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

JAPAN SOCIETY FOR THE PROMOTION OF SCIENCE
日本学術振興会

Abstracts of
2nd 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 12-13, 2021

Online

Organized by

Faculty of Forestry, Universitas Gadjah Mada
&
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Abstracts of 2nd 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"

Welcome remarks from Dr. Sigit Sunarta, The Dean of Faculty of Forestry, Universitas Gadjah Mada, Indonesia

I am Sigit Sunarta, the dean of the Faculty of Forestry Universitas Gadjah Mada (UGM). First of all, welcome to everyone who attends this symposium virtually. Although the Covid-19 pandemic is still occurring, I believe it will not impact our spirit to meet and discuss the following topic regarding the research hub of long-term forest monitoring field centers on environmental changes and ecosystem responses: Collaborating for data, knowledge, and young researchers. In forestry, the detection of environmental changes and ecosystem responses requires baseline datasets based on long-term observations. Ecosystem monitoring is a fundamental aspect of our understanding of how ecosystem change is impacting our natural resources and it is also vital for developing evidence-based policy and management. However, the current different types of ecosystem monitoring, along with their recommended applications, are often poorly understood and contentious. University forests refer to forested areas owned or managed by universities and devoted primarily to research and teaching activities in forest-related sciences. Faculty of Forestry UGM, with teaching forest WANAGAMA which is located in Wonosari, Yogyakarta, and KHDTK Getas which is located in Ngawi, East Java have been collecting, managing, and analyzing long-term data of meteorological, hydrological, biological, and geographic information up to this day. Therefore, it is an urgent need to collaborate for data and knowledge, particularly with young researchers, to carry out cooperative research, exploring the impact of current global changes on Asian forest ecosystems and how Asian forest ecosystems respond. I believe that the fruits of this Symposium will contribute to forest protection in Asia. Now, here on this good occasion, I sincerely hope that university forests from various countries can actively cooperate with UGM. We will also provide strong scientific and technological support to build the foundation of Forestry in Indonesia and Asia. Finally, I wish the Symposium a complete success. Stay healthy and happy.

Sigit Sunarta
Dean Faculty of Forestry, Universitas Gadjah Mada

Welcome from the Director of the University of Tokyo Forests

It is a great honor to invite you all to attend the "2nd International Symposium of Long-term Forest Monitoring Research in Asia" held online. This project is funded by Japan Society for the Promotion of Science (JSPS) and has started since FY2019 (April 2019). The 1st symposium was held by Hainan University November 2019. The interim symposium was held online March 2021. The University of Tokyo Forests have been used by a great number of students and researchers as education and research stations for 128 years from the establishment of the University of Tokyo Chiba Forest (UTCBF) in 1894. The UTCBF has managed conifer plantations and accumulated tree growth data for longer than 120 years. Ecohydrology Research Institute (ERI). The University of Tokyo Forest, has accumulated a long-term monitoring data of hydrology in relation to forest recovery for nearly 100 years.

This project is aiming to establish an international network on long-term monitoring. This is globally important especially to better understand the process of climate change that is attributed to human activity. Unfortunately, due to the ongoing COVID-19 pandemic, we cannot meet face-to-face. However, I am sure that this symposium provides a firm platform for further international collaboration between our university forests and yours in the future.

Kohei KUBOTA
Director of the University of Tokyo Forests

Welcome from Prof. Naoto KAMATA: A Project Leader of JSPS Core-to-core Program

I am Naoto Kamata, a project leader of the Japan Society for the Promotion of Science (JSPS) Core-to-core Program. I had been a Director of the University of Tokyo Hokkaido Forest (UTHF) for 6 years since April 2015 but was relocated to the University of Tokyo Chiba Forest April 2021 This is my great honor to host this symposium together with Universitas Gadja Mada under a sponsorship by the JSPS. Originally, this symposium was scheduled in the Japanese FY2020 (April 2020–March 2021) at UGM, Yogyakarta, Indonesia. However, as you know, the pandemic of COVID-19 started early in 2020 so that the symposium was postponed to the Japanese FY2021 (April 2021–March 2022). We have sought the timing of this meeting at Yogya but had finaly given up the idea and decided to have this symposium online. As a project leader, I welcome all of the participants to this online symposium.

It is the third year of the second phase of the project. In the first phase (FY2016–FY2018), there were five members: The University of Tokyo, Seoul National University, National Taiwan University, Kasetsart University, and Universiti Malaysia Sabah. We have started many joint researches during the three years and published one book titled "Developing a network of long‐term research field stations to monitor environmental changes and ecosystem responses in Asian forests" March 2019. A special issue of the Journal of Forest Research was published, which included fifteen papers. These papers will soon be republished as a book.

Each university has long-term data on climate, hydrology, LTER study plots, and plantations. These basic data are valuable treasures for a field of our science. In this project, I would like encourage you and your students to collaborate with foreign researchers and students and compare your data with ones outside your location. In the second phase (FY2019–FY2021), we expanded our network wider than the first phase by including three new members: Haina University, University Sri Jayawardenapura, Universitas Gadjah Mada. To date, we have started several new collaborations to contribute to this field of science. Due to the pandemic, the FY2021 budget will be carried over to FY2022 so that the project will continue by March 2023.

Each university has long-term data on climate, hydrology, LTER study plots, and plantations. These basic data are valuable treasures not only for science but also for human beings. In this project, I would like encourage you to expand your research internationally by using this network. I hope that this symposium will act as a stepping stone for future collaboration among all participants and their faculties. I also hope your will have a fruitful time.

Naoto KAMATA
Project Leader of the Japan Society for the Promotion of Science (JSPS) Core-to-core Program
Director, The University of Tokyo Chiba Forest
Symposium Secretariat, "2nd International Symposium of Long-term Forest Monitoring Research in Asia"

Welcome from Dr. Sri Rahayu: Local Organizer

I am Sri Rahayu, Lecturer from Faculty of Forestry Universitas Gadjah Mada (UGM), Local organizer of the 2nd 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" by online on March 12-13, 2022. UGM joined the Core-to-Core Program FY 2019 (B. Asia-Africa Science Platforms) by the Japan Society for the Promotion of Science (JSPS) program from the second phase together with Hainan University and University Sri Jayawardenapura. While other universities from Korea, Taiwan, Malaysia, and Thailand have been joint since the first phase. This is my great honor to be the local organizer and host this symposium under the support of the JSPS. Originally, this symposium was scheduled in the Japanese FY2020 (April 2020–March 2021) at UGM, Yogyakarta, Indonesia. However, as we all know, the COVID-19 pandemic started in early 2020 so the symposium was postponed to the Japanese FY2021 (April 2021–March 2022). We have sought the timing of this meeting at Yogyakarta but had finally given up the idea and decided to have this symposium online. Thank you for technical support of the WEBEX for this online prepared by PIKA (Center for Academic Innovation Studies) of UGM. As a local organizer, I welcome all of the participants to this online symposium. UGM has some teaching forests and two of them are WANAGAMA and KHDTK GETAS. It is a good opportunity for us, through this symposium to discuss and exchange our research data and findings, even more on long-term forest monitoring data. Finally, I hope that this symposium will act as another stepping stone for future collaboration among all participants and their faculties. I also hope that all of you will have a fruitful time and be able to build effective networking.

Sri RAHAYU
Lecturer from Faculty of Forestry, Universitas Gadjah Mada. Local Organizer of "2nd International Symposium of Long-term Forest Monitoring Research in Asia"

Program of Oral Presentation and Index of Abstracts

*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

Plenary Session
March 12 (Sat) 12:00-17:50 (JST = GST+9:00hrs)

12:00-12:30		Opening, Welcome Address, & Group photo	
12:30-13:15		**Interim Report by Research Groups (RG1-3)**	
	12:30 Kuraji KOICHIRO (UTokyo)	Interim Report of Collaborative Research Activities within Asian University Forests by Research Group 1 (Water & Climate)	p.13
	12:45 Naoto KAMATA (UTokyo)	Interim Report of Collaborative Research Activities within Asian University Forests by Research Group 2 (Ecosystem & Biodiversity)	p.14
	13:00 Toshiaki OWARI (UTokyo)	Interim Report of Collaborative Research Activities within Asian University Forests by Research Group 3 (Sustainable Management)	p.15
13:15-14:30		**Invited Speech by Each Country 1**	
	13:15 Hyun Seok KIM (SNU)	Seoul National University Forests and Ongoing Researches and Achievements	p.16
	13:40 Chiang WEI (NTU)	Rainfall network design across different spatiotemporal scales	p.17
	14:05 Koichiro KURAJI (UTokyo)	Organization restructuring based on the University of Tokyo Forest Education and Research Plan (2021-2030)	p.18
14:30-14:40		**Break**	
14:40-15:40		**Poster session in 5 breakout rooms**	
15:40-17-45		**Invited Speech by Each Country 2**	
	15:40 Dokrak MAROD (KU)	Forest Ecosystem Services based on Long Term Ecological Research at Mae Klong Watershed, Western Thailand	p.19
	16:05 Mui-How PHUA (UMS)	Tropical Montane Forest Aboveground Biomass Changes from Spaceborne and Airborne Remote Sensing Data	p.20
	16:30 Mingxun REN (HU)	A brief introduction of School of Forestry, Hainan University and its forest platforms	p.21

16:55	G.G.T. CHANDRATHILAKE (USJ)	Long-term research at the Department of Forestry & Environmental Science, University of Sri Jayewardenepura, Sri Lanka	p.22
17:20	WIDIYATNO (UGM)	Use of Native Species for Rehabilitation of Secondary Tropical Rainforest in Indonesia	p.23
17:45-18:00		**House keeping**	
18:00-		**Social gathering (voluntary)**	

Research Group Sessions
March 13 (Sun) 12:00-18:00 (JST = GST+9:00hrs)

12:00-17:00	**RG Sessions (see following pages for details)**
17:00-17:10	**Report from Research Group 1 (RG1)**
17:10-17:20	**Report from Research Group 2 (RG2)**
17:20-17:30	**Report from Research Group 3 (RG3)**
17:30-17:50	**General Discussion**
17:50-18:00	**Closing & Awarding ceremony**
18:00	**End of the Symposium**

12:00-16:40 (JST = GST+9:00hrs)		**RG1 Oral Presentation**	
12:00-13:00		**Session 1 (Chair: Kuraji)**	
12:00	Chatchai TANTASIRIN (KU)	Rainfall Characteristics and Trend at a Hill Evergreen Forest, Kog Ma Experimental Watershed, Northern Thailand.	p.24
12:20	Hatma Suryatmojo (UGM)	Runoff Hydrograph and Suspended Sediment Yield in Small Headwater Catchments in Tropical Rainforest, Central Kalimantan, Indonesia	p.25
12:40	Hero Marhaento (UGM)	Long term impacts of forestation and climate change on hydrological processes of a tropical catchment	p.26
(Break)			
13:20-14:40		**Session 2 (Chair: Asano)**	
13:20	Nobuaki TANAKA (UTokyo)	Climate elasticity of annual runoff from fifteen Asian forested catchments	p.27
13:40	Anand Nainar (UMS)	Quantifying oil palm stemflow: methodological challenges	p.28
14:00	Moein FARAHNAK (UTokyo)	Runoff response to felled logs' placement direction on a slope after thinning in a Japanese cypress plantation	p.29
14:20	Taehyun KIM (SNU)	Experimental analysis of aggregate stability of crusted ash layer using ASWAT test	p.30
(Break)			
15:00-16:20		**Session 3 (Chair: Im)**	
15:00	Tsung-Ming TSAO (NYU)	Seasonal Variation of Ozone in Xitou Forest Environment	p.31
15:20	Xiu ZENG (HU)	The effect of winter chilling and spring forcing on spring phenology of subtropical tree seedlings	p.32
15:40	Xiaoyan LIN (HU)	Simulation of Soil Water Retention Curves and Model Optimization in Tropical Latosol Rubber Planting Area	p.33
16:00	Yen-Jen LAI (NTU)	Assessing the impact of climate change on water resources: a proposal for Asian experimental forests	p.34
16:20-16:40		**General Discussion & Closing**	

12:00-17:00	(JST = GST+9:00hrs)	**RG2 Oral Presentation**	

12:00-12:05		**Opening & Introduction**	

12:05-13:20		**Session 1 (Chair: Dokrak)**	
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12:20	Wongsatorn PHUMPHUANG (KU)	Forest structure, species composition and dynamics in a dry evergreen forest, northeastern Thailand	p.36
12:35	Elia Godoong (UMS)	Trees Diversity and Forest Carbon Assessment of a Coastal Forest Ecosystem at the Silam Coast Conservation Area, East Coast Sabah,	p.37
12:50	Diana Mahayani (UGM)	Assessing Changes in Bornean Rain Forest Tree Diversity and Ecosystem Functioning a Decade after Logging Using Functional Trait Approach	p.38
13:05	Nianxun XI (HU)	Drought alters plant diversity effects on biomass through soil legacy effects	p.39
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13:40-14:40		**Session 2 (Chair: Guan)**	
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13:55	Kwang Hyun NAM (SNU)	Post-planting performance of *Zelkova serrata* and *Fraxinus chinensis* subsp. *rhynchophylla*	p.41
14:10	Kyu-Suk KANG (SNU)	Construction of genetic linkage map and determination of QTLs by GBS and GWAS in *Populus davidiana* Dode	p.42
14:25	Biing T. GUAN (NTU)	Imputing Long-term Tree Species First Leafing and Flowering Dates at the Tokyo University Hokkaido Forest	p.43
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15:00-16:15		**Session 3 (Chair: Kamata)**	
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15:15	Naoto KAMATA (UTokyo)	Long-term Population Dynamics of the Beech Caterpillar, *Syntypistis punctatella* (Motshulsky) (LEPIDOPTERA: Notodontidae)	p.45
15:30	Minjung HUH (SNU)	Field Attraction and Electroantennogram Responses of Korean Pine Wood Nematode Insect Vectors to Sex-Aggregation Pheromone, Kairomone, and Host Volatiles	p.46
15:45	Maria Lourdes T LARDIZABAL (UMS)	Species Diversity of Bark and Ambrosia Beetles in a Tropical Montane Forest of Northern Borneo Island	p.47
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12:35	Toshiaki OWARI (UTokyo)	Old Sugi (*Cryptomeria japonica*) plantations at the University of Tokyo Chiba Forest: Long-term growth trends and current status	p.51
12:50	Keisuke TOYAMA (UTokyo)	Historical forest management plans as long-term research materials	p.52
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Interim Report of Collaborative Research Activities within Asian University Forests by Research Group 1 (Water & Climate)

Koichiro KURAJI[1] and Nobuaki TANAKA[2]

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Abstract

Among three Research Groups (RGs) under the Japan Society for the Promotion of Science Core-to-Core Program, RG1 (Water & Climate) deals with water cycling and climate changes in Asian forests, Long-term hydrological and meteorological data, and ecosystem services associated with physical and chemical processes. International collaborative research activities have been promoted by core universities in eight Asian countries (Japan, Korea, Taiwan, Thailand, Malaysia, China, Indonesia, and Sri Lanka). One major product of the collaborative research is editing a special issue of "Water" (open access journal) entitled "Long-Term Monitoring and Research in Forest Hydrology: Towards Integrated Watershed Management". As of March 1, eleven papers, including those from the five core universities (Japan, Korea, Malaysia, China, and Indonesia), have been published or are under review. In addition, a booklet titled "Experimental Watersheds and Weather Stations in University Forests in Asia" was published by the University of Tokyo Press. The authors of this booklet consist of eight researchers, one from each core university.

Interim Report of Collaborative Research Activities within Asian University Forests by Research Group 2 (Ecosystem & Biodiversity)

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Abstract

RG2 deals with issues related to ecosystems and biodiversity in Asian forests. International collaborative research activities have been promoted by core universities and collaborating institutes in eight Asian countries (Japan, Korea, Taiwan, Thailand, Malaysia, China, Indonesia, and Sri Lanka). Kamata (UTokyo) has conducted international collaborative research on bark and ambrosia beetles with Thailand (Sanguansub, Saowaphak, Buranapanichpan), Taiwan (Li, Wu), Malaysia (Lardizabal, Wong), and Indonesia (Sri Rahayu) since 2005. Guan (NTU) stayed at the University of Tokyo Hokkaido Forest (UTHF) in 2019 and collaborated with Tanaka and Kamata in analysing long-term plant phenology and climate data (1930–present) obtained by UTHF. Zhang (HU) is staying at UTokyo to work with Kamata on a long-term data (1985–present) of the beech caterpillar density. A *Hinoki* (*Chamaecyparis obtusa*) project by Kang (SNU), Chu (NTU), and Goto (UTokyo) collected *Hinoki* seeds from each country 2021 for the transplant experiment.

Interim Report of Collaborative Research Activities within Asian University Forests by Research Group 3 (Sustainable Management)

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Abstract

Among three Research Groups (RGs) under the Japan Society for the Promotion of Science Core-to-Core Program, RG3 (Sustainable Management) deals with anthropogenic interventions in Asian forests, long-term geospatial and management data, and ecosystem services associated with social, economic and cultural values. International collaborative research activities have been promoted by core universities in eight Asian countries (Japan, Korea, Taiwan, Thailand, Malaysia, China, Indonesia, and Sri Lanka). In September 2021, we presented our collaborative research activities at the IUFRO World Day. Our collaborator at University of Sri Jayewardenepura (Sri Lanka) is currently editing a special issue entitled "Tropical Forestry: Conservation, Management and Utilization" for *Trees, Forests and People*. Although most of planned activities have been postponed or renounced due to the coronavirus pandemic, we are planning to continue our research collaboration for the growth and yield of Sugi (*Cryptomeria japonica*) and teak (*Tectona grandis*) plantations in 2022.

Seoul National University Forests and Ongoing Researches and Achievements

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Abstract

Seoul National University (SNU) was founded in 1946 as the first national university of Korea and the College of Agriculture & Life Sciences (CALS), SNU, is a leading institution specializing in agricultural education and research. The Department of Forest Environmental Sciences in CALS specializes in nurturing forests and the sustainable use of forest resources which include the direct and indirect uses of forest products. 17 faculty members have served in the department to identify and resolve important problems in biology, conservation, management, and utilization of forest resources and to disseminate research results to the scientific community, resource user-groups, and the general public.

Seoul National University Forests (SNUF) was established in 1913 in order to contribute to education and research of forest science and forestry. SNUF has three forests in the mid and southern part of South Korea: Chilbosan University Forest, Taehwasan University Forest, and Nambu University Forest. Chilbosan University Forest (CUF) is located in Suwon-si and Hwaseong-si in Gyeonggi-do. In CUF, education and research on raising seedlings and trees are ongoing inside nurseries and greenhouses. Research on urban forestry is also ongoing. Taehwasan University Forest (TUF) is located in Gwangju-si in Gyeonggi-do. TUF has a flux tower that can measure carbon, air and matter cycling, and also has a debris barrier for hydrological research. Nambu University Forest (NUF) is located in Gwangyang-si and Gurye-gun in Jeollanam-do. NUF is a large forested area with 16,213 ha and thus profitable to conduct research. NUF has 880 sites for permanent vegetation monitoring, and research installations such as hydrological facilities and an observation garden.

The introduction of ongoing researches and their achievement will be presented for future collaboration with other universities.

Rainfall network design across different spatiotemporal scales

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Abstract

The network design for collecting the hydrological data is a fundamental and crucial issue for water resource management. However, the adequate spatiotemporal scale for monitoring these data may differ from various specific purposes and demands. The authors analysed the rainfall network design in area within Experimental Forest of National Taiwan University and other watersheds in Taiwan using kriging and information entropy since 2005. The results show that only few reallocated raingauges can capture the majority of rainfall uncertainty (i.e. 95%). There exists different candidate raingauges with high priority across the combinations of spatitemoral scales. The authorities may have face to the issue and trade off to select the optimum allocation to save precious or limited budget, manpower, time and maintenance in the future.

Organization restructuring based on the University of Tokyo Forest Education and Research Plan (2021-2030)

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Abstract

Since 2011, the University of Tokyo Forests (UTF) has declared three missions: education, research, and extension. The research mission is to facilitate specialized research on forest-based natural environments and the relationship between forests and people and to accumulate optimal records (data) on the dynamics of natural environments, mainly fields and forests, through university-based research organizations. In order to realize this research mission, two major reorganizations were implemented in April 2021. One is the reorganization of the former independent Fundamental Data Development Committee into Long-term Ecological Data Coordinator within the Research Committee, which consists of the Biology Division, the Meteorology, Hydrology, and Water Quality Division, and the Forest Growth Survey Division. The other was the establishment of the Field Data Research Center (FDRC), which aims to advance research and education in new ways through digital transformation (DX) of field and data in the UTF.

Forest Ecosystem Services based on Long Term Ecological Research at Mae Klong Watershed, Western Thailand

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Abstract

Deforestation is the major threat on loss of biodiversity and ecosystem services. This study aimed to clarify relationship between forest recovery and ecosystem services, particular regulation and supporting services The result showed that the changes of degraded forest into forest areas were fluctuated and varied among period (7.85 ± 7.35 km^{2}4y^{-1}) from 1998-2013. High relationship between hydrological changed and increased forest areas were detected. The annual stream flow trended to decrease accordance with amount of stream flow in the rainy season. Indicating high storage capability of watershed was detected and flow during the dry season was increased. Forest area increasing was activated high hydrological efficiency for regulation and supporting services. High biodiversity both flora and fauna were found, in addition, non-timber forest minor products were also increased which provided for local people. Thus, the reforestation policy is urgently needed, including, knowledge transferred to society for concerning on biodiversity conservation and utilization awareness.

Tropical Montane Forest Aboveground Biomass Changes from Spaceborne and Airborne Remote Sensing Data

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Abstract

There are five undergraduate forestry programmes in Universiti Malaysia Sabah. Field-based learning and research activities mainly take place in state parks and forest reserves. Since 2016, research have been conducted in Ulu Padas area within the Core-to-Core program. Tropical montane forest aboveground biomass (AGB) changes in the study area were examined using multi-resolution remote sensing data. We used spaceborne (30 m) and airborne (1 m) digital elevation data to estimate the AGB changes between 2000 and 2012 (Period 1). The AGB variations in Period 2 (2012-2017) were estimated using bi-temporal airborne laser scanning data (1 m). In period 1, AGB loss rate was higher in managed forests than on state-land, but this was reversed in period 2 due to forest-to-rubber conversion. Reduced-impact logging implemented in 2000s contributes to the AGB loss reduction in the managed forests. Forest administrations can use these approaches to estimate forest AGB changes and to determine the drivers.

A brief introduction of School of Forestry, Hainan University and its forest platforms

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Abstract

The history of School of Forestry, Hainan University can date back to year 1954 when Chinese government aims to produce rubber, which in turn has make China become the top 5 rubber producing country in the world. However, rubber expansion has also made Southeast Asia have the highest tropical rainforest deforestation in the world. Thus protecting the remaining tropical rainforest and recovering the degraded tropical rainforest has become the common task for the whole world. In year 2019, School of Forestry, Hainan University emerge as the times require. In year 2021, Hainan Tropical Rainforest National Park has been established to protect tropical rainforest in Hainan Island. Several forest platforms have also been established by School of Forestry, Hainan University to provide scientific guidance to Hainan Tropical Rainforest National Park at the following aspects: 1) tropical rainforest theoretical researches; 2) tropical rainforest restoration; and 3) forest natural education and health researches.

Long-term research at the Department of Forestry & Environmental Science, University of Sri Jayewardenepura, Sri Lanka

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Abstract

Since its inception to JSPS C2C, different research groups in the department including Center for Sustainability have initiated several research projects that generate long-term data. Experimental restoration of tropical lowland wet evergreen forests and tropical dry mixed forests have been undertaken with permanent sample plots set up for long-term data collection. Databases on individual tree growth and survival are being maintained (data pertaining to 3 years are currently available) with the objective of understanding the carbon sequestration potential of restored forests. A similar project will be initiated in 2022 to understand the dynamics of mangrove restoration and its carbon sequestration potential. The department maintains a field research station at Yagirala Forest Reserve (YFR) with 100-acre forest where rainfall data are available from 2010 to 2020, As an addition to the existing research facilities at YFR, a paired watershed delineated aiming to establish a water gauging facility for long-term hydrological monitoring.

Use of Native Species for Rehabilitation of Secondary Tropical Rainforest in Indonesia

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Abstract

Tropical rainforest is one of the most species-rich in the terrestrial ecosystem in terms of species richness and endemics that support 18.7% of the world's plant biodiversity. One of the dominant native species in tropical rainforests in Indonesia is the dipterocarps species However, forest degradation has a direct effect to be loss of plant biodiversity, especially increasing the status of dipterocarps become the risk of extinction. One of the methods to rehabilitate secondary tropical rainforest is enrichment strip planting using native species. This method could increase the dipterocarp tree density and productivity of the secondary tropical rainforest. Enrichment planting using native species is advantageous for the conservation of both the species themselves and their genetic diversity and can be adapted to the local environment. Furthermore, enrichment planting might increase the standing stock of secondary tropical rain forests and conserve dipterocarp species, much like *ex situ* conservation.

Rainfall Characteristics and Trend at a Hill Evergreen Forest, Kog Ma Experimental Watershed, Northern Thailand.

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Abstract
Twenty years of rainfall recorded by a tipping bucket rain gage at altitude about 1,300 m during 1997 – 2016 was analyzed. Number of storms and rain day per year ranges between 125 – 243 storms and 77 to 145 days. Average number of storm and rain day is equal to 182 storms and 111 days respectively. Rainfall duration < 30 , 30 – 60 and > 60 minutes is about 35, 24 and 41 percent of total number of storms. Rainfall intensity <10, 10 – 50 and > 50 mm/hr is about 66, 32 and 2 percent of rainstorms. Annual rainfall range from 1,172 – 2,340 mm or averagely about 1,660 mm. There was not significant change in number of storms, rain day, maximum intensity, duration, and annual rainfall. However, rainfall amount of May was significantly decreased while it was increased in July when moving average data longer than 5 years was analyzed.

Runoff Hydrograph and Suspended Sediment Yield in Small Headwater Catchments in Tropical Rainforest, Central Kalimantan, Indonesia

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Abstract
Indonesian tropical rainforests are managed by Intensive Forest Management System (IFMS), characterized by selective timber harvesting and intensive line planting. This study conducted quantitative evaluations on catchment-scale impacts during each selective logging (SL) and intensive line planting (ILP) stage. Direct runoff (DRO), peak discharge (Qp), and suspended sediment (SS) concentrations were measured in three headwater catchments located in the Bukit Baka Experimental Catchments, Central Kalimantan, Indonesia. During the post-SL period, total runoff of catchments B and C increased by 68.8% and 47.3%, respectively, in comparison with natural catchment A. During the post-SL period, SS yields dramatically increased to 34.0, and 14.5 t ha^{-1}y^{-1}, respectively, while in catchment A of 0.6 t ha^{-1}y^{-1}. During the post-ILP period, SS concentration did not show decreases compared to the post-SL period. This study indicated that ILP of IFMS was not effective to decrease SS discharge in the initial stage of the post-operation period.

Long term impacts of forestation and climate change on hydrological processes of a tropical catchment

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Abstract

A reforestation program is considered as a long-term process with long-term benefits, however, the existing evaluations of the success of these programs tend to focus on short-term success indicators e.g., planting area targets. This study aims to assess the long-term impacts of forestation on the hydrology of the Bogowonto catchment (597 km^2) on Java Island, Indonesia under climate change conditions. A calibrated Soil and Water Assessment Tool (SWAT) model was used to diagnose the isolated and combined effects of forestation and climate change on water balance components. The results show that the forestation program through increasing around 10% of forest area during 2006-2019 has minor impacts compared to that of climate change on the hydrological processes in the Bogowonto catchment. However, it was observed that forestation activity has potentially decreased the streamflow and surface runoff during the wet season which may reduce the risk of moderate floods.

Climate elasticity of annual runoff from fifteen Asian forested catchments

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Abstract

In order to overview the impact of climate change on runoff from forested catchments over Asian countries, we collected the long-term hydrologic data from fifteen forest catchments, spanning from Sabah, Malaysia (our southernmost site) to Hokkaido, Japan (our northernmost site). We then employed an elasticity analysis to the data set to examine how annual runoff from each catchment responded to inter-annual fluctuations in annual rainfall and annual mean air temperature. As a result, we found that annual runoff was sensitive to annual rainfall for all the catchments examined. In addition, annual runoff from seven of the fifteen catchments were found to be sensitive to inter-annual change in mean air temperature, probably due to change in forest evapotranspiration. Annual rainfall in the previous year (carry-over soil moisture) was found to be an important variable to explain annual runoff from two tropical montane forest catchments.

Quantifying oil palm stemflow: methodological challenges

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Abstract

Stemflow on oil palm (OP) trees were rarely studied because of methodological challenges due to tree physiology. Here, we report challenges faced and improvisations. The primary challenge is in attaching stemflow collectors/collars to the trunk because they are covered in dead fronds. Dead frond removal is labour-intensive and time-consuming but was performed, nonetheless. Upon levelling of the trunk, sufficient time is required for the frond "wounds" to dry. Compared to other parts of the trunk, the wounds are more fibrous and susceptible to peeling especially during the wet season. In such events, stemflow collars that are installed on the trunk will also peel-away and fail. In the West coast of Sabah, we found February and March (inter-monsoon period) to be the best months for installation as rainfall and rain frequency is lowest. As tropical mountainous terrain often have localised rainfall, we managed to minimise but not completely eliminate failure rates.

Runoff response to felled logs' placement direction on a slope after thinning in a Japanese cypress plantation

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Abstract

Runoff causes sediment transportation and flooding in forest plantations without understories. This study examined the effect of felled logs' placement direction on runoff on a slope of a Japanese cypress plantation in central Japan. Thinning, which removed 40% of stems, was performed on this slope in early 2019. Three study plots were selected: two treatment plots (T1 and T2) and one control plot (C1). In T1, felled logs were randomly placed on a slope, and in T2, counterparts were aligned parallel to contour lines after thinning. We observed soil surface runoff in the three study plots from 2018 to 2020. Results showed soil surface runoff was lower in T1 and T2 than C1. Monthly runoff, runoff ratio, and flow-duration curve were lower in T2 than T1 after two years of thinning. These findings help recognize the changes in soil surface runoff under different felled logs' placement directions after thinning.

Experimental analysis of aggregate stability of crusted ash layer using ASWAT test

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Abstract

The formation of surface ash crusts influences on the infiltration capacity of the wildfire-affected area, and thereby increases surface runoff and soil erosion immediate after a fire. The degree of surface crusts depends on the type and thickness of ash, and wetting and dry processes. When rainfall occurs, ash layer absorbs water and swells up and dried again. This forms a thin and low hydraulic conductivity layer over the soil surface. The slaking of soil crusts, sometimes defined as aggregate stability, is an important component to determine the effects of soil crusts on post-fire hydrology. In this study, the aggregate stability of crusted ash layer was quantitatively analyzed according to the thickness of the ash layer and the rainfall intensity using ASWAT(Aggregate Stability in Water) test. The ASWAT is used to quantify the structural stability of soil aggregates against rainfall and water movement. The ash crusts formed under rainfall simulation with varying rainfall intensity (2-year, 10-year, and 100-year rainfall return) and ash thickness (5-mm, 10-mm, and 20-mm thick). The results of ASWAT test showed that the aggregate stability index to water of crusted ash layer were $0 - 1$, showing high stability against water absorption regardless of ash thickness and rainfall intensity. There were no significant different on crust stability between the experiments (rainfall and ash thickness) with the Tukey post-hoc test ($\alpha=0.05$). However the ash layer aggregates were so weak that it was impossible to directly measure the hardness. Therefore, the physical stability and continuity of the crusted ash layer require further research in addition to the stability of the aggregation to water.

Seasonal Variation of Ozone in Xitou Forest Environment

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Abstract

Impact of ozone on human health and the environment has been an important issue in the fields of public health and atmospheric environmental science. This study aims to monitor the seasonal variations of ozone concentration in the Xitou forest environment, and compare the 24- hour variation characteristics between weekdays and weekends (i.e., Saturdays and Sundays). In addition, we also compared the monitoring records in Xitou with the measurements in the Zhushan station monitored by the Environmental Protection Agency, to investigate the sources of ozone and its impact on human health. The results showed that the ozone concentrations in Xitou in all of the four seasons were significantly lower than that in the Zhushan area, but the fluctuation trends were very similar in the two regions. In particular, the maximum ozone concentration in Xitou was found to occur in spring with an average daily concentration of 21.50±15.84 ppb.

The effect of winter chilling and spring forcing on spring phenology of subtropical tree seedlings

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Abstract

Global warming and environmental changes have a serious impact on plant phenology, and the advance of phenology could affect the ecosystem function. It is well known that spring phenology could be driven by photoperiod and temperature (winter chilling and / or spring forcing temperature) in temperate regions. However, the climatic drivers of spring phenology are largely undocumented in subtropical regions. In this study, we established a climate chamber experiment to test the effects of chilling and forcing on seedlings of seven subtropical woody species. The treatments of chilling and forcing led to different heat forcing requirements for budburst and leaf-out of seven species. The new chilling method was used for the first time to study the seedling phenology of subtropical plants. This study demonstrated the effects of winter and spring forcing temperatures on the phenology of subtropical seedling, and provided cues for the phenology of subtropical plants in response to global climate change.

Simulation of Soil Water Retention Curves and Model Optimization in Tropical Latosol Rubber Planting Area

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Abstract

As of 2020, Hainan Island has planted about 519,200 hm^2 of rubber forests. The growth of rubber forests causes ground runoff and wells to dry up in some areas. The soil water retention curve reflects the relationship between matrix potential and water content. In this study, the sandbox drainage method combined with the pressure plate method was used to determine five fertilization treatments in rubber plantations (organic fertilizer mixed with chemical fertilizer (H), chemical fertilizer, planting green manure, application of special fertilizer and no fertilization) and four empirical models (Brooks-Corey, van Genuchten, Gardner and lognormal distribution) were used to fit the soil water retention curves. The accuracy of the four models in fitting the soil water retention curves of different treatments from high to low is the BC, VG, LND and Gardner models.

Assessing the impact of climate change on water resources: a proposal for Asian experimental forests

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Abstract

This study proposes a water resource assessment based on the ground-truth hydrological and climate data, the historical/projected data from Coordinated Regional Downscaling Experiment (CORDEX), and the Generalized Watershed Loading Function model (GWLF). Based on the water balance method, the streamflow component of the GLWL model will be used to evaluate three major topics, 1. How are the performances of the GLWF model? 2. How are the improving performances of the revised curve numbers (Im et al., 2020) on the streamflow simulations of the GWLF model? 3. How the streamflow simulations are projected based on the daily data of the CORDEX dynamically downscaled regional climate models (RCMs) and the GWLF model. The long-term daily streamflow, precipitation, and air temperature ground-truth data are necessary for the joint university hydrological watershed. On the other hand, the CORDEX data provide historical meteorological data and the short-term observed streamflow data might be evaluated as well.

Forest Integrated Assessment and Biodiversity Analysis for The Balaban Rayak Social Forestry at Ketapang Regency, West Kalimantan Province

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Abstract

Social forestry is newly implemented agrarian reform in Indonesia. Local community is given the rights to manage state forest and develop limited agricultural activity or other economic activity, while maintaining the forest cover and state forest status. Balaban Rayak recently was granted permit and has collaborated with adjacent oil palm company to sustainably manage the forest. To start reforestation, agroforestry and other ecosystem services, we are recently conducted biodiversity baseline assessment, using the methodology from USAID LESTARI.

The results showed from 13 plots is known that the number of species 56; Menhenicks index 3.80; Margalef index 10.22; Shannon biodiversity index 3.33; Simpson's biodiversity index 0.95; eveness values 0.83.The forest hosts 34 species that are directly beneficial to the community, and 13 flora and habitats that are culturally beneficial and local wisdom. The data will benefits the program in forest conservation and improving the welfare of communities around the forest.

Forest structure, species composition and dynamics in a dry evergreen forest, northeastern Thailand

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Abstract

Long-term ecological research based on large permanent plot can explore the forest dynamics in relation to environmental changes. This study aimed to detect the forest structure, species composition as well as clarifying tree demography, mortality and recruitment, in response to drought conditions in the dry evergreen forest (DEF) at Sakaerat Biosphere Reserve, northeastern Thailand. A total of 81,728 individuals ($\geq$ 1 cm DBH) comprising 204 species 156 genera and 62 families were found. The stem density and basal area were 5,108 individual ha^{-1} and 30.16 m^2 ha^{-1}, respectively. The mortality and recruitment rates of trees during 2010–2020 were mostly balanced (1.96 and 1.93 % year^{-1}, respectively); nevertheless, the rates varied among periods. According to the drought index, humid conditions were widespread, particularly in extended humid conditions during the second period. Hence, this study provides useful information for effective conservation and management of DEF.

Trees Diversity and Forest Carbon Assessment of a Coastal Forest Ecosystem at the Silam Coast Conservation Area, East Coast Sabah, Malaysia

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Abstract

The study aims to provide some baseline information of tree diversity and forest carbon assessment of the coastal forest ecosystem in the East Coast Sabah, Malaysia. In this study, 41 families with 123 species were documented. Euphorbiaceae, Dipterocarpaceae and Ebenaceae are the most dominant family while *Diospyros spp., Buchanania arborea* and *Pouteria obovata* are the dominant species. A dipterocarp tree species for Sabah's new record was discovered in this coastal forest. The study shows mainly of medium sized trees with highest mean of 12 m tall and 23 cm dbh with basal area ranging between 2 to 18 m^2 ha^{-1} indicated that the coastal forest area has been disturbed before and is regenerating naturally. The mainland forest showed 56 Mg C ha^{-1} compared to the islands which has only 4 Mg C ha^{-1} and both mainland and the islands showed similar diversity of tree species with Shannon indices of 4 for the mainland and 3 for the islands respectively. Such important coastal forest ecosystem is now considered rare and vulnerable especially along the East Coast of Sabah due to increasing pressure of land use conversion for agriculture and urban development.

Assessing Changes in Bornean Rain Forest Tree Diversity and Ecosystem Functioning a Decade after Logging Using Functional Trait Approach

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Abstract

Logged-over forests comprise a large proportion of tropical forest landscapes, but questions remain on how to identify the loss of sets of ecologically important species traits and detect changes in forest functioning of these forests. Functional trait approach is beneficial to understand the ecological processes that are responsible for the resulting patterns of biodiversity. We evaluated the regrowth of 72 one-hectare logged forest subplots in East Kalimantan a decade after different treatments: selective conventional and reduced-impact logging, and liberation thinning. Seven functional traits were used to compare the short-term ($\approx$1 year) and longer-term ($\approx$10 years) changes in functional diversity and composition of the forest. After a decade of treatments, both logging techniques resulted in higher functional; however, forest functional traits shifted away from those observed in the unlogged subplots. Selectively logged forest subplots with liberation thinning exhibited higher functional diversity than the un-thinned communities and greater similarity to unlogged forest.

Drought alters plant diversity effects on biomass through soil legacy effects

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Abstract

Ecosystem functions are threatened by both recurrent droughts and declines in biodiversity at a global scale, but the drought-dependency of diversity-productivity relationships remains poorly understood. Here we use a two-phase mesocosm experiment with simulated drought treatments and model oldfield communities to examine drought-induced changes in soil microbial communities along a plant species richness gradient, and to assess interactions between past drought (soil legacies) and subsequent drought on plant diversity-productivity relationships. We show: (1) drought decreases bacterial and fungal richness, and modifies relationships between plant species richness and microbial groups; (2) drought soil legacy increases net biodiversity effects but responses of net biodiversity effects to plant species richness are unaffected; (3) linkages between plant species richness and complementarity / selection effects vary depending on past and subsequent drought. These results provide mechanistic insight into biodiversity-productivity relationships in a changing environment, with implications for the stability of ecosystem function under climate change.

Impact of human-induced on litter accumulation and decomposition in four forest types along the drought gradient in Thailand

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Disturbances by human-induced shapes forest systems by influencing their composition, structure, and functional processes. To investigate how ecosystem function was affected by the disturbance, the study of the litter accumulation, decomposition, and the factor controlling between old-growth forest (O) and secondary forest (S) among four forest types in Thailand using the nine functional traits were conducted. Leaf litter dynamics differently affected by disturbance depending on the forest type, but leaf litter decomposition at a community level was rather affected by litter quality. The decomposition with and without termite effect showed that termite was an important factor for decomposition particularly in some forest types. Disturbance affects species' leaf litter decomposition through the effect of termites. Although the factors affecting decomposition differed depending on forest types, a small set of functional traits can predict species' decomposition across forest types.

Post-planting performance of *Zelkova serrata* and *Fraxinus chinensis* subsp. *rhynchophylla*

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Abstract

This study was conducted to understand the growth performance of Sawleaf zelkova (*Zelkova serrata*) and East Asian ash (*Fraxinus chinensis* subsp. *rhynchophylla*) after planting. Sawleaf zelkova is commonly used for landscaping and the plantation area of East Asian ash is increasing in South Korea. Seedlings were planted in density of 5,000 trees/ha, 10,000 trees/ha and 20,000 trees/ha in the Taehwasan University Forest. The mortality and height of seedlings were monitored for four years after planting. The survival rate was 76% for zelkova and 80% for ash and both showed the highest mortality during the first 2 years after planting. The height of the zelkova was significantly higher than that of the ash after four years ($p<0.05$). The growth rate of both species was low in the first two years and recovered from the third year. This study would provide information on initial growth of the two species after planting.

Construction of genetic linkage map and determination of QTLs by GBS and GWAS in *Populus davidiana* Dode

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Abstract

Genus *Populus* is rapid-growing and relatively high carbon absorption ability, so used for phytoremediation and short-rotation coppicing. Poplar species are also known to be suitable and model for genomic tree breeding. The main purposes of the present study are to construct a high-density genetic linkage map of *Populus davidiana*, using the genotyping-by-sequencing (GBS) technique that is one of the next-generation sequencing tools, and to search QTLs related to the growth of height, root collar diameter, and the recovery of defoliator damage. The growth characteristics of seedling height and root collar diameter were investigated, and leaf samples were collected from the four-year-old seedlings. The recovery of defoliator damage was also surveyed in the same seedlings. The collected samples were verified by conducting parental analysis using microsatellite markers after DNA extraction, and only the samples verified as paternity were used for this study. The DNA of the verified samples were digested using Apek I restriction enzyme, and these DNA fragments were made into a GBS libraries and sequenced. The sequenced reads were mapped in the reference genome of *Populus trichocarpa*. A total of 58,040 SNP markers were mapped in the reference genome, of which 17,755 SNP markers were used to construct the genetic linkage map. A total of 19 linkage groups were found and the total length was 2,129.54 cM. Based on the genome-wide assorted selection (GWAS), the analysis of quantitative trait locus was performed on the three traits investigated.

Keywords: *Populus davidiana* Dode, genetic linkage map, QTL, genotyping-by-sequencing

Imputing Long-term Tree Species First Leafing and Flowering Dates at the Tokyo University Hokkaido Forest

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Abstract

This study aimed to impute the missing first leafing and flowering dates in the period 1931–2017 of seven dominant and codominant tree species in the University of Tokyo Hokkaido Forest based on daily temperature records for the same period. Three temperature predictor data sets with different temporal resolutions were created. The predictors included the average minimum, mean, maximum, and diurnal range within a day of the year period. We used a LASSO regression approach to develop imputation models. Using 2018–2020 observations as validation, the best imputation model for a combination was the one with the minimum mean squared error between the observed and predicted dates. The results showed that different combinations were best predicted by different temperature data sets. Because all absolute prediction biases are less than 14 days, a commonly accepted standard, the selected models will enable us to impute the missing dates.

Effects of forest area and forest fragmentation on population dynamics of Hainan gibbons

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Abstract

We utilize RS and GIS to determine forest dynamics across Bawangling National Natural Reserve (BNNR) and within the home ranges of all Hainan gibbon social groups from 1990 to 2021, and use time-series data to quantify the relationship between forest dynamics and gibbon population dynamics. Forest quality (as measured by percentage cover, total area, and fragmentation) has improved across the overall BNNR landscape and within the home ranges of the two long-established Hainan gibbon social groups (A and B) over the past three decades, and we demonstrate a positive correlation between total number of gibbon individuals and both percentage forest cover and forest area with a 1-year time lag. Conversely, there are no positive correlations over time between metrics of forest quality and variation in total number of individuals within each gibbon social group, and gibbon group C increased to 11 individuals while local forest quality deteriorated.

Long-term Population Dynamics of the Beech Caterpillar, *Syntypistis punctatella* (Motshulsky) (LEPIDOPTERA: Notodontidae)

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Abstract

The beech caterpillar, *Syntypistis punctatella* is a monophagous species that feeds on the foliage of two species of beeches in Japan and sometimes causes complete defoliation on the Siebold's beech, *Fagus crenata*. The population outbreaks have been reported to occur periodically with about 10-year intervals by cyclic population dynamics. The population densities of the final instar have been monitored using litter traps in four sites located in northern Japan since 1985. The density was estimated by the quantity of fallen frass. The density basically changed with an approximately 10-year cycle that was generated by endogenous delayed density-dependent factors, mainly an entomopathogenic fungus *Cordyceps militaris*. White noises caused by rainfall (plum rain) during the larval stage showed a strong influence on the cycle and disordered population synchrony among the sites.

Field Attraction and Electroantennogram Responses of Korean Pine Wood Nematode Insect Vectors to Sex-Aggregation Pheromone, Kairomone, and Host Volatiles

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Abstract

Electroantennogram responses and field attraction assay of matured male and female adults of korean pine wood nematode insect vectors, *Monochamus saltuarius* Gebler *and Monochamus alternatus* Hope, to sex-aggregation pheromone (monochamol), kairomone and host volatiles were tested and compared. The tested volatiles were monochamol, (-)-α-pinene, (+)-α-pinene, β-pinene, ethanol, myrcene, β-caryophyllene, 3-carene, (+)-limonene, (-)-limonene, ipsenol and ipsdienol. Electroantennogram responses to were recorded at various concentrations, 0.1, 1, 10, 100, 1000 µg / 10 µl n-hexane. In field assay, both species showed different preferences among combinations or isomers of pheromone and host volatiles.

Species Diversity of Bark and Ambrosia Beetles in a Tropical Montane Forest of Northern Borneo Island

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Studies on bark and ambrosia beetle (Curculionidae: Scolytinae and Platypodinae) are still poorly documented in Malaysia Borneo, with regard to species diversity. To address this gap, a three-year study was conducted in Long Mio, Sipitang, Sabah, which were compared using ethanol traps (ET, three land-use types) and grab-and-go method (GG, 95 tree species from 109 sampled logs). GG recorded higher beetle captures (271 species, 9,015 individuals) compared to ET (173 species, 7,212 individuals). GG worked much better for Platypodinae (133 species, 6,061 individuals) than ET (21 species, 30 individuals). Conversely, ET captured a higher number of scolytine species (152 species, 7,182 species) compared to GG (138 species, 2,954 individuals). ET recorded the highest diversity in disturbed forest (H' = 2.643) and the lowest in primary forest (H' = 2.311). For GG, *Lithocarpus conocarpus* and *Nephelium* sp. recorded the highest (*H'* = 2.88) and the lowest diversity (*H'* = 0.71), respectively.

Proposal of study on altitudinal variation of bark beetle assemblages in Indo-Pacific forests

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Abstract

For strengthening the tie among university forests in Asia on bark beetle research, we propose a project for investigating bark beetle assemblages in managed forests along an altitudinal gradient to compare and characterize bark beetles in different forests from north Asia to south Asia with species composition and abundance. The use of ethanol-baited trap is suggested for common collecting device setting up for one week in forests along an altitudinal gradient from 400 to 1000 m a.s.l. at every 150 m of altitude. In each of these altitudinal interval site, there will be two transects separated by 50 m, each consisting of five traps separated by 30 m. In the study period of one year, every month conducts one investigation and retrieve the collections for identification. Both temperature and humidity of each altitude are also measured for further analysis on how local environmental factors affecting the emergence of beetles.

The growth performance of one-year-old *Octomeles sumatrana* and *Terminalia subspathulata* King on degraded forest land in Sandakan, Sabah

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Abstract

Octomeles sumatrana and *Terminalia subspathulata* King are fast-growing tree species planted in forest gaps created after harvesting. Silviculture trials were established along enrichment planting corridors at the Segaliud Lokan Forest Reserve, Sandakan, to gauge their growth performance. The experiments were in RCBD, with three replicated blocks representing four planting spacing (4mx4m, 5mx5m, 4mx8m, 8mx8m), and three combinations of ERP and NPC fertilisers on degraded forest sites. Tree growth meteorological and environmental data were obtained and analysed at twelve months. The mean survival of *T. Subspathulata* and *O. sumatrana* was 92.6 to 100%. There were significant differences ($P<0.05$) for some growth characteristics between the planting spacings and fertiliser treatments for both species on moderately and severely degraded sites. The best growth performance for both species was shown in 4mx4m planting spacing, and 100g ERP application on the first month, 25g and 50g NPC application on the second and third month.

Impacts of Tree Coring on Growth of *Pinus kesiya* Royle ex Gordon

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Abstract

Due to the crisis of dieback pine trees in the natural forests of Thailand, one of the suspected causes, without academic support documents, is the wood sample collection using an increment borer. This research aims to clarify the effects of increment coring on Khasi pine growth in northern Thailand. These pine trees were divided into three groups of small, medium, and large sizes. Each sized group was also divided into two groups of coring and non-coring. Tree diameter was measured every two months to monitor the growth of each tree since 2019. By using the statistic of the repeated measures ANOVA, it was indicated that there were no significant differences among the growth patterns of small, medium, and large pine trees in both coring and non-coring conditions. It could be summarized that the increment boring did not slow down the pine growth rate and caused the dieback after coring.

Old Sugi (*Cryptomeria japonica*) plantations at the University of Tokyo Chiba Forest: Long-term growth trends and current status

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Abstract

Cryptomeria japonica D. Don ('Sugi' in Japanese) is one of the important plantation species in East Asia. The University of Tokyo Forests (UTF), National Taiwan University Experimental Forest (NTUEF), and Seoul National University Forest (SNUF) hold old *C. japonica* plantation stands, which were planted between 1890s–1920s. Under the Core-to-Core Program of the Japan Society for the Promotion of Science (JSPS), researchers in three universities have been working together for collaborative research activities on long-term *C. japonica* growth. This presentation synthesizes the long-term growth trends and current status of old *C. japonica* plantations at the University of Tokyo Chiba Forest. Our long-term growth observation revealed that the growth of Sugi did not get slower even at older ages at both the individual tree level and the stand level. The stand volume and average DBH of old Sugi plantations showed large variations and there were no significant correlations with stand age.

Historical forest management plans as long-term research materials

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Abstract

In the long history of forest management, sustainability of timber production and forest stock has been treated as key factors. Developing forest management plans (FMPs) has been the main action to attain such goals and hence FMPs tend to use the best quality data in those time, be archived as high-priority documents, and are expected to become useful research materials for past forestry activities and forest conditions.

In Japanese forest planning system stated by the Forest Act, FMPs with four stages (national basic, national, regional and municipal) are publicly developed, and private FMPs are voluntarily developed. Also, FMPs of national forests are currently developed for each "forest planning region", however, the planning units does not correspond to national forest's organizational units, which previously developed their own FMPs. Each individual UTF has developed its own FMP, currently named as "educational and research plan".

Study of mycorrhizal communities of rehabilitation a Cryptomeria japonica plantations to a mixed deciduous and coniferous forest

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Abstract

Prior to large scale planting of *Cryptomeria japonica* at Xitou Nature Education Area during the early part of the 20th century, the area was previously dominated by Lauro-Fagaceae association. A silvicultural experiment is set up with the motivation to understand stand dynamics of rehabilitating a *C. japonica* plantation as a mixed species plantation. The experiment is set up as a one-factorial completely randomized design at a forest stand of 1.7 ha, where all C. japonica trees were removed. A hardwood (*Michelia compressa*) and a softwood species (*Cunninghamia lanceolata*) are chosen and planted with a fixed density but with different spatial arrangements. The experiment factor is planting ratio of 1:1, 1:3, and 3:1 (M. compressa : C. lanceolata). We used wet sieving and decanting method to survey the rhizosphere arbuscular mycorrhizal fungi, results shows dominant mycorrhizae species are completely changed after planting mixed tree species.

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

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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 January 2022. 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 67 trees consisting of 20 species have been infected by ganoderma in April 2021, became 95 trees (24 species) in November 2021, and reached 109 trees (25 species) in January 2022. Disease incidence each monitoring were 0,56%, 079%, and 0,91% 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.

The Dynamics Of Ujung Pangkah Mangrove Coverage (KEE) Using Combined Mangrove Recognition Index

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Abstract

As an ecosystem that is sensitive to changes, regular monitoring activities are needed due to its (dynamic) vulnerability to change. Monitoring activities that are labour intensive can now be carried out by utilizing remote sensing that is minimal in labour. Mangroves in the Ujung Pangkah Essential Ecosystem Area (KEE) are very vulnerable to the threat of sedimentation that occurs in the Bengawan Solo watershed which potentially could change mangrove formation. This research is one of the pilot projects to test the Combined Mangrove Recognition Index (CMRI) method which has never been used in Indonesia. CMRI takes into account the correlation between the Normalized Difference Vegetation Index (NDWI) and the Normalized Difference Water Index (NDWI). The results of this study indicate the dynamics of mangrove area cover in the range of 2000 to 2020 in the Ujung Pangkah Mangrove Area which mainly caused by acretion and land use convertion to fishpond.

Remote Sensing of Tropical Rainforest Biomass Changes in Hainan Island, China from 2003 to 2018

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Abstract

The saturation phenomenon of remote sensing data from different satellite sensors results in low forest biomass estimation accuracy in tropical rainforests with high biomass density. In this study, a remote sensing estimation model of tropical rainforest biomass was established by establishing Hainan tropical rainforest database, introducing forest age and 14 types of environmental information, combined with enhanced vegetation index (EVI). The fitting determination coefficient R^2 of the model was 0.694. The remote sensing estimate of relative bias was 2.29%, and the relative root mean square error was 35.41%. The tropical rainforests in the northern and coastal areas of Hainan Island have been severely damaged by tourism and real estate development. Particularly in low-altitude areas, large areas of tropical rainforest have been replaced by economic forests. Furthermore, there were few tropical rainforests in areas with high rainfall. Therefore, afforestation in these areas could maximize the ecological benefits of tropical rainforests.

Development and implementation of community forestry policies in Taiwan.

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Abstract

There are two kinds of community forestry programs in Taiwan, one was initiated by the Forestry Bureau in 2002 and already with more than 2,500 cases, the other was by the National Taiwan University Experimental Forests in 2010 with less than 200 cases. Adopting a qualitative approach, this study aims to discuss the development and effectiveness of both community forestry programs. The results showed that it is regarded as a way to promote community participation in forest resource management for the community forestry program of the Forestry Bureau, whose topics are mainly related to resource conservation and forest patrolling. The bureau could build links with local communities effectively through the program as the majority belonging to the 1st stage. The community forestry program of Experimental Forest in this university focuses on providing economic incentives and empowering local communities on environmental-friendly development activities with few relevant to participation.

Forest Management Certification Status of Rubber Plantations in Thailand

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Abstract
    This research aimed to study forest management certification status of rubber plantations in Thailand, including the analysis of problems and risks compliance with the standard of Forest Stewardship Council (FSC) forest management (FSC-FM) certification activities during the period 2011-2019. The results indicated that there were19 FSC-FM certifications in Thailand covering only 0.6% of the total rubber plantations area. The number of major and minor Corrective Action Requests (CARs) and observations were 76, 199 and 2 times, respectively. They were identified and grouped into 69 issues. The initial risks of the rubber plantation compliance with the FSC-FM certification standard in Thailand were then analysed and categorized into 4 levels, namely, very low, low, medium and high risks. The items found in each risk level were 148, 14, 19, and 36 items, respectively.

REVISITING FOREST CERTIFICATION IN SRI LANKA: THE FOREST MANAGEMENT AND EXPORT WOOD-BASED MANUFACTURING SECTOR PERSPECTIVES

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Abstract

Forest Stewardship Council certification (FSC) has become the most popular forest certification practice mainly in developing countries. Hence, the investigation of wood-based manufacturer's perspective towards FSC certification is highly important. In this study, fifty forest-based companies were surveyed and their satisfaction with the performance of FSC certification in its economic, environmental and social aspects ware analysed using Importance-Performance Analysis (IPA). Customer demand, the ability to access new markets, enhancement of the market share, and price premiums can be considered as the driving forces of certification. In addition, certification positively influenced sales volume and reduces business risk by securing continuous orders from their buyers and positively affect the company image. Further, study findings provide implications for the FSC certification scheme and independent certifiers, enabling them to identify the areas of FSC certification that need improvement.

Ecosystem services and conservation priority regions of the Hainan Tropical Rainforest National Park in China

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Abstract

Hainan Tropical Rainforest National Park (HTRNP) on the Hainan Island, an island included into the globally important Indo-Burma biodiversity hotspot, comprises seven regions, while ecosystem services in these regions remained unexplored. Here we first quantified five ecosystem services, i.e. water conservation, soil retention, carbon storage, oxygen release, biodiversity maintenance, for seven regions of HTRNP from 2000, 2010 to 2019, using InVEST, RUSLE, NPP transformation formula, and MaxEnt models, and then determined the important ecosystem services. Finally, we identified the conservation priorities of HTRNP. We found (1) total and average volumes of five ecosystem services in HTRNP declined firstly and then increased from 2000, 2010 to 2019. (2) Water conservation, carbon storage and oxygen release were dominant ecosystem services. (3) Conservation priorities were assigned to the higher altitude areas of east and north parts in HTRNP. These results are helpful for formulating effective management strategy to enhance ecosystem services for HTRNP.

Mapping Ecosystem Services in Tropical Wetland Area of Sabah, Malaysia

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Abstract

Mapping wetland ecosystem services (ES) supply and their linkage between multiple land use pressures is the key issue for an effective tool in conservation management. This study assesses the ES supply of multiple land cover pertaining to wetland conservation effectiveness. This approach used different land cover/land use types as complex indicators. Qualitative expert judgment assessment of ecological integrity and ES supply, combined with the land cover types with ecosystem categories and subtypes were conducted to identify their respective capacities. Our empirical results showed that there were dynamic changes and declining supply of all the ES particularly regulating services in the wetland area. The diminishing supply, on the other hand were significantly influenced by other land use type and human livelihood activities. The indicators derived from this study demonstrate an innovative approach to non-monetary valuation of tropical wetland ES supply.

Streamflow discharge responses to thinning treatment in an unmanaged Japanese cypress plantation

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Abstract

In between the 1950s and 1970s, Japan has developed large forest plantation under the government conifer-centered policy for timber production. However, due to the stagnation of domestic forest economy since the 1980s, plantations were left without silvicultural practices for several decades. These unmanaged plantations with high tree stand density become unsustainable and may reduce water resources availability. The aim of this research is to seek the response of total streamflow yield, quickflow and baseflow to thinning operation in an unmanaged Japanese cypress plantation. A paired catchment approach is used in this research, where streamflow in two neighbouring headwater catchments have been monitored since 2016. A 40% of thinning in terms of stand density was applied to the treatment catchment in early 2020. The annual water yield from the treatment catchment increased in both the first (2020) and second year (2021) after thinning.

Effects of thinning on rainfall partitioning in a dense unmanaged Japanese cypress plantation

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Abstract

This study exams the thinning effects on rainfall partitioning (precipitation (P), throughfall (TF), stemflow (SF), canopy interception loss (CI)) in a dense unmanaged Japanese cypress plantation with a paired-plot design, in which two plots (one treatment and one control) have been deployed to better understand the thinning effects. The rainfall partitioning data have been collected since 2016, a 38% stem removal thinning was conducted on the treatment plot on Jan 28, 2021. A comparison of the treatment plot data between before- and after-thinning periods shows that, after thinning, annual TF/P ratio increase by 8.7%, SF/P decreases by 0.1%, CI/P decreases by 8.6%, compared to the average annual values during the before-thinning period. The observed vs predicted values comparison (using before-thinning treatment plot vs control plot linear relationship and after-thinning observed control plot data) shows observed TF is 12.6% larger, and SF, CI are 14.6% and 70.6% smaller, compared to the predicted values.

Three-dimensional change in reproductive phenology duration

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Abstract
The duration of reproductive phenology (flowering and fruiting) is related to the dry mass and size of seeds, which is crucial for the successful spread of species. Previous studies on plant reproductive phenology mostly concentrated on start dates and few species. Here, for the first time, we collected more than 20 thousands species covering almost all angiosperms in China on reproductive phenology duration to understand how flowering and fruiting durations vary across broad environmental gradients. Our results showed that the duration of reproductive phenology among of plant species gradually shortened along latitudes, whereas there was no obvious change across longitudes. Only the herb species were obviously affected by changes in altitude, whereas the results from the woody and total plant species were not significant. The mean annual temperature and the length of the growing season were the most important factors for the herbaceous plants, and that the average winter temperature and temperature seasonality were the most important for the woody plants. Our study uncovers the drivers of key flowering and fruiting phenophases and proposes a geographic pattern of reproductive phenology durations that applies to both herbaceous and woody plants. Geographical patterns of phenological duration can provide insights into ecological and evolutionary processes that influence phenological timing and phenological diversity.

Resilience of tropical forests after Drought—A Case Study in Xishuangbanna, China

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Abstract

With global warming, drought events are becoming more frequent and severe, threatening even the most intact tropical forest ecosystems. This study uses the Spatially Explicit Individual Based Dynamic Global Vegetation Model (SEIB-DGVM) to simulate multiple drought scenarios, rain and dry seasons × 12 level durations × 4 level intensities, repeats the simulation 2,000 times to obtain the response process of the ecosystem after drought, and compares and analyzes the legacy effects of different droughts on the ecosystem. This study is expected to address the following questions: 1. Can ecosystems recover to pre-disturbance levels after being disturbed by drought? 2. How long does it take for the ecosystem to return to a new equilibrium state? Assessing the post-drought resilience of tropical forest ecosystems has important guiding significance for forest post-disaster management.

Tropical Rainforest Successional Processes can Facilitate Successfully Recovery of Extremely Degraded Tropical Forest Ecosystems Following Intensive Mining Operations

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Abstract

We described a reforestation protocol which is based on tropical rainforest successional processes to not only prevent landslides and tree uprooting due to frequent typhoon and heavy rain, but also accelerate tropical forest succession. This protocol first used the slope and soil layer of the undisturbed old-growth tropical rainforest as a reference to reconstruct slope and soil layers. Then multiple tropical tree species with high growth and survival rate were separately monocultured in the reconstructed soil layers. Our results showed that, both typhoons and heavy rains did not result in landslide or any tree damages in the area this reforestation protocol was used, based on tropical rainforest successional processes, our research provides an effective protocol for quickly and effectively restoring an extremely degraded tropical rainforest ecosystem. We expect that this work will be important for the future recovery of other extremely degraded tropical rainforest ecosystems.

The Dynamic of Macro Fungi at the Arboretum of Faculty of Forestry Universitas Gadjah Mada

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Abstract
Arboretum of Faculty of Forestry Universitas Gadjah Mada (UGM) is one of the urban forest in the UGM area. The arboretum is consisted by variate trees and be able to provide microclimate so it becomes suitable habitat of some organisms, like macro fungi. Macro fungi are important ecosystem component including the arboretum. Their growth is affected by weather, season, and climate. The growth of Agaricales order in the arboretum is significant especially in rainy season and has the higher fluctuation compared to Polyporales order which has longer life cyle. The results showed the dynamic of Agaricales was variate from 2018, 2020, and 2021 which found 19, 12, and 27 genera respectively. However, the Polyporales, which grew on the fallen trees and wood debris, did not show a significant fluctuation. Some macro fungi in the arboretum can be utilized as food and medicine such as Auricularia, Fomes, Ganoderma, and Pleurotus.

The Diversity of Macro Fungi at Hiking Track of Lawu Mountain, Indonesia

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Abstract

Lawu Mountain has a unique ecosystem mountain in Java island, Indonesia, making the southern slope is suitable for macro fungi to grow. The aim of this research was to identify and analyze the diversity of macro fungi along the hiking track. The result showed there were 28 genera of macro fungi, with most of them were Agaricales, has roles as saprophytic and decomposer as well as useful for edible and medicinal mushrooms. The level of diversity of macro fungi was low at 1900-2100 masl (0,87) and 2901-3100 masl (0,86), while at at 2101-2300 masl (1,08), 2301-2500 masl (1,03), 2501-2700 masl (1,6), and 2701-2900 masl (1,35) were moderate. The abundance of macro fungi was high at an altitude of 2301-2500 masl (0.76 individuals/m2) and was dominated by Hygrocybe mushrooms at an altitude of 1900-2900 masl. There were many specifically mushrooms at the mountain such as Arrhenia, Inocybe, Hygrocybe and Lentinula.

Exploration of drought tolerant fungi isolated from rhizophere of *Abies koreana* to see their effect on *Capsicum annuum* under drought stress

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Abstract

In agriculture, broad management of drought tolerant plant growth promoting fungus (PGPF) is of great significance. The survival and adaptation of PGPF under drought conditions were investigated in this study. Ten fungal strains were identified from rhizospheric soil of *Abias koreana* in the Girisan mountain. Three of them were discovered to be extremely drought tolerant medium supplemented with 10% PEG. On the basis of morphological and biochemical characteristics, isolated fungi were identified and classified. The most resistant strain was identified as *Trichoderma virens* and it was chosen to promote Capsicum growth under drought stress. Under drought stress, *T. virens* exhibited a positive effect on the biochemistry, physiology and antioxidant enzymatic activities of Capsicum plants. This study showed that the inoculation of PGPF improves the growth attributes for example photosynthetic pigments and relative water content. On the basis of this data, it may be concluded that inoculating Capsicum seeds with T. virens can reduce the negative effects of drought on Capsicum plant.

First report of the *Mesua ferrea* L. Dieback in Yagirala Forest reserve

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Abstract
Mesua ferrea L. commonly known as "Naa" (Ceylon ironwood) is a medium to large evergreen tree, native to Sri Lanka, occurring in the lowland rainforest and moist monsoon forest, either scattered or in more or less pure small patches. In lowland rainforests *Mesua ferrea* plays a significant role by making species communities with association of various other species. Wood is hard and flowers and leaves used in traditional medicine. A small patch of *Mesua ferrea* present in the in Yagirala Forest reserve (6˚21' to 6˚26' N and 80˚08' to 80˚11' E) and showing symptoms of forest dieback. As a reconnaissance survey, physical observation were made and number of healthy trees, trees showing dieback symptoms and dead trees were counted. The stand is located in flat terrain and there were 17 living trees and 6 dead trees. The diameter at breast height of the study trees varied in between 21cm to 53 cm. Symptoms included wilting and blackish discoloration of leaves, shoot, twig and branch dieback. Symptoms of beetle attack or necrosis of bark tissue, discrete necrotic lesions in the bark were not observed. Except one single tree in the stand, all other living trees showed the symptoms of forest dieback indicating the severity of the issue. It appears that the forest dieback present across Sri Lanka has entered into Yagirala Forest reserve. Therefore, immediate comprehensive investigations are required for identifying causative factors of *Mesua ferrea* dieback and providing migratory measures.

Key words: forest dieback, Yagirala Forest reserve, *Mesua ferrea*

The Occurrence of Root Rot Disease on Urban Trees of Universitas Gadjah Mada

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Abstract

Universitas Gadjah Mada (UGM) is a Green campus that considers the vegetation landscape. As a green campus, UGM is developing urban trees with various species, size, and ages characteristics. *Ganoderma* spp. is a fungus that causes root rot, which is commonly found on living trees at UGM. The aim of this research was to evaluate the occurrence of root rot disease by *Ganoderma* spp. This research was conducted from March to April 2021 using a complete survey method on 11.929 urban trees with DBH of more than 10 cm. The results showed that 67 trees from 20 different species were infected by *Ganoderma* spp. The most infected tree species were *Leucaena leucocephala, Pterocarpus indicus, Adenanthera pavonina, Manilkara kauki* and *Cassia fistula*. The incidence of *Ganoderma* spp. infection was rare and the disease severity was low to very severe. Because the infection is fast, its presence needs to be considered.

Three trophic level of insect community based on sandalwood (*Santalum album*; Santalaceae) flowering phase in Tlogo Village, Nglanggeran, Gunungkidul

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Abstract
This research was done at the peak of the flowering period of sandalwood which grows naturally in Nglanggeran, Gunungkidul, Yogyakarta in February 2015. The aim was to determine the insect community and the effect of variations of flowering sandalwood character of the insect community. Survey method used to select the group of stands and the individual which has the same floral colour and flowering phase. The method used for observation, documentation and collection is direct sampling. Identification of insect held at the Laboratory of Entomology, Faculty of Agriculture, Universitas Gadjah Mada. The influence of flowering phase to insect community was measured by Multivariate ANOVA in SPSS version 25. The result showed that the insect communities consist of 7 orders, 23 families. Flower abundance was significantly influenced by family Formicidae, Vespidae, Eumenidae, Syrphidae, Muscidae, Hesperiidae, Nymphalidae; while the flowering phase did not significantly influence without any interaction with other factors.

Identification of (Z)-9-heptacosene and (3Z,6Z,9Z)-tricosa-3,6,9-triene as new sex pheromone components of yellow peach moth, *Conogethes punctiferalis* (Lepidoptera: Crambidae) and field attraction test

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Abstract

Recently, reduced attractiveness of Conogethes punctiferalis adult males to sex pheromone, (E)-10-hexadecenal and (Z)-10-hexadecenal, have been reported. To find out the other essential components of sex pheromone, male and female body extracts were analyzed. Two hydrocarbon components, (Z)-9-heptacosene (Z9-27:HC) and (3Z,6Z,9Z)-tricosa-3,6,9-triene (Z3,6,9-23:HC), were identified from only female body extract. There was a significant difference in the electroantennogram (EAG) response of male antennae to Z3,6,9-23:HC and Z9-27:HC at all test concentrations compared to response to the hexane control. In field attraction testing, addition of Z9-27:HC and Z3,6,9-23:HC to binary aldehyde pheromones significantly increased trap catches of C. punctiferalis male adults. Based on the female and male body extract analysis and field attraction test, Z-9-27:HC and Z3,Z6,Z9-23:HC were determined as other essential sex pheromone components of Korean C. punctiferalis.

Morphological and biological characteristics of
the western conifer seed bug, *Leptoglossus occidentalis* Heidemann
(Heteroptera: Coreidae)

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Abstract

The western conifer seed bug, *Leptoglossus occidentalis* is a serious insect pest in various conifers, which caused significant decreases in seed production of *Pinus koraiensis* in Korea. Herein, we investigated the morphological and biological characteristics of Korean WCSB population. The population showed similar morphology with overseas populations. Body lengths of adult males and females were 17.2 and 19.05 mm, respectively, while pronotum widths were 4.85 and 5.55 mm, respectively. Body weights were 111.27 and 169.89 mg, respectively. Body lengths of the first to fifth instar nymphs were 3.07, 4.76, 8.77, 13.56, and 15.53 mm, respectively. Developmental duration of the egg and nymphal instar stages were 8.63, 3.69, 7.63, 5.82, 5.83, and 9.15 days, respectively. Nymphal mortality was shown as 47.5%. Life expectancies of adult males and females were 58.2 and 63.9 days. A single Korean WCSB adult female laid averagely 68.6 eggs during the lifetime.

Seasonal changes in the number of flying adults, body size, and the number of mycangium pits of *Platypus quercivorus*

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Abstract

Japanese Oak Wilt (JOW) is caused by *Raffaelea quercivora–Platypus quercivorus* complex and kills oak trees. JOW-related mortality occurs mid-July–mid-September, whereas flying season of *P. quercivorus* lasts much longer (June–November). We hypothesized that a quantity of *R. quercivora* carried by *P. quercivorus* is related to this phenomenon. This study determined seasonal changes in the number of flying beetles, their body size, and the number of mycangium pits. Beetle samples collected by multi-layer funnel traps throughout flying season were sorted by sex and the number of pits, oven-dried, then weighted. Two peaks were observed in the seasonal occurrence. Body size was largest in early August and smallest in early October. Number of mycangium pits varied in a similar manner to the body size so that the fungus quantity carried by *P. quercivorus* possibly change seasonally. Environmental factors likely influenced the body size and number of mycangium pits.

Seasonality and Ecology of Bark and Ambrosia beetles at Ulu Padas Forset Reserve, Sabah, Malaysia

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Abstract

A study on bark and ambrosia beetles (Coleoptera: Curculionidae: Platypodinae and Scolytinae) was conducted at Ulu Padas Forest Reserve, Sipitang, Sabah, Malaysia. The objectives of this study were to determine the influence of felled log species and size on species composition and abundance of bark and ambrosia beetles, and the seasonality of bark and ambrosia beetles based on the beetles' occurrence time and abundance. The grab-and-go sampling method was applied in this study. A total of 9,015 initiating individuals with 271 beetles species were sampled in this study. *Gluta Oba* (Tree 28) harboured the most beetle abundance (807 individuals) while *Castanopsis* sp. (Tree 6) recorded the highest number of beetle species (36 species). PERMANOVA detected significant influences of log species and size on the beetle species composition. The seasonality patterns of the beetle species were varied among beetle species in both Platypodinae and Scolytinae groups.

Diversity and Dynamics of Bark and Ambrosia Beetles in Three Land-use Types of Ulu Padas Forest Reserve
Sipitang, Sabah, Malaysia

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Abstract
A study on diversity, seasonality and cyclicity of tropical Bark and Ambrosia (B&A) beetles were conducted from May 2017 to May 2020 at Ulu Padas Forest Reserve, Sipitang, Sabah, Malaysia. The objective was to test the relationship between tropical climatic factors and B&A beetle community trends in three land-use types–Primary Forest (PF), Disturbed Forest (DF) and Plantation Forest (PL). The sampling method was by using ethanol-baited traps and samples were collected every two weeks. There were 80 samples collected overall. B&A beetles were highly abundant and diverse with *Scolytogenes sp.SA1* dominating all land-use types. DF was the most even and diverse with the lowest dissimilarity. Mean precipitation influenced beetle abundance but had a weak positive correlation ($p \leq 0.001$, $R^2 = 0.00407$). Beetle emergence was higher during the start of rainy seasons due to indirect effects of rainfall. However, no significant cyclic patterns were observed.

Effects of plant fine root functional traits and soil nutrients on the diversity of rhizosphere microbial communities in tropical cloud forests in a dry season

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Abstract

In this study, the fine root functional traits and rhizosphere soil environmental factors of 13 representative plants in Bawangling tropical cloud forest of Hainan Island were measured, to assess the key factors driving plant rhizosphere microbial communities. Results showed that root phosphorus content, the specific root length and specific root area, were significantly negatively correlated with the Faith-pd indices of the bacterial community. The soil pH was significantly and positively correlated with the Chao1 index, OTUs, Faith-pd and Simpson indices of the bacteria and fungi communities. The soil available phosphorus content was significantly and negatively correlated with the bacteria Simpson, and the fungus Faith-pd indices. ABT analysis showed that soil pH and soil available phosphorus were the important environmental conditions contributing to the rhizosphere bacterial and fungi communities, respectively. Our findings demonstrate that the soil environments had more influence on rhizosphere microbial diversity than fine root functional traits.

Patterns of bat functional diversity in the Japanese archipelago

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Abstract

  The studies in island biogeography of bats have shown relationships between species richness (SR) and island characteristics. To gain a deeper understanding of the mechanisms underlying these patterns, it is necessary to investigate functional diversity which allows us to infer the functional roles of ecological features and biological interactions in structuring bat assemblages. This study investigated the taxonomic and functional diversity patterns of Japanese insectivorous bats across 17 islands and relationship between the diversity and island characteristics (area and distance to the mainland). Firstly, our analyses showed that SR and functional richness (FRic) significantly positively correlated with the island area, but the relationship was weaker in FRic than SR. Secondly, the analyses of beta diversity indicated that the relative contribution of nested components was higher in functional diversity (48 %) than species diversity (32 %). These results suggest that functional traits play a role in structuring bat assemblages.

Estimating the distribution and future prediction in Japanese bat

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Abstract

Quantifying the potential impacts of climate change on species distribution is essential for developing effective conservation strategies. Species distribution models (SDM) can be one of important tool. Bat, the second most diverse group of mammals, is a group that is threatened with extinction for many species. Our aim is to estimate the potential distribution based on species distribution models for 22 Japanese bat species and to quantify the impact of future global warming based on the estimation. In our results, it was predicted that potential distribution of 13 species would decrease, 5 species would remain and 4 species would increase. Eight of 13 species that would decrease had a rate of change below -50%. These eight species were not listed on the Red List of the Ministry of the Environment. This suggests the need to consider the response to global warming when evaluating species in the future.

Dynamics of Avian Community in Shade Grown Coffee Agroforestry of Central Java, Indonesia

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Abstract

Coffee (*Coffea* spp.) is one of the most important commodity crops in the world, including Indonesia as coffee producers countries. Coffee fields are particularly suitable to host high levels of biodiversity as they are traditionally cultivated under dense and diverse shade canopy. In Indonesia, few studies have quantified animal biodiversity in coffee fields and none of these have consider dynamics of avian community in such shade- grown coffee ecosystem. In addition, studies involving roles of shade grown coffee for biodiversity mostly carried out as a shapshot description. We established a longterm monitoring of response avian communities in a shade grown coffee in Central Java Indonesia. We established 91 points of observation in Kemuning of Temanggung regency, and monitored during 2015 to 2021. At least 3 times a year, 15 days of surveys were conducted. In each point, we identified bird species within 50m of radius, and taking note their vertical and horizontal position. We compare the encounter rates of birds between the different time scales and grouping them by ecological role (e.g. pollinators, seed dispersers). We found 80-104 bird species during our observation, and mostly dominated by insectivorous. We only measured vegetation data once, which assumed doesn't change much during our study, however observation of vegetation data might helpful in the future to explain the dynamics.

Keywords: aves, coffee grown, conservation, wildlife friendly coffee, monitoring

Increased occupancy of artificial nests can reduce the reproductive output of tits (Paridae) due to increased predation rate

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Abstract

Artificial nests are widely used for population increase and conservation of forest birds. However, the artificial nest can attract predators because of visual conspicuousness, and it may result in the reduction of breeding success and fitness of individuals that breed in the nests. This study was carried out at Nambu University Forest of Seoul National University from 2016 to 2019 to understand the relationship between nest occupancy, predation rate, and reproductive output of tits (Paridae) in artificial nests. Our results showed that the higher nest occupancy may not guarantee the higher reproductive output, measured by the number of fledglings, in breeding tits due to increased predation rate. Therefore, the use of artificial nests may not be always preferable to increase population sizes of forest birds, and the realized effects of artificial nests for forest bird conservation and management should be evaluated based on site-specific researches in different environments.

Identifying and extracting bark key features of 42 tree species using convolutional neural networks and class activation mapping

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Abstract

The significance of automatic plant identification has already been recognized by academia and industry. There were several attempts to utilize leaves and flowers for identification; however, bark also could be beneficial especially for trees. Previous studies regarding bark identification have mostly contributed quantitatively to increasing classification accuracy. Here, we trained two convolutional neural networks (CNNs) with distinct architectures using a large-scale bark image dataset and applied class activation mapping (CAM) aggregation to investigate diagnostic keys for identifying each species. CNNs could identify the barks of 42 species with > 90% accuracy, and the overall accuracies showed a small difference between the two models. Diagnostic keys matched with salient shapes, which were also easily recognized by human eyes, and were typified as blisters, horizontal and vertical stripes, lenticels of various shapes, and vertical crevices and clefts. Our methodologies and findings are potentially applicable to identify and visualize crucial traits of other plant organs.

Identification of diterpene synthases in *Chamaecyparis obtusa* with undiscovered function

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Abstract

Chamaecyparis obtusa, commonly called hinoki, has excellent wood featuring high durability and pleasant fragrance. These desirable attributes are contributed by specialized metabolites. This research focuses on the biosynthesis of specialized diterpenoids in *Chamaecyparis obtusa*. The formation of diterpenes undergoes two-step reactions, from a single precursor to various scaffolds, which are carried out by diterpene synthases (diTPSs). To find out and confirm the function of diTPSs, candidate diTPS were selected from the transcriptome and transformed into *Escherichia coli* for reactions. Chemical analyses were performed afterward to identify the structure of the products. Among the diTPSs identified, an enzyme capable of synthesizing (-)-beyerene was discovered for the first time. Three homologous enzymes of (-)-beyerene diTPS were also found in *Chamaecyparis obtusa* var. *formosana*, an endemic variety of *Chamaecyparis obtusa* in Taiwan, whereas only two of them are functional. The result glimpse the genetic diversity of specialized metabolism in Asian *Chamaecyparis*.

Functional traits and soil properties explain variation, and its association in the tropical evergreen monsoonal forest

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Abstract

In the context of forest community restoration, soil properties and plant functional traits interactions are known to affect the dynamics and functional structure of plant communities. Though, there is a limited knowledge in understanding the relationship between plant functional traits and soil properties for plant communities in tropical evergreen monsoonal forest. This study was conducted in tropical evergreen forest on Hainan Island, Southern China. Here, we examined the soft plant functional traits i.e., LSA, LT, SD and SWC to determine the correlation and intraspecific trait variability between functional traits and soil properties i.e., pH, TP, TN and OM using PCA and regression analysis. We found that CWM-RLWC and CWM-LSA was positively correlated with SWC and soil properties particularly, OM and TN had positive association. However, functional traits i.e., LSA and RLWC, in addition to soil nutrients i.e., OM and TN, should be considered in coastal forest restoration and conservation programs.

LIPOPHILIC COMPONENTS OF YOUNG MAHAGONY WOOD DURING HEARTWOOD FORMATION

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Abstract
This study aims to investigate the lipophilic components which play an important role in the process of heartwood formation in young *Swietania mahagoni*. The *n*-hexane extract was analyzed by GC-MS to determine lipophilic constituents. The content of *n*-hexane extract ranged from 0.7 to 2.4 % based on dried wood. This study showed that there were two major fractions detected, namely fatty acids (palmitic, linoleic, oleic, stearic, and arachidic) and sterols (β-sitosterol and cycloartenol). Palmitic acid was major component in fatty acids, while in the sterol fraction was β-sitosterol. In general, the lipophilic components increased with increasing tree age except for certain components. Subsequently, in radial variation, the lipophilic component was larger in the heartwood than in the sapwood part. The main lipophilic component played an important role in the formation of heartwood. Further studies are required to investigate the phenolic components as it is involved in heartwood formation.

Keywords: Lipophilic components; heartwood formation; fatty acids; sterols, *S. mahagoni*

Functional traits of soil nematodes define their response to nitrogen fertilization

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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.

Host Tree Selection of Vascular Epiphytes in the Tropical Cloud Forest of Hainan Island

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Abstract

This study was conducted to investigate the number, species, diameter at breast height (*DBH*), substrate type and the number and species of epiphytic vascular plants growing on all trees and shrubs with a diameter at breast height >1 cm in 21 fixed 20 m × 20 m sample plots in Bawangling area of Hainan Tropical Rainforest National Park. The relationship between epiphyte distribution and host species, *DBH*, height, and stroma type (bare bark, bryophyte mats, litter, and soil) was analyzed using Mixed linear model, One-way variance and Selectivity index. In the plot of tropical cloud forest, *Pyrrosia eberhardtii*, *Coelogyne fimbriata*, *Davallia repens*, and *Psychotria serpens* showed some selectivity for host trees species, with a significant preference for one to four species. The epiphytic vascular plant life also showed a significant preference for light substrate types (bryophytes) and more than 70% of epiphytes survived on bryophyte mats.

Areca triandra (Arecaceae): An introduced species on its way to becoming invasive

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Abstract

Areca triandra Roxb. Ex Buch-Ham is a palm introduced to Sri Lanka as an ornamental in the early 1900s, naturalized and spreading rapidly. This study investigates the reasons for successful colonization and makes an assessment of its invasiveness. Field surveys conducted in two tropical lowland rain forest locations i.e., Meethirigala and Yagirala Forest Reserves revealed the following: establishment was favoured by disturbance, by clustering habit of stems, high fruit production with 38% of stems bearing 150-200 fruits per infructescence, high seedling production with 69% of seedling in the surveyed plots identified as *A. triandra*. Further, seed germination experiment showed soil-depth and pericarp conditions are strongly correlated with percentage of germination with germination favoured by the absence of a pericarp and being close to the soil surface. Results were evaluated under "Criteria for categorizing invasive non-native plants that threaten wildlands" and showed highly invasive behavior in the characteristics under the assessment.

Key words: *Areca triandra,* aggressiveness, invasive species, naturalized palm

Exploration of pollen traits and its relevance in the taxonomy of

subfamily Papilonaceae of Hainan Island

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Abstract

The subfamily Papilonaceae is taxonomically complex and the pollen morphology of this subfamily is still poorly known. Therefore, this study aims to provide new palynological information to correctly identify and define species . Light and scanning electron microscopic techniques were used to observe various pollen traits. A significant variations was found in exine sculpturing i.e. most of the taxa have reticulate type pollen while Desmodium triflorum have psilate exine pattern.Variations were found in surface of the reticula that can help to delimit the species from another. Pollen type was observed as tricolporate and rarely tricolpate. Similarly, the colpus surface membrane morphology may also vary significantly from species to species i.e. scabrate, verrucate, gemmate, rugulate patterns. Hence our study explored the pollen morphological traits and found helpful to correctly identify the species and define species boundaries of the subfamily Papilonaceae at various taxonomic levels.

Poster Session
P-30

Monitoring of Natural Enemies (Hymenoptera) on Different Lands Use

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Abstract

Vegetation has a very important role for insects, such as the function of foraging, sheltering, and breeding. The model of land uses may affect structure and composition of vegetation, furthermore those affect the microclimate conditions in that ecosystem. Insects are part of biodiversity and their existence has very important ecological functions. Together with vegetation, insects plays an important role as indicator of the stability of an ecosystem. This study aims to determine the abundance of insects on land with different land uses (agroforestry and community forests). This research was conducted on agroforestry and community forests in Wanagama Education Forest, Yogyakarta. Observations and insect collections were carried out in August-October 2019 using pitfall traps, sticky traps, and sweeping nets. Direct identification and reference studies are used to determine insects and their roles to the morphospecies level. The diversity index (H') was calculated to describe the insect community. One-way ANOVA was conducted to determine the effect of two different vegetation structure on insect communities at the family level, and was supported by environmental data and visualization of the horizontal vertical structure of vegetation. The abundance of phytophagous insects varied by month of observation. The order Homoptera is the insect with the highest abundance in both agroforestry and community forests. Differences in the structure of vegetation with variations in habitus have an impact on the presence of phytopagous insects that live in it. The different of natural enemies (Hymenoptera) based on it is taxa on each land use were also discussed.

Keywords: hymenoptera, land use, monitoring, natural enemies

Differential responses of *Betula ermanii* populations to elevated temperature revealed by range-wide provenance trials

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Abstract

Global warming has become a serious problem, especially for high-latitude and altitude ecosystems. Responses to warming might be different among species and/or populations within a species. Range-wide provenance trials of *Betula ermanii*, a representative species of cool-temperate and alpine ecosystem in Japan, were established to evaluate the effects of elevated temperature on its survival and growth. Overall, *B.ermanii* responded negatively to warming in both survival and height growth. The intensity of negative responses is dependent on population. Decreases in survival rate were lower in saplings of northern populations than those of other populations, whereas saplings of southern populations performed better in height growth compared to those of other populations. Assisted migration of southern populations to north and conservation of tree-line populations should be considered in the future.

Canopy height affects the down-regulation of Rubisco in *Fraxinus rhynchophylla* and *Sorbus alnifolia* under elevated CO₂

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Abstract

Down-regulation of Rubisco under elevated CO₂ (eCO₂) are caused by increased non-structural carbohydrates (NSC) due to the sink–source imbalance. We investigated whether canopy position affects the down-regulation of Rubisco in two different height species grown at ambient CO₂ (aCO₂ ; 400 ppm) and eCO₂ (ambient CO₂×1.4 ; 560 ppm and ambient CO₂×1.8 ; 720 ppm) ; *Fraxinus rhynchophylla* (6.8±0.3 m) and *Sorbus alnifolia* (3.6±0.2 m) for 3 years. NSC increased under eCO₂ in *F. rhynchophylla*, but the increase of NSC was greater in the upper canopy of *S. alnifolia*. In contrast, Rubisco was decreased under eCO₂ in *S. alnifolia* but the reduction of Rubisco was greater in the upper canopy of *F. rhynchophylla*. Besides, Rubisco showed negative correlation with NSC only in the upper canopy of *F. rhynchophylla*. Our findings suggested the modification of the canopy level model is necessary in the context of climate change.

Seasonal contrasting effects of PM$_{2.5}$ on forest productivity in peri-urban region of Seoul Metropolitan Area

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Abstract

Urban forests are recognized as eco-friendly filters to reduce PM$_{2.5}$ concentrations. However, there remains a lack of consensus on how PM$_{2.5}$ affects forests' productivity in highly polluted urban areas by altering solar radiation components. Here, we tested the hypothesis that the effect of PM$_{2.5}$ on the solar radiation components and forest productivity differs by season because of seasonal variations in solar elevation angle and PM$_{2.5}$ concentrations and/or compositions. Based on in-situ PM$_{2.5}$ concentrations and CO$_2$ flux measurements conducted from April 2018 to December 2019, complex relationships between PM$_{2.5}$ concentration, direct radiation, diffuse radiation, air temperature, and net ecosystem production were disentangled by season and solar elevation angle using structural equation modelling at a natural deciduous oak stand and an evergreen pine plantation in the peri-urban region of the Seoul Metropolitan Area. We emphasize the importance of integrating our results into ecosystem modelling and sustainable environmental management plan in urban/peri-urban regions.

PM$_{2.5}$ reduction capacities of leaf and their relation to leaf morphological and physiological traits in 13 landscaping species

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Abstract

Recently, because of their ability to reduce PM$_{2.5}$, the introduction of landscaping trees has become popular. In this study, we quantified the PM$_{2.5}$ reduction capacities of 13 major landscaping species and analyzed their relationship with the leaf morphological and physiological characteristics of each species. The results showed that the amount of PM$_{2.5}$ reduction per leaf area differed among species. Moreover, PM$_{2.5}$ reduction by the broadleaf species ($18,802 \pm 1,638$ # cm^{-2} min^{-1}) was approximately 8.6-fold higher than that of the needleleaf species ($2,194 \pm 307$ # cm^{-2} min^{-1}). Correlation analysis revealed that differences in PM$_{2.5}$ reduction were explained by differences in specific leaf area between species ($P = 0.004$) and by the length of margin per leaf area among individual trees ($P < 0.05$). Additionally, reduction in PM$_{2.5}$ correlated with photosynthetic properties ($P < 0.001$), indicating that PM$_{2.5}$ is reduced not only by physical adsorption but also by physiological processes.

The Effect of Forest Density Control on PM$_{2.5}$ Mitigation

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Abstract

In this study, the effect of mitigating fine particulate matter(PM$_{2.5}$) in forests with forest density control was analyzed and quantified. In the case of broad-leaved forests, the average PM$_{2.5}$ reduction rate in the group of high forest density was about 14%, whereas the average PM$_{2.5}$ reduction rate in the group of low forest density was relatively high at about 25%. In the case of coniferous forests, the average PM$_{2.5}$ reduction rate in the group of high forest density was about 3%, whereas the average PM$_{2.5}$ reduction rate in the group of middle forest density was relatively high at about 23%. In forests where forest density control were not performed, it is thought that pollutants in the air stagnate due to air resistance inside the forest. Through the results of this study, it is expected that it will be able to specifically present ways to create new urban forests and sustainable management to reduce fine particulate matter in the future.

Surface Fire Susceptibility of Teak Plantation in WANAGAMA I, Gunungkidul, Yogyakarta, Indonesia

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Abstract
Teak plantation are susceptible to forest fire because the abundance of fuel in the surface ground. Moreover, many activities of community around the forest area also closed to fire utilization. This research aims to identify surface fire susceptibility of Teak Plantation from teak plantation characters such as the abundance of litter fall and understory plants, also bark properties. This observation conducted in 3 age level of teak plantation (juvenile, middle ages, and mature). The age level of stand influence surface fire susceptibility of Teak plantation. The mature stands produce a lot of litter while the abundance of understory plants was low. Surface fire susceptibility are high on juvenile and middle age of stand. In this level, abundance of litter was low, but the understory plants are dense. In dry season, the understory become a potential fuel to surface fire. Furthermore, the thickness of juvenile teak bark was low and very flammable.

Estimation of breeding values for height growth considering spatial autocorrelation in hybrid larch progeny derived from a *Larix gmelinii* var. *japonica* × *L. kaempferi* open-pollinated seed orchard

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Abstract

The hybrid larch (*Larix gmelinii* var. *Japonica* ✕ *L. kaempferi*) exhibits rapid growth and high resistance against field voles' damage. Accurate estimation of breeding value is very important for improving the efficiency of hybrid larch breeding. Generally, test plantation is spatially heterogenous, it may affect the accuracy of estimation of individuals' breeding values. Spatial analysis can be used to estimate accurate breeding values of individuals. In this study, the F_1 hybrid larch was produced by mating a single maternal clone with different paternal clones. The study aimed to reveal the effects of spatial analysis on estimation of breeding values by spatial model. The results suggested that accuracy of estimation of breeding values would be improved by spatial model, additionally, estimated breeding values of individuals existed differential due to difference of paternal clones. The above information would be helpful for forward and backward selection of hybrid larch in this test plantation.

Genetic variation among the provenances of Teak (*Tectona grandis* Linn.f,) in Myanmar

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Abstract

In this study, we examined the genetic differences of growth characteristics among 8 provenances of teak in a trial site situated in Ngalaik Reserved Forest, Tatkone Township, Naypyitaw. The provenance trial was established in 2007. The experimental design was the randomized complete block design with 5 blocks and spacing of 2.7m by 2.7m. There were 8 plots in each block. The plot size was 25 individuals (5 x 5). We measured the height and diameter at breast height (DBH) of 745 trees in January 2022. The tree volume was estimated based on the tree height and DBH growth. The two-way ANOVA showed that there was a highly significant difference of height (ranged from 6.10 to 22.86 m) and DBH (ranged from 22.86 to 127.00 cm) growth among the provenances. According to Duncan's multiple range test, three out of eight provenances were showed the superior results. The provenance, Thabeikkyin was separated as the poorest one. The results would contribute for selecting mother trees (plus trees) and utilizing seed sources in the future tree breeding program in Myanmar.

Key words: teak, provenance trial, variation, growth characteristics, plus trees

Health Status of *Zanthoxylum rhetsa* (Roxb.) DC.) Progeny Trial at Teaching Forest of WANAGAMA, Gunungkidul, Yogyakarta Indonesia

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Abstract

Health status evaluation of *Zanthoxylum rhetsa* (Panggal buaya) progeny trial at WANAGAMA teaching forest is the important part of tree selection process to get superior and resistant family against some biotic and abiotic disturbance. This study aims to identify and evaluate the incidence of biotic and abiotic disturbance and to determine the most potential adapted family. The incidence of biotic disturbance was pink disease (24.5%) at the stem and crown caused by *Ceratocystis salmonicolor* and termite (*Macrotermes* sp.) at the root (76.6%) and stem (17.6%). While abiotic disturbance was an open wound on the root (21.6%) and stem (6.3%) caused by physical activity by the farmer's land cultivation activity. The potential adoptive families were family number 38, 41, 45, 55 (originated from Tabanan) and family number 18 (originated from Gianyar) showed superior growth weather many disturbances either caused by biotic or abiotic factors.

Respond of Five Provenans *Acacia mangium* to *Ceratocystis manginecans*

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Abstract

Acacia mangium (mangium) is fast-growing species that is seriously attacked by *Ceratocystis* sp. in the plantation, resulting in a significant decrease in wood productivity. This study aims to determine the response of five provenances of mangium i.e., Gubam, Claudie River, Kini, Wipim, and Pascoe River, against Ceratocystis (Isolate AM7). Artificial inoculation on seedlings was carried out in 2015 and 2019 using similar provenances to determine the stability response of each provenance to *Ceratocystis* sp. The results showed that Kini provenance consistently had the lowest disease severity both in 2015 and 2019 compared to other provenances. After 5 months of planting either in 2015 or 2019, Kini was performed the best with high and diameter were 190.7 cm and 16.7 mm respectively. Based on mortality percentage, provenance Kini was showed moderate, while other provenances were susceptible.

Delineating the coniferous canopy in a mixed conifer–broadleaf forest by integrating winter Unmanned Aerial Vehicle (UAV) imagery and a machine learning algorithm

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Abstract

The aim of this study was to explore the feasibility of winter UAV imagery to delineate coniferous canopies in a mixed conifer–broadleaf forest by integrating with semantic segmentation and Random Forest algorithm. We analysed 6 winter UAV images taken at the University of Tokyo Hokkaido Forest separately as well as their orthophotos to compare the accuracies of raw images against orthorectified images that allow to remove errors caused by camera tilting and topography. 80% of the dataset were used for training while 20% for testing. Our results showed the accuracies of raw winter images to segment the areas of coniferous and non-coniferous canopies were between 90.4% and 98.1% and close to those of orthophotos (between 91.9% and 96.6%). As it is a preliminary study, however, further studies should be conducted by using the UAV imagery taken in leave-on season and actual ground truth data to confirm this research finding.

Remote Sensing Detecting of Yellow Leaf Disease of Arecanut Based on UAV Multisource Sensors

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Abstract

Unmanned aerial vehicle (UAV) remote sensing technology can be used for fast and efficient monitoring of plant diseases and pests. This study aims to apply the multi-spectral data obtained by the UAV along with the high-resolution UAV remote sensing images to obtain five vegetation indexes such as the normalized difference vegetation index (NDVI), opti-mized soil adjusted vegetation index (OSAVI), leaf chlorophyll index (LCI), green normalized dif-ference vegetation index (GNDVI), and normalized difference red edge (NDRE) index, and estab-lish five algorithm models such as the back-propagation neural network (BPNN), decision tree, naïve Bayes, support vector machine (SVM), and k-nearest-neighbor classification to determine the severity of the yellow leaf disease of arecanut, which is expressed by the proportion of the yellowing area of a single areca crown (in percentage). The traditional qualitative expression of this disease is transformed into the quantitative expression of the yellow leaf disease of arecanut per plant.

Assessment of Natural Recovery of Mangrove Forest from Anthropogenic Disturbance Using Neural Network-based Satellite Images

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Abstract

Natural recovery of mangroves in abandoned shrimp ponds in the Wunbaik Mangrove Forest (WMF) in Myanmar was examined using artificial neural network (ANN) classification and a change detection approach with Sentinel-2 satellite images. In 2020, we conducted various experiments of mangrove classification by tuning input features and hyper-parameters. The selected ANN model was used with a transfer learning approach to predict the mangrove distribution in 2015. Naturally recovering mangroves were identified by extracting the change detection results of three abandoned shrimp ponds. The method yielded an overall accuracy of 95.98%, a kappa coefficient of 0.92 for the 2020 prediction, and 97.20% and 0.94 for the 2015 prediction. Mangrove forests in the WMF slightly decreased between 2015 and 2020. Naturally recovering mangroves were detected at approximately 50% of each abandoned site. The ANN method using Sentinel-2 imagery and topographic and canopy height data can produce reliable results for mangrove classification.

Remote sensing of spatial-temporal evolution of mangrove forests in Hainan Island from 1991 to 2021

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Abstract

Mangrove ecosystems dominate coastal wetlands in tropical and subtropical regions of the world. The research shows that remote sensing technology is the preferred tool to provide temporal and spatial information of mangrove ecosystem distribution and mangrove population change, and plays a very important role in protecting mangroves. In this study, mangroves in Hainan Province are selected as the research object. With the help of artificial intelligence technology, the mangrove remote sensing image classification model in Hainan Province is established to estimate the spatial distribution and changes of mangroves in Hainan Province from 1991 to 2021. This paper attempts to use u-net deep learning and SVM machine learning to classify remote sensing images, combined with the method of manual visual interpretation, to interpret the mangrove remote sensing images of Hainan Province in recent 30 years, so as to explore the temporal and spatial variation law of mangroves in Hainan Province.

Forest maintenance of privately owned forests after 2000 as seen from the regional forest plan

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Abstract

The plantations in Japan have entered the utilization period, but their utilization has not expanded and there are problems such as stagnation of reforestation. The regional forest plan clarifies the maintenance targets of the forest planning areas under the jurisdiction of the national forest plan. It is believed that the problems of forest maintenance in private forests can be grasped by analyzing the plan contents. Therefore, we analyzed and examined target values and practical accomplishments of regional forest plans after 2000 for all forest planning areas. The results of the study showed that, the planning and implementation of regional forest plan is constantly influenced by the local government, the results of operations in many areas, especially the progress of reforestation of plantations, are lower than the planned goals, and the new plan target is not reasonable in view of the results of the previous period.

Regionality and Diversity in Measures to Maintain Abandoned Bamboo Forests in Japan

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Abstract

Bamboo forest expansion has been problem in Japan for several decades, and this phenomenon is influenced by social factors as well as physiological characteristics of bamboo. Measures to deal with the problem of bamboo forest expansion may differ depending on the differences in social factors in different regions. Therefore, we conducted a questionnaire survey on the problem of bamboo forest expansion and its countermeasures targeting forestry departments in 47 prefectures. The results of the survey showed that there are many cases across the country where citizens' groups are carrying out bamboo forest maintenance with the support of the prefectural government in terms of funding and other factors. In addition, there were some common points regarding the funds used by the prefectural government. Various efforts are being made to develop new uses for bamboo. However, the development of high value-added products is limited to regions where bamboo has traditionally been used.

Changes in the Character of the Nagoya Timber Market and Its Factors

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Abstract

The Nagoya Timber Market (NTM) is located on the lower reaches of the Kiso River, facing the sea, and is characterized by forestry areas such as Kiso, Owase, and Tenryu in Japan. In this study, we analyzed changes in timber distribution in NTM since the Edo period and clarified the changes in the character of NTM and its factor. NTM had started as the distributing center of timber from the Kiso forestry area. From the latter half of the Meiji era, many timber factories were built to process large-diameter timber such as Kiso cypress and the character as a production area market was formed. Furthermore, under the liberalization of timber imports after World War II, timber was produced using a large amount of timber imported from Southeast Asian countries. However, from the mid-1970s, Southeast Asian timber switched from log imports to lumber imports, and NTM became a consumption area market.

Study about the value of giant trees in Japan

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Abstract

It is considered that enshrining giant trees as "holy things" is one of the most primitive expressions of human beliefs. In Japan, there are many examples of giant trees being worshiped as gods, and legends and folklore being handed down, which can be seen that giant trees also affects people's lives and solidarity within the local community. In order to understand why giant trees have psychological effects, it is necessary to investigate the characteristics of giant trees from various aspects and clarify the spiritual image that the Japanese people receive from giant trees and the fundamental elements that make them feel "holy." In this study, we selected individuals from the trees listed in the survey conducted by the Ministry of the Environment of Japan and analyzed physical factors such as appearance and location conditions, historical factors such as folklore, and spiritual factors such as local beliefs related to giant trees.

The scenery of the West Lake: the landscape image in Hangzhou West Lake novels in the Ming and Qing Dynasties

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Abstract：
　　As a kind of regional literature, "West Lake novel" prevailed in China's Ming and Qing Dynasties. Most of the stories are written against the background of the scenery of the West Lake, which has certain literary and regional characteristics. Taking the Ming and Qing Dynasties of China as the research period and the "West Lake novel" as the research object, this study summarizes and arranges the West Lake landscape in the novel through the grounded theory method and image analysis method, and obtains the landscape types, bedding structure, landscape characteristics, landscape color and the garden activities of ancient people in the landscape scene. By comprehensively studying the literary landscape scenes and the behavior and psychology of the ancients, this paper summarizes the representative landscape images in 16 novels. From these unique landscape images, we can examine the Garden Aesthetics of people in the Ming and Qing Dynasties, and also show a fantastic, wonderful and rich connotation of the West Lake scenery like the world.

Restoration of Tree Environment in the Late Edo period from Ukiyo-e

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Abstract

Ukiyo-e is a Japanese painting that developed during the Edo period (from 17th to 19th century). Ukiyo-e depicting landscapes is a valuable resource for learning about the town of Edo in the days when there were no photographs. In this study, we analyzed information about the species and distribution of trees drawn in Ukiyo-e such as "One Hundred Famous Views of Edo" drawn by Hiroshige Utagawa, and estimated and restored the tree environment within the town of Edo. As a result, many pine trees were distributed mainly in samurai residences and temples, few trees were planted in the areas where the general public lived. Broad-leaved trees such as cherry blossoms, willows, and maples were planted mixed with pine trees, as well as in riverbanks and tourist spots in the suburbs. Based on the information obtained, the tree environment of the town of Edo was estimated and restored on a map.