah Mada University, INDONESIA, sawitri_fkt@mail.ugm.ac.id , mnaiem@ugm.ac.id , widiyatno@ugm.ac.id , sindrioko@ugm.ac.id
[2] Faculty of Life and Environmental Sciences, University of Tsukuba, JAPAN, tani.naoki.fu@u.tsukuba.ac.jp , tsumura.yoshihiko.ke@u.tsukuba.ac.jp
[3] Forestry Division, Japan International Research Center for Agricultural Sciences, JAPAN, ntani@affrc.go.jp
[4] Department of Forest Molecular Genetics and Biotechnology, Forestry and Forest Products Research Institute, JAPAN, kruchiyama@affrc.go.jp
[5] Forestry Biotechnology Division, Forest Research Institute Malaysia, MALAYSIA, kevin@frim.gov.my , leesl@frim.gov.my

Abstract

Shorea platyclados is a commercially important timber tree species in Southeast Asia. Its stocks have dramatically declined due to excessive logging, insufficient natural regeneration and slow recovery rate. There are needs to promote enrichment planting and develop effective technique to support its rehabilitation and improve timber production through implementation of GWAS and GS. Plant materials were collected from a half-sib progeny population in Kalimantan, Indonesia. We detected high LD extending up to >145 kb, suggesting that associations between phenotypic traits and markers in LD can be more easily and feasibly detected with GWAS. However, the detection power of single-locus GWAS seems low, since few SNPs linked to any focal traits were detected, indicating that the species' phenotypic traits are under polygenic quantitative control. A multi-locus GWAS model successfully identified 18 significant QTNs, which potentially utilized as the hotspot region for fine mapping and candidate gene analysis. Machine Learning method provided higher prediction accuracies than Bayesian methods. Stem diameter, branch diameter ratio and wood density were more predictable than height, clear bole, branch angle and wood stiffness traits. Predictive model used to predict the phenotypic value of selection candidates without phenotyping in the next generation. By selecting some top ranked GEBV seedlings, breeders can apply higher selection intensity among juveniles. This strategy will help forest tree breeders to reduce generation interval to gain full advantage of the early availability of GEBV in shorter cycle. Some factors may affect the genomic prediction accuracy, such as statistical methods, training population set, marker density and kinship relatedness. Our study suggested that GS had potential for improving the timber productivity and wood quality of *S. platyclados*, and our genomic heritability estimates may improve the selection of traits for future breeding.

Keywords: *Shorea platyclados*, GWAS, GS, genomic prediction, growth, wood quality traits

RG3-18

In-situ Assessments of Wood Density Variability in Tropical Forest Trees of Southwest Sabah using Resistograph Technology

Jacqueline JOSEPH[1,2], Alexius KOROM[2], Rhema Debully MARIPA[1], Wilson Wong VUN CHIONG[1] & Phua MUI HOW[1]

[1]Faculty of Tropical Forestry, Universiti Malaysia Sabah, Jalan UMS, 88400, Kota Kinabalu, Sabah, MALAYSIA, jacquelinejoseph.ums@gmail.com
[1]Faculty of Tropical Forestry, Universiti Malaysia Sabah, Jalan UMS, 88400, Kota Kinabalu, Sabah, MALAYSIA, rhema@ums.edu.my
[1]Faculty of Tropical Forestry, Universiti Malaysia Sabah, Jalan UMS, 88400, Kota Kinabalu, Sabah, MALAYSIA, w.wilson@ums.edu.my
[1]Faculty of Tropical Forestry, Universiti Malaysia Sabah, Jalan UMS, 88400, Kota Kinabalu, Sabah, MALAYSIA, pmh@ums.edu.my
[2]Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA UiTM Sabah Branch, Kota Kinabalu Campus, Locked Bag 71, 889997 Kota Kinabalu, Sabah, MALAYSIA, jacqueline@uitm.edu.my
[2]Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA UiTM Sabah Branch, Kota Kinabalu Campus, Locked Bag 71, 889997 Kota Kinabalu, Sabah, MALAYSIA, alexi502@uitm.edu.my

Abstract

Wood density (WD) variability has been recognized as a crucial factor affecting forest carbon stock assessment. This study aimed to examine the influence of WD variability on carbon stock estimation. We used a database of 36 existing inventoried plots in Southwest Sabah with WD values derived from the global WD database. We also collected data from the same plots where WD was measured in the field using Resistograph variables. We compared the two datasets to determine the extent of variability in WD and how it affects carbon stock estimates. Our results indicate that there is significant variability in WD between the two datasets. The WD derived from Resistograph-variables was consistently lower than the values in the derived database, indicating the field measurements may underestimate carbon stocks. Overall, our study highlights the importance of considering WD variability in carbon stock assessments and has important implications for forest management.

RG3-19

Anatomical and mechanical properties of the Highland 30 year-old Pine Tree in Northern Thailand.

Theerat ARDSAMANG[1], Trairat NEIMSUWAN[1] & Siriluk SUKJAROEN[2]

[1] Department of Forest products, Faculty of Forestry, Kasetsart University, THAILAND, ffortra@ku.ac.th
[2]Program in Forest Industry Technology, Maejo University, Phrae Campus, THAIALND

Abstract

The anatomical characteristics of softwood is typically complicated as their have similar wood structure. The purpose of this research was to determine anatomical properties of each highland pine wood in Thailand and to correlate the effect of anatomical properties with their physical and mechanical properties. The highland pine species have the indigenous species, Merkus pine (*Pinus merkusii*) and Khasi pine (*Pinus kasiya*) and the exotic species are Caribbean pine (*Pinus caribaea*), Oocarpa pine (*Pinus oocarpa)* and Tecunuman pine (*Pinus tecunumanii*). The variation of species in wood density, fiber length, cross-field pitting, ray height and resin canals were established the correlations that could be used identify the differences between species of five pine species. The anatomical and mechanical properties have significantly high relationship such as wood density with mostly mechanical properties whereas some properties have moderate relationship such as fiber width, radial canals diameter and cross-field pitting.

RG3-20

Studies on *Acacia mangium* Polyol and its Application as Polyurethane Products

Ismawati PALLE[1], Naruhito HORI[2] and Akio TAKEMURA[2]

[1]Faculty of Tropical Forestry, Universiti Malaysia Sabah, Jalan UMS, 88460 Kota Kinabalu, Sabah, MALAYSIA, isspalle@ums.edu.my
[2]The University of Tokyo, Yayoi, Bunkyo-Ku, Tokyo, 113-8657, JAPAN, anahori@icloud.com, akiot@mail.ecc.u-tokyo.ac.jp

Abstract

This research focuses on wood liquefaction development from *Acacia mangium* wood and its potential applications as polyurethane products. The optimization of polyol from *A.mangium (AM)* is the main focus where the minimization of the insoluble residue has been selected as the main criterion against the function of reaction time, temperature and the blending of solvents. The *AM* polyol produced then were co-polymerized with pMDI through the solution casting method for producing *AM* polyurethane films at different isocyanate index. The rigid *AM* polyurethane foams were also prepared which comprising of *AM* polyol, catalyst, blowing agent (water), surfactant and pMDI where *AM* polyol residue were integrated and had acted as the filler. Results from the experiments carried out by this study show that about 75% of *AM* polyol were produced at 150 °C in 150 minutes with a PEG400/glycerol ratio of 80/20 in the presence of 3% sulfuric acid. The formation of urethane in *AM* polyurethane film which located at 1730 cm^{-1} is confirmed by FTIR spectroscopy. The prolonged heat shows to enhance the tensile strength properties of *AM* polyurethane films which finally resulted in low sol fraction. The incorporation with residue in *AM* polyurethane foam formation certainly led to high density, high thermal stability and high crosslinking density with low elasticity. Increasing isocyanate index, water loading, catalyst and surfactant have had extensive impacts on the *AM* polyurethane foam mechanical properties where the density and compression modulus reduced considerably whilst crosslinking density intensified.

P-1

Effects of pre-commercial thinning on runoff characteristics in a dense Japanese cypress plantation

Ibtisam Binti MOHD GHAUS[1], Nobuaki TANAKA[2,3], Takanori SATO[2,4], Yuya OTANI[5], Moein FARAHNAK[5], Anand NAINAR[2,6], Koichiro KURAJI[2,7], Mie GOMYO[2].

[1]Laboratory of Forest and Water Resources Management, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, ibtisam-ghaus@g.ecc.u-tokyo.ac.jp
[2]Former Affiliation: Ecohydrology Research Institute, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, Gomyo_mie@yahoo.co.jp
[3]The University of Tokyo Hokkaido Forest, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, tnk-nobu@g.ecc.u-tokyo.ac.jp
[4]Faculty of Regional Environment Science, Tokyo University of Agriculture, JAPAN, ts207920@nodai.ac.jp
[5]Ecohydrology Research Institute, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, yuyaotani@g.ecc.u-tokyo.ac.jp, moein-farahnak@g.ecc.u-tokyo.ac.jp
[6]Faculty of Tropical Forestry, Universiti Malaysia Sabah, MALAYSIA, nainar.sci@gmail.com
[7]Executive Office, The University of Tokyo Forest, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, kurajikoichiro@g.ecc.u-tokyo.ac.jp

Abstract

This study investigated the effects of pre-commercial thinning in a dense Japanese cypress plantation on runoff characteristics using a paired catchment approach. Runoff in two neighbouring catchments has been monitored since 2016. A 40% thinning in terms of stand density was conducted in 2020 in treatment catchment (A-1) by forest workers using chainsaw and logs were placed parallel to the contour lines. The other catchment (A-2) was left as control. Mean annual runoff yield for A-1 has increased up to 90.5 mm after thinning. After thinning, runoff at the start of a storm event has increased in A-1 whereas peak runoff increased in A-1 for large storms only. Considering results from plot-scale hydrological process experiments in the same site, we could attribute the runoff changes to after-thinning reductions in both canopy interception and overland flow.

P-2

Title: Analysis of the radial profile of sap flow in Japanese cedar trees

Author: Wei-Ling Chen, NTU

Advisor: Taro Nakai, NTU

Abstract

Granier's thermal dissipation (TD) method has been widely used to estimate transpiration. Still, previous studies have reported uncertainties in the TD method due to ignorance of the factors, resulting in inaccurate sap flux density (F_d). One of the factors that have contributed to inaccurate estimation is radial variation. The goal of this study was to review the previous work focused on the radial effect and assess the radial profile of sap flux density (F_d) by using handmade modified TD sensors. Our findings suggested that F_d might differ between trees at various depths. As a result, we concluded that taking radial variation into account may improve the accuracy of transpiration calculation. We intend to correlate the results with previous TD data to compile long-term transpiration data at Xitou.

Keywords: thermal dissipation method; transpiration; radial profile

P-3

Diversity of soil fungal communities associated with *Betula ermanii* in five transplanted sites

AYE MYAT MYAT PAING[1], Nobuhiko SHIGYO[2], Yoshihiko TSUMURA[3], Masahiro TAKAGI[4], Yoko HISAMOTO[5], Susumu GOTO[6]

[1, 2, 5, 6]Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, [1]paing@uf.a.u-tokyo.ac.jp; [5]hisamoto@uf.a.u-tokyo.ac.jp; [6]gotos@uf.a.u-tokyo.ac.jp,
[2]Forestry and Forest Products Research Institute, JAPAN, [2]nishigyo@ffpri.affrc.go.jp
[3]Faculty of Life and Environmental Sciences, University of Tsukuba, JAPAN, [3]tsumura.yoshihiko.ke@u.tsukuba.ac.jp
[4]Faculty of Agriculture, University of Miyazaki, JAPAN, [4]mtakagi@cc.miyazaki-u.ac.jp

Abstract

Global warming is predicted to reduce the resilience of forest ecosystems as plant species migrate northward and upward resulting in species range shifts. Both abiotic and biotic factors can influence migration and adaptation of plant species, but the roles of soil fungal communities have been poorly explored. Here, we investigated soil fungal communities associated with *Betula ermanii* in five planting sites of different environments using DNA metabarcoding. Soil fungal communities varied significantly among sites. *Sphaerobolus ingoldii* was the predominant species in Nayoro, the coldest site whereas *Umbelopsis dimorpha* was the predominant species in Tano, the warmest site. *Tomentella ellisii* was the most commonly found species in all sites. Soil fungal communities showed significant relationships with growth, leaf area, climate conditions, and soil properties. Smaller leaf areas had a higher proportion of ectomycorrhizal taxa (e.g., Inocybaceae), while larger leaf areas had a higher proportion of potentially plant pathogenic taxa (e.g., Nectriaceae).

P-4

Macro fungi in Urban Forest of Universitas Gadjah Mada and Their Potential Uses as Medicinal Fungi

Galuh ANGGARA[1], Sri RAHAYU[2] & Handojo Hadi NURJANTO[3]

[1]Faculty of Forestry Universitas Gadjah Mada, INDONESIA,
anggigaluh92@gmail.com
[2]Faculty of Forestry Universitas Gadjah Mada, INDONESIA,
sri.rahayu2013@ugm.ac.id
[3]Faculty of Forestry Universitas Gadjah Mada, INDONESIA, hhnurjanto@ugm.ac.id

Abstract

Macro fungi are important ecosystem component, containing carbohydrates, fibers, proteins, vitamins, and have enormous medicinal purposes. Earlier study on Lawu Mountain found that macro fungi can become alternative source of healthy food to increase human immunity. Another report found macro fungi growing in urban forest of UGM, but studies on their medical benefits have not been conducted yet. This research aimed to understand macro fungi which has medicinal fungi potential in urban forest of UGM. Literature review was done to identify the medicinal potential of macro fungi in urban forest of UGM. The result shows 15 fungus in urban forest of UGM can be natural source of medicine, Agaricus, Auricularia, Ganoderma, Mycena, Earliella, Microporus, Poria, Pycnoporus, Trametes, Schizophyllum, Stereum, Tremella, Pleurotus, Tricholoma, and Xylaria. This information indicates that UGM can become source of medicinal macro fungi which can be developed as source of high-quality fungal genetics through pharmaceutical research.

P-5

Characterization and Pathogenicity Evaluation of *Ceratocystis* spp. Isolates from Different Tree Hosts to *Acacia crassicarpa*

Eva LUTFIANA[1] & Sri RAHAYU[1]

[1]Faculty of Forestry, Universitas Gadjah Mada, INDONESIA,
eva.lutfiana@mail.ugm.ac.id

Abstract

Due to the efficiency of industrial processing, *Acacia crassicarpa* has been widely developed in plantations as an alternative to *A.mangium*. *Ceratocystis* spp. has been reported to massively infect woody plants causing yield losses, and significant financial failures. This study was to describe the morphology and evaluate the pathogenicity levels of Ceratocystis isolates to *A.crassicarpa*. The research was conducted in the Laboratory of Forest Health and Protection, UGM Indonesia. Four-month-old *A.crassicarpa* seedlings were artificially inoculated with Ceratocystis isolates from *A.crassicarpa*, *A.mangium*, *Eucalyptus* spp., and *Lansium* spp. host using the CRD with 8 isolates and 4 replication. Based on their morphology, isolates from *Eucalyptus* spp. and *A.crassicarpa* host had slimmer in conidia's size than other isolates. Based on the percentage of seedling mortality and the lesion length, the two isolates are also the most pathogenic and will be used to further screen the tolerance of *A.crassicarpa* clones against the Ceratocystis fungus.

Keyword: *Ceratocystis* spp., *A.crassicarpa,* characterization, pathogenicity

P-6

DISEASE OF STEM AND LEAVES ON EUCALYPTUS HYBRID *E. pellita x E. urophylla* AT WANAGAMA EDUCATIONAL FOREST

Bayu Anggita WIRABUMI[1], Ananto TRIYOGO[1] & Sapto INDRIOKO[1]

[1]Faculty of Forestry, UGM, INDONESIA

Abstract

The aim of this research is to find out the symptoms of stem and leaves disease in *Eucalyptus pellita x E. urophylla* plantation; the dominant disease in the plantation; disease incidence and severity; the most resistant family to disease. The study conducted in plot 18 Wanagama Forest. There are 3 types of disease that dominantly found in stem and leaves of Eucalyptus hybrid plantation: stem canker, termites attack, and leaf spots. The data of disease incidence shows that leaf spots is the most widely found disease in this research site. This disease attack almost all of individuals on every family of Eucalyptus. P18U1 is considered as the best family among others. The stand on this family is categorized as moderately damaged, and the resistance level is on somewhat resistant. Moreover, this family is highly resistant to stem canker and resistant to leaf spots.

Keywords: Eucalyptus Hybrid, Stem, Leaves, Disease, Incidence, Severity

P-7

Spatial and Temporal Distribution of *Ganoderma* Sp at Urban Forest Gadjah Mada University

Siti Husna NURROHMAH[1], Sri RAHAYU[2] , Salsa Yumna FARAZIKA[3], Nias Putri Marta NINGKRUM & Dony Satria UTOMO[4]

[1]Student of Magister of Forestry, Universitas Gadjah Mada, INDONESIA, siti_husna_n@yahoo.com
[2]Lecturer of Faculty of Forestry, Universitas Gadjah Mada, INDONESIA, sri.rahayu2013@ugm.ac.id
[3]Student of Bachelor of Forestry, Universitas Gadjah Mada, INDONESIA, salsa.yumna.f@mail.ugm.ac.id
[4]Student of Bachelor of Forestry, Universitas Gadjah Mada, INDONESIA,
[5]Student of Bachelor of Forestry, Universitas Gadjah Mada, INDONESIA , satriodony@gmail.com

Abstract

Universitas Gadjah Mada (UGM) urban forest consists of many species of trees. Some of them have been infected by *Ganoderma* sp.. This study has been carried out to monitor the spatial and temporal distribution of *Ganoderma* sp.. Monitoring were conducted in April 2021, November 2021, and December 2021. Trees indicated symptoms and signs (based on the occurrence of the fruit body and canopy condition) were observed, scored, and marked. The result showed that 60 trees consisting of 20 species have been infected by ganoderma in April 2021, became 79 trees (22 species) in Oktober 2021, and reached 86 trees (24 species) in December 2021. Disease incidence each monitoring were 0,51%, 067%, and 0,73% while disease severity of trees attacked by Ganoderma was 25% to 100% respectivelly. The spatial pattern of trees with ganoderma basidiocarp are clustered. Regular monitoring is required to control and inhibit the spread of ganoderma.

P-8

Soil arthropod diversity in three different land management intensities of Wanagama Forest, Yogyakarta, Indonesia

Arina DAMAYANTI[1], Ananto TRIYOGO[2*] & Musyafa MUSYAFA[3]

[1]Faculty of Forestry, Universitas Gadjah Mada, INDONESIA,
arina.damayanti94@gmail.com
[2]Faculty of Forestry, Universitas Gadjah Mada, INDONESIA, triyogo99@yahoo.com
[3] Faculty of Forestry, Universitas Gadjah Mada, INDONESIA, mus_afa@yahoo.com

Abstract

Information of soil arthropods abundance and diversity is common used as indicator of ecosystem health. The purpose of this study was to investigate how arthropods respond to different management practices such as intensive management land (IM), medium land management (MM), and land without management (NM). Field data was collected for three months using an observation plot, followed by soil and litter samples taken using the monolith method. Pitfall traps and the Berlese-Tullgrenn method were used to collect the soil arthropods from the sample monolith of each plot. As a result, seven dominant taxa of soil arthropods were identified: Collembola, Formicidae, Acari, Araneae, Coleoptera, Gryllidae, and Termitidae. This study found a significant difference in arthropod soil abundance based on land type, with NM, MM, and IM having the highest abundance, respectively. This study shows that differences in land management can have an impact on the abundance and diversity of soil arthropods.

Key words: soil arthropod; land use management; arthropod diversity; pioneer

P-9

Seasonal variations of *Platypus quercivorus* in body size, number of mycangium pits, and quantity of accompanied *Raffaelea quercivora*

Andreas Ade KRISTIAN[1*], Naoto KAMATA[1] & Shuhei TAKEMOTO[1]
[1]Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN
*aa-kristian@g.ecc.u-tokyo.ac.jp

Abstract

Japanese Oak Wilt (JOW) is major forest pest caused by *Raffaelea quercivora–Platypus quercivorus* complex and kills oak trees in Japan. JOW-related mortality occurs only in early flying season of *P. quercivorus*. This study aimed to determine seasonal changes in 1) number of flying beetles-body size-number of mycangium pits; and 2) quantity of *R. quercivora* carried by *P. quercivorus*.

Funnel and sticky traps used to collect *P. quercivorus* in The University of Tokyo Forest (Tanashi, Fuji, and Chiba) during 2021 and 2022. After sortation, 2021 sample dried and weighted. Sample from 2022 used for *R. quercivora* DNA quantification using qPCR.

Data shows conspicuous first peak in early season. Mycangium pits influenced by genetic factors. Meanwhile, body size determined both by genetic and environmental factors. Greater *R. quercivora* quantity also found in early season from both sexes. It is a possible cause of JOW incidence occurred only early in the season.

P-10

Trophic Niche of Three Sympatric Anuran Species in Forest

Su-Yeon LEE[1*], Eun-Jeong KIM[1], Jongbin GO[1], Chang-Yong CHOI[1]

[1]Department of Agriculture, Forestry and Bioresources, Seoul National University, REPUBLIC OF KOREA, babyaxolotl@snu.ac.kr

Abstract

Amphibians are indicators of terrestrial and aquatic ecosystem health and are centered in the trophic network contributing to the energy and nutrition flow in forests. The purpose of this study was to enhance the understanding of the ecological role and population dynamics of the forest structure by confirming the ecological niche of three sympatric anuran species of *Bombina orientalis*, *Rana uenoi*, and *R. huanrenensis* at the forest genetic resource reserve in Mt. Jeombong, Korea. Stable isotope analysis using toe bone tissues confirmed that both nitrogen ($\delta^{15}N$) and carbon stable isotopes ($\delta^{13}C$) values were significantly different between *B. orientalis* and two *Rana* frogs while the trophic niche of two *Rana* frogs was highly overlapped. This result suggests that species with a close lineage relationship may share a similar trophic niche and that the *Bombina* toad maintains a more independent position in the same trophic network. In addition, $\delta^{15}N$ tended to increase as individual body length (snout-vent-length; SVL) increased in all three species, confirming that larger individuals may be in higher trophic level. However, the change in $\delta^{13}C$ by SVL was not consistent over the species, implying that the changes in trophic pathways by growth may be species-specific. This study quantified the relative trophic niche of three sympathric amphibians, and more information may help bridge the current knowledge gap to understanding the nutrient flux by amphibians in the forest ecosystem.

P-11

The Impact of Extreme Climate on Predicting the Distribution of Dominant Plant Associations in South Korea

Jeewoo Shin[1] & Hyeyeong Choe[1]

[1]Department of Forest Sciences, Forestry and Bioresources, Seoul National University, REPUBLIC OF KOREA, jwshin1103@snu.ac.kr

Abstract

Climate works as one of the main factors of vegetation distribution. As the frequency and intensity of extreme climate increase, the need to quantify its impact is rising. We used the decision tree method to compare the influence of average and extreme climates on the distribution of dominant plant associations in South Korea. First, the study site was divided into fix-sized reference grids and the association occupying the largest area within each grid was extracted. Then we proceeded with the learning process of the distribution of vegetation and the abiotic factors, and finally predicted the current status. The models were validated using the overall accuracy and the Kappa coefficient. As a result, the models used with the extreme climate showed higher accuracy. In future studies, we will predict future vegetation distribution more accurately by using additional factors that affect vegetation distribution and improving the resolution issue between data.

P-12

POST-FIRE PEAT SWAMP FOREST COMMUNITY STRUCTURE IN MERANG-NGIRAWAN RIVER PEAT HYDROLOGICAL UNIT, SOUTH SUMATRA

Paskah Eri PERDANA[1], Ni Putu Diana MAHAYANI[2]

[1]Student of Forestry Faculty, Gadjah Mada University, INDONESIA,
paskaheri00@mail.ugm.ac.id
[2]Lecturer of Forestry Faculty, Gadjah Mada University, INDONESIA,
diana.mahayani@ugm.ac.id

Abstract

The peat swamp forests of PT Global Alam Lestari, located in Merang-Ngirawan River PHU were 85% burnt in 2015 which are threaten biodiversity preservation and is to humans. This study aims to identify the development of tree community structure 7 years after fire and its differences from unburnt forest as well as to determine the relationship between environmental condition and tree community structure. Seventy-two nested plots were established covering unburnt forest, burnt forest with natural regeneration, and burnt forest with enrichment planting. The results showed that seedling and non-seedling density in burnt forest with natural regeneration (2,916 seedling/ha and 1,580 trees/ha, respectively) was lower than burnt forest with enrichment (3,437 seedling/ha and 1,259 trees/ha, respectively). However, the species diversity index and the evenness index of burnt forest with natural regeneration (0.59 and 0.54, respectively) was higher than burnt forest with enrichment (0.32 and 0.48, respectively). Environmental variables with significant differences between unburnt and burnt forest were soil pH, soil moisture, and light intensity. These environmental variables were significantly affected by the tree community structures.

Keyword: peat swamp forest, forest fire effects, community structure

P-13

Floristic Survey in Dombagaskanda Forest Reserve, Kalutara District, Sri Lanka.

Jayaratne V.C.P.[1], Singhakumara B.M.P.[1]

[1]Department of Forestry and Environmental Science, Faculty of Applied Science, University of Sri Jayewardenepura, Sri Lanka
balangodasingha@gmail.com

Abstract

Dombagaskanda is a rainforest with an extent of 262 hectares. This work was carried out to study the floristic composition and diversity along the topographic gradient and to record the endemic and threatened plant of the forest reserve. Plots of size 20m×20m, 5m×5m and 1m×1m were laid. A total of 98 species belonging to 55 families and 76 genera were recorded. Out of identified species, 43% are endemic, 57% are indigenous, two species are invasive and one is exotic. According to the relative density values, the most common species is *Horsfieldya iryagedhi* and the most common family is Myristicaceae which is also the most dominant family in all topographic levels. Looking at Shannon's diversity index, there is no significant difference (p value>0.05) in diversity, evenness and dominance in all three topographic levels. The forest is not dominated by Dipterocarpaceae like other wet zone forests and more inclined towards *Vitex-Dillenia-Chaetocarpus-Anisophylla* community.

P-14

THE APPLICATION OF SExI-FS FOR FOREST STRUCTURES AND DYNAMICS ASSESSMENT: A CASE FROM SHADE-GROWN COFFEE AGROFORESTRY AREA IN CENTRAL JAVA

Ryan Adi SATRIA[1], Dennis ALBIHAD[2], Luthfi HANINDITYASARI[3], Ni Putu Diana MAHAYANI[1], Muhammad Reza PAHLEVI[1], Frita Kusuma WARDHANI[1] & Erny POEDJIRAHAJOE[1]

[1]Faculty of Forestry, Universitas Gadjah Mada, INDONESIA, ryan.a.s@ugm.ac.id
[2]Javan Wildlife Institute, INDONESIA
[3]Research Center for Ecology and Ethnobiology, National Research and Innovation Agency, INDONESIA

Abstract

Monitoring forest structure tends to be based on the results of quantitative measurements. However, the results do not always visually reflect the physiognomic conditions. SExI-FS is software that has been developed since 2002 which is able to help researchers to model vegetation growth which is influenced by various factors, such as competition for light, nutrients, growth space, etc. Several studies have used SExI-FS to create forest profile diagrams to visually describe the condition of canopy stratification. The ability to draw accurately and aesthetically which is required in making manual profile diagrams is not owned by everyone, but can be overcome with the help of SExI-FS. However, there are limitations that SExI-FS has not been able to describe in detail, such as branching stems, slanted growing stems, pagoda-shaped crowns, etc. This software is also still unable to provide quantitative information on forest vertical stratification.

P-15

Genomic prediction for growth and wood property in hybrid larch

Shufen Chen[1], Wataru Ishizuka[2], Yamato Unno[3], Kazutaka Kusunoki[4], Kentaro Uchiyama[5], Susumu Goto[6]

[1] Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, shufen@uf.a.u-tokyo.ac.jp
[2] Forestry Research Institute, Hokkaido Research Organization, JAPAN, wataru.ishi@gmail.com
[3] Tsukuba Research Institute Resource Group, SUMITOMO FORESTRY Co., Ltd., JAPAN, unno_yamato@star.sfc.co.jp
[4] Tsukuba Research Institute Resource Group, SUMITOMO FORESTRY Co., Ltd., JAPAN, KUSUNOKI_kazutaka@star.sfc.co.jp
[5] Department of Forest Molecular Genetics and Biotechnology, Forestry and Forest Products Research Institute, JAPAN, kruchiyama@affrc.go.jp
[6] Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN, gotos@uf.a.u-tokyo.ac.jp

Abstract

The half-sib hybrid larch cultivar “Clean-Larch” (*Larix gmelinii* var. *japonica* "Nakashibetsu-5" × *L. kaempferi*) is characterized by rapid juvenile growth and high carbon accumulation ability. Genomic prediction can be employed to accelerate the breeding process and improve growth and wood property traits. In this study, adjusted values by spatial analysis for growth and wood property traits were used as phenotype data. Subsequently, genotype data (27,181 SNPs) combined with phenotype data were used to assess the prediction accuracies and biases of three single-trait GP models incorporating additive and dominance effects. According to the prediction accuracies and biases, the Bayes B model incorporating additive plus dominance effects were more suitable for early selection of hybrid larch.

P-16

HEARTWOOD FORMATION AND ITS RELATIONSHIP WITH BASIC DENSITY AND GREEN MOISTURE CONTENT OF YOUNG *Swietenia mahagoni* (L.) JACQ

Rizki ARISANDI*, Sri Nugroho MARSOEM, Johanes Pramana Gentur SUTAPA & Ganis LUKMANDARU

Department of Forest Product Technology, Faculty of Forestry, Universitas Gadjah Mada, INDONESIA, e-mail*: rizki.arisandi@mail.ugm.ac.id

Abstract

Swietenia mahogani is one of the commercially valuable timber in Indonesia. We investigated the time or age at which heartwood formation begins, observed and determined whether the occurrence of heartwood formation was affected by age or diameter. It was also observed the presence of heartwood from the bottom to the top of the stem and measured their basic density (BD) and green moisture content (GMC). The area of heartwood and sapwood was determined based on the color differences in the cross-section. The results showed that the formation of the heartwood begins when the tree is 4 years old. The heartwood can be found up to 65% of the tree height. The ANOVA test showed that heartwood proportion were more determined by the diameter than the age. Harvesting of young, fast growing mahogany trees with large diameters from tree breeding can be expected to produce wood with good beauty and durability.

P-17

Comparison of Backpack- and UAV-LiDAR for Understory Biomass Estimation and Mapping

Heejae LEE[1], Hyeyeong CHOE[1]

[1]Department of Forest Sciences, Forestry and Bioresources, Seoul National University, REPUBLIC OF KOREA, heejae0110@snu.ac.kr

Abstract

Estimating spatial-explicit understory biomass is important to understand forest properties such as carbon storage. In this study, we compared Backpack- and UAV (Unmanned Aerial Vehicle)-LiDAR for understory biomass estimation and mapping in three afforestation stands that have different stand structures. First, we developed multiple regression models to estimate understory biomass using Backpack- and UAV-LiDAR data. Second, we mapped understory biomass in three stands and calculated the proportion of understory mapped by two kinds of LiDAR data. The model using Backpack-LiDAR data showed a higher coefficient of determination (R^2=0.52) than the model using UAV-LiDAR data (R^2=0.45). Backpack-LiDAR successfully mapped total area in all three stands, but UAV-LiDAR mapped 70.5% to 100% of the area depending on the stand structure. The averages of understory biomass were 95.13g/m^2 and 64.67g/m^2, respectively, when using Backpack- and UAV-LiDAR data. The results suggest that Backpack-LiDAR is more promising for understory biomass estimation and mapping.

P-18

The tendency in cutting and tree-planting of private forest in last ten years

Shihao ZHA[1]・Seiji ISHIBASHI[2], Naoki YASUMURA[3] & Keisuke TOYAMA[4]

[1]Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
zha-shihao331@g.ecc.u-tokyo.ac.jp
[2]University of Tokyo Tanashi Forest, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
bashi@uf.a.u-tokyo.ac.jp
[3]Ecohydrology Research Institute, University of Tokyo Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
anson@uf.a.u-tokyo.ac.jp
[4]University of Tokyo Chiba Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
toyama@uf.a.u-tokyo.ac.jp

Japanese forest planning system has been established under the Forest Law to promote appropriate management of forest resources from a long-term perspective. However, there are problems such as the stagnation of harvesting and reforestation. It is thought that it is possible to grasp the extent to harvesting and tree-planting being carried out of the private-owned forests through the regional forest plan. Therefore, we defined five years as one period, and the target and result of the two recent regional forest plans were examined. As a result of the examination, (1) the achievement rate of the plan shows that although the harvesting is progressing, the tree-planting remains a low rate; (2) the planned amount of harvesting and tree-planting showed a small increase in most areas; (3) the amount of harvesting increased correspondingly, but the amount of tree-planting mostly maintained the original level, resulting in a further decrease in the achievement rate.

P-19

Consideration on the image that giant trees give to Japanese people

Ningxin CAI[1], Seiji ISHIBASHI[2], Haruo SAITO[3] & Akio FUJIWARA[4]

[1]Graduate School of Agricultural and Life Sciences,
The University of Tokyo, JAPAN,
cai-ningxin818@g.ecc.u-tokyo.ac.jp
[2]University of Tokyo Tanashi Forest, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
bashi@uf.a.u-tokyo.ac.jp
[3]Fuji Iyashinomori Woodland Study Center, University of Tokyo Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
haruo_s@uf.a.u-tokyo.ac.jp
[4]Field Data Research Center, University of Tokyo Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
akio@uf.a.u-tokyo.ac.jp

Abstract

In Japan, many giant trees are objects of worship and are deeply connected to local people with stories and traditions. In this study, we examined how the relationship between giant trees and the Japanese people was formed. In addition to the size, the impression of a giant tree may change depending on the balance between the circumference of the trunk and the height of the tree. The shape of the tree crown and trunk evokes images of overwhelmingness, mystery, and rarity. In the past, giant trees were local landmarks and eventually became indispensable presences in people's consciousness. It's highly possible that giant trees have been deified since that the image of overlooking the village from high places overlaps with the god who watches over people's lives. The existence of giant trees and the lives of the Japanese people have been built a relationship by mutually influencing each other.

P-20

Changes in the use of wood in public buildings as a result of The Laws for Promotion of Use of Wood in Public Buildings

Kuan NI[1], Seiji ISHIBASHI[2], Naoki YASUMURA[3]& Keisuke TOYAMA[4]

[2]University of Tokyo Tanashi Forest, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
bashi@uf.a.u-tokyo.ac.jp
[3]Ecohydrology Research Institute, University of Tokyo Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
anson@uf.a.u-tokyo.ac.jp
[4]University of Tokyo Chiba Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
toyama@uf.a.u-tokyo.ac.jp

Abstract

The Laws for Promotion of Use of Wood in Public Buildings was came into force in 2011. This law aims to promote the use of timber in public buildings, thereby contributing to the utilisation of local timber and the promotion of local forestry. In this study we attempts to analyse the actual situation following the enforcement of the law by comparing the wood construction rates of new public buildings in before and after enforcement of the law. The annual average of the wood construction rate was 8.3% from 2006 to 2010, gradually increased to 9.8% from 2011 to 2015 and 13.4% from 2016 to 2020.However, in metropolitan areas, the annual average of the wood construction rate was relatively low at around 10% in later period. Although this law has had a certain effect, it was considered necessary to introduce further systems that take regional characteristics into account.

P-21

Comparison between Japan and China on the characteristics of management policies for artificial forests

Ke ZHANG[1], Seiji ISHIBASHI[2], Akio FUJIWARA[3] & Keisuke TOYAMA[4]

[1]Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
zhangke1230@g.ecc.u-tokyo.ac.jp
[2]University of Tokyo Tanashi Forest, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
bashi@uf.a.u-tokyo.ac.jp
[3]Field Data Research Center, University of Tokyo Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
akio@uf.a.u-tokyo.ac.jp
[4]University of Tokyo Chiba Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
toyama@uf.a.u-tokyo.ac.jp

Abstract

Plantations forests play an important role in timber production and environmental improvement. Although the area and accumulation of plantation forests in China continue to increase, their ecological services are insufficient. To consider how to manage Chinese plantation forests, Japan's forest management policies, which promoted large-scale afforestation after World War II, were compared with China. China's current age distribution of plantation forests is similar to Japan's in the 1980s, with a bias towards young forests. While Japan focused on Japanese cedar and Japanese cypress for timber production, China aims to improve its timber production capacity with China fir and Dahurian Larch. Moreover, poplar, which is planted for sand prevention in China, accounts for 14% of forestation, second only to China fir and reflects the diversity of afforestation purposes and tree species, unlike Japan in the 1980s. China needs to consider age structure stabilization by diversifying harvesting ages while securing afforestation areas.

P-22

Factors contributing to the spread of tree burials in Japan

Xiaoan YOU[1], Seiji ISHIBASHI[2], Naoki YASUMURA[3] & Haruo SAITO[4]

[1]Graduate School of Agricultural and Life Sciences,
The University of Tokyo, JAPAN,
youxiaoan574@g.ecc.u-tokyo.ac.jp
[2]University of Tokyo Tanashi Forest, Graduate School of Agricultural and Life Sciences,
The University of Tokyo, JAPAN,
bashi@uf.a.u-tokyo.ac.jp
[3]Ecohydrology Research Institute, University of Tokyo Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
anson@uf.a.u-tokyo.ac.jp
[4]Fuji Iyashinomori Woodland Study Center, University of Tokyo Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
haruo_s@uf.a.u-tokyo.ac.jp

Abstract

In recent years, woodland burials (tree burials) have been attracting attention in Japan. In this study, we tried to find out the factors that have caused to the rapid spread of woodland burials in Japan. After WWII, Japanese people's sense of "ie (family)" started to fade, and people gradually became less attached to the idea of joining family graves. Meanwhile, the cemetery shortage problem appeared in urban areas because of the rapid population shift. To solve this problem, new types of burials, including woodland burials, emerged. On the other hand, because of the serious environment problems that happened in 1960s, nature-oriented ways of thinking began to permiate. People became more interested in woodland burial because of its beautiful image of returning to nature. In summary, the problem of cemetery shortage, the spread of nature-oriented values, and a fading sense of "ie" have contributed to the spread of woodland burial.

P-23

Roadside tree maintenance initiatives in Tokyo

Lu Meiling[1], Seiji ISHIBASHI[2], Haruo SAITO[3] & Akio FUJIWARA[4]

[1]Graduate School of Agricultural and Life Sciences,
The University of Tokyo, JAPAN,
lu-meiling651@g.ecc.u-tokyo.ac.jp
[2]University of Tokyo Tanashi Forest, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
bashi@uf.a.u-tokyo.ac.jp
[3]Fuji Iyashinomori Woodland Study Center, University of Tokyo Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
haruo_s@uf.a.u-tokyo.ac.jp
[4]Field Data Research Center, University of Tokyo Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, JAPAN,
akio@uf.a.u-tokyo.ac.jp

Abstract

The maintenance of roadside trees in Tokyo has been ongoing for about 150 years since cherry and Japanese elm trees first planted along Ginza roadside in 1874. Despite periods of damage from natural disasters and wars, various measures have been taken to maintain the roadside trees, resulting in 1 million roadside trees by 2016. This study reviews the historical development of roadside tree maintenance in Tokyo and considers future possibilities. Initially, roadside tree maintenance in Tokyo was based on traditional Edo-style, but became more formalized in the 1910s with the implementation of laws and improvements in tree species. Despite being damaged by the Great Kanto Earthquake and World War II, the maintenance of roadside trees has improved in quantity and quality due to the city's emphasis on planning and urban greening. At present, the roadside trees maintenance in Tokyo is setting new goals in terms of landscape.

P-24

Current status of Forest Parks in Hainan island, China

Ying Wang[1], Huaiyue Liang[2] & Rongxiao He[3]

[1]Hainan University, CHINA, 845482645@qq.com
[2]Hainan University, CHINA, lianghuayue@haiannu.edu.cn
[3]Hainan University, CHINA, rx.he@qq.com

Abstract

In order to support the construction of the natural reserve system in Hainan island, it is essential to conduct an investigation of current status of forest parks. This survey covers 20 samples of forest parks in Hainan Province. The management and development state of these parks is examined. Using data collection, field investigations, manager interviews as survey methods, the study indicates that the diversity of forestry natural and cultural resources is a key advantage of those parks. And some forest parks have disadvantage, including inadequate management systems, overlapping land use, or lacking tourism facilities. It suggests the need to improve the relevant regulations for the management of Hainan forest parks, to activate tourism activities, to enhance the link between the surrounding forest parks and the Hainan Tropical Rainforest National Park, in an attempt to balance the relationship between Forest tourism and the habitat preservation.

P-25

COMMUNITY FOREST EVALUATION IN RPH GUBUGRUBUH, BDH PLAYEN, KPH YOGYAKARTA

Arif Tirta ALVIANA[1], Teguh YUWONO[2]
[1]Faculty of Forestry, Universitas Gadjah Mada, INDONESIA,
ariftirta99@mail.ugm.ac.id,
[2]Faculty of Forestry, Universitas Gadjah Mada, INDONESIA, tyuwono@ugm.ac.id

Abstract

The Community Forest Farmers Group (KTHKm) is the community which managed the community forest (HKm). KTHKm Wana Lestari I and KTHKm Wana Lestari II was established in 2007 and should be evaluated in every 5 years. This study aims to evaluate the HKm implementation in these two KTHKm, identify the supporting and inhibiting factors, and formulate strategies for HKm management. The data collection was carried out by survey methods through observation, and focus group discussions using ministry standard evaluation as evaluation guidelines. The evaluation consists of 5 principles: the legitimacy of the management and regional entities; planning; organizing; implementing; also monitoring and evaluation. Identification of factors was carried out by interviews and questionnaires while formulating the strategy used SOAR (Strengths, Opportunities, Aspirations, and Results). The result found these two groups had developing score but have different implementation that affected by several factors.

P-26

Application of Trichoderma koningiopsis combined with iron oxide nanoparticles improves the physiochemical response of Arabidopsis thaliana under drought

Fiza Liaquat[1], Hyun Seok Kim[1,2]

[1]Program in Forest Environmental Sciences, Seoul National University, e-mail: fizaliaquat@snu.ac.kr
[2]Interdisciplinary Program in Agricultural and Forest Meteorology, Seoul National University

Abstract

Bio-control strategies and the application of eco-friendly nanoparticles to enhance drought tolerance in plants have attained great interest in arid and semi-arid water resource management. The purpose of this study to determine the effects of *Trichoderma koningiopsis* and the combination of *T. koningiopsis* and iron oxide nanoparticles (FeO-NPs) on the biochemical, physiological, and anatomical responses of *Arabidopsis thaliana* under drought stress. *T. koningiopsis* and its co-inoculation with FeO-NPs promoted fresh biomass and root length compared with the untreated control. Moreover, exposure to both *T. koningiopsis* and FeO-NPs significantly decreased electrolytic leakage, indicating a decrease in reactive oxygen species accumulation and lipid peroxidation levels in plants. The activity of superoxide dismutase, antioxidant enzymes and catalase, in the plants, was significantly increased with *T. koningiopsis* and FeO-NP application. This elicitor decreased electrolyte conductivity and improved relative water and total chlorophyll contents in plants compared with the control. The findings show that *T. koningiopsis* and FeO-NPs can considerably reduce the water requirement of *A. thaliana* and enhance their drought tolerance ability, particularly in drought-prone areas.