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Special Feature

JIRCAS International Symposium 2023



Japan International Research Center For Agricultural Sciences

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Looking Back at JIRCAS International Symposium 2023

The world's forest cover is estimated to be approximately 4 billion hectares, corresponding to one-third of the land area, and various forest ecosystems have been established from high to low latitudes. In the low-latitude zones around the equator across Southeast Asia, Central Africa, and the Amazon in Latin America, tropical forests, also known as tropical rainforests, are widely distributed and characterized by high annual rainfall and average temperatures. They have provided not only timber but also natural herbal medicines and wild-derived foods that have sustained the livelihoods of local communities in these regions. Tropical forests have been established over a long period of time in hot and humid environments, thus they are also home to a wide variety of species, including trees, plants, animals, insects, and microorganisms on the forest floor, playing a crucial role in maintaining the Earth's biodiversity.

Since the mid-20th century, however, deforestation and forest degradation have progressed due to human-induced economic activities such as overexploitation of rare natural resources and conversion to cash crop plantations. Forests absorb carbon dioxide from the atmosphere through active photosynthesis and store substantial amounts of carbon. Therefore, their disappearance raises concerns about their serious impact on the global environment. However, the World Resources Institute's Global Forest Watch reports that global deforestation is still accelerating and that 4.1 million hectares of primary tropical forest, an area the size of Switzerland, had been lost in 2022.

Against this background of increasing deforestation, especially in tropical forests, international conferences and negotiations on climate change countermeasures and biodiversity conservation have focused on the need for resource management that enhances the climate and environmental control functions of tropical forests and for rules to curb deforestation caused by tropical forest industries. To achieve coexistence between environmental conservation and industrial sustainability, it is necessary to implement innovations in tropical forest resource management systems in the respective regions.



The Japan International Research Center for Agricultural Sciences (JIRCAS) has played a crucial role in research on agriculture, forestry, and fisheries in the tropics, subtropics, and other developing regions. Over the past decades, JIRCAS has conducted international collaborative research on regional forestry in Thailand, Malaysia, Indonesia, and other countries. These studies have led to the development of technologies that contribute to the resilience and sustainable use of tropical forests. Furthermore, networks have been established for research and development as well as for social implementation.

Accordingly, JIRCAS International Symposium 2023, titled "Innovations to enhance the resilience of tropical forests and sustainability of the forest industry," was held in response to the global interest in tropical forests. The symposium provided an opportunity to share knowledge and experiences and discuss issues that need to be addressed to achieve both resilience of tropical forests and sustainability of related industries. It has deepened our understanding of tropical forests and related industries as we work towards establishing sustainability.

YAMAMOTO Yukiyo Vice-President, JIRCAS

JIRCAS International Symposium 2023 Report

JIRCAS International Symposium 2023, themed "Innovations to enhance the resilience of tropical forests and sustainability of the forest industry," was held in hybrid format at the U Thant International Conference Hall of the United Nations University in Shibuya, Tokyo, on November 17, 2023. It was held under the auspices of the Ministry of Agriculture, Forestry and Fisheries (MAFF) and the Forestry and Forest Products Research Institute (FFPRI), with 274 participants (101 on-site and 173 online).

Following the opening remarks by President KOYAMA Osamu of JIRCAS, Mr. KOSAKA Zentaro, Deputy Director-General of the Forestry Agency, spoke on behalf of MAFF about JIRCAS's continued efforts and cooperation in research, technological development, and technical cooperation that contribute to sustainable forest management in tropical regions. Next, Dr. NAKASHIZUKA Tohru, Director General of FFPRI, gave a welcome address and talked about the history of promoting forest research through the close cooperative relationship between FFPRI and JIRCAS. He also talked about the need to continue this cooperative relationship in order to develop joint research with forest and forestry researchers in tropical countries. Both speakers concluded their speeches with words of hope for the development of research and activities at JIRCAS for the conservation and sustainable use of tropical forests.

There were two keynote speeches. Prof. KITAJIMA Kaoru, Vice Dean of the Graduate School of Agriculture at Kyoto University, spoke on the topic of "Climate Change, Fire and Forest Resilience," and Dr. Sonya Dewi, Director of Asia Programme at the Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF), spoke about her thoughts on "Global Policy Developments and Initiatives on Tropical Forests and Sustainable Industries."

Session 1, themed "Enhancing Resilience of Tropical Forest Landscapes and Trees," featured Dr. Wan Mohd Shukri Wan Ahmad, Director of the Forestry and Environment Division at Forest Research Institute Malaysia (FRIM); Dr. TANI Naoki, Senior Researcher in the Forestry Division at JIRCAS; and Dr. MIYAMOTO Motoe, Team Leader in the Department of Forest Policy and Economics at FFPRI.

Session 2, themed "Improving Industrial Sustainability of Tropical Timber/Non-timber Products," featured Dr. Mohammad Na'iem, Professor in the Faculty of Forestry at Gadjah Mada University; Dr. KOSUGI Akihiko, Project Leader in the Biological Resources and Post-harvest Division at JIRCAS; and Dr. SAMEJIMA Hiromitsu, Research Manager in the Biodiversity & Forests Area at the Institute for Global Environmental Strategies, Japan.

In the panel session facilitated by Dr. HAYASHI Keiichi, Program Director for Environment at JIRCAS, the panelists explored innovations to enhance the resilience of tropical forests and the sustainability of the forest industry and discussed the importance of collaboration between companies and the government, as well as the importance of providing scientific evidence for production sites and certification systems.

The symposium was concluded by JIRCAS Vice-President YAMAMOTO Yukiyo, who also expressed her appreciation to the speakers and viewers in her closing remarks.

NOGUCHI Shoji Director, Forestry Division, JIRCAS



Group photo of JIRCAS International Symposium 2023 organizers and speakers

JIRCAS International Symposium 2023

Innovations to Enhance the resilience of tropical forests and Sustainability of the forest industry

Date November 17, 2023 13:30 ~ 17:30

Venue U Thant International Conference Hall On-Site × Online

Time	Slot		Speakers	
13:30 ~	Opening Ceremony			
13:50 ~ 14:30	Keynote Speeches1	Climate Change, Fire and Forest Resilience	Prof. KITAJIMA Kaoru Vice Dean, Graduate School of Agriculture, Kyoto University	
	Keynote Speeches2	Global Policy Developments and Initiatives on Tropical Forests and Sustainable Industries	Dr. Sonya Dewi Director of Asia Programme, CIFOR-ICRAF	
14:30 ~ 15:30	Session 1	Enhancing Resilience of Tropical Forest Landscapes and Trees		
	1-1	Sustainable Forest Management and Conservation	Dr. Wan Mohd Shukri Wan Ahmad Director, Forestry and Environment Division, FRIM	
	1-2	Enhancing Tropical Forest Resilience and Production through Tree Breeding Technology	Dr. TANI Naoki Senior Researcher, Forestry Division, JIRCAS	
	1-3	Deforestation Mechanisms and Sustainable Solutions	Dr. MIYAMOTO Motoe Team Leader, Forest Environmental Policy, Department of Forest Policy and Economics, FFPRI	
15:30 ~ 15:50	Coffee Break			
15:50 ~ 16:50	Session 2	Improving Industrial Sustainability of Tropical Timber/Non-Timber Products		
	2-1	Contributions of Tree Improvement Program to Increase Forest Productivity and Achievement of Indonesian Nationally Determined Contributions (NDCs)	Prof. Mohammad Na'iem Faculty of Forestry, Gadjah Mada University	
	2-2	Oil Palm Trunk – High Value Technology for Tropical Forest Conservation	Dr. KOSUGI Akihiko Project Leader, Biological Resources and Post-harvest Division, JIRCAS, Japan	
	2-3	Policies & Initiatives – implications of global policy developments and initiatives for tropical forests in Asian context (Tentative)	Dr. SAMEJIMA Hiromitsu Research Manager, Biodiversity & Forests Area, IGES, Japan	



Keynote Speech 1 Climate Change, Fire, and Forest Resilience

The first keynote speaker, Professor KITAJIMA Kaoru, Vice Dean of the Graduate School of Agriculture, Kyoto University, gave a lecture titled "Climate Change, Fire, and Forest Resilience."

Forests are important for conserving species diversity and mitigating the effects of climate change. Tropical forests, in particular, account for about 45% of the world's forests and are an important resource for photosynthesis, accounting for two-thirds of the global forest photosynthesis. It also plays a central role in both climate change mitigation and adaptation, and the conservation of biological and cultural diversity. However, the destruction of tropical forests in South America and Africa continues to be a serious problem. Although carbon sequestration efforts through afforestation and reforestation are taking place around the world to address the global crisis, forest fires can instantly release the carbon stored in the forest. Agricultural activities such as commodity crop farming and slash-and-burn agriculture also contribute to deforestation. Tropical deforestation and soil erosion weaken the climate change mitigation function of forests, creating a negative spiral in which forests become more and more vulnerable as climate change progresses.

What can be done to arrest this negative spiral and achieve resilience at the local level? Using the example of the transition of forest management in Japan since the Edo period, Professor Kitajima explained resilience in terms of an adaptive cycle in a coupled social-ecological system. In other words, Japan's forest management is an example of resilience. Due to the emergence of various problems caused by logging in the early Edo period, the shogunate and local governments imposed strict regulations in the late Edo period, and forest regeneration was promoted through forest conservation at the regional and national levels, with the transition influenced by the impact of the industrial and energy revolutions during and after the Meiji period. She also presented the resilience of Madagascar's tropical forests, which are a treasure trove of species diversity, by working with local residents to address the problems of slash-and-burn agriculture and forest fires caused by recent population growth.

She concluded her presentation with the message that each of us must think about how to protect our landscapes, including forests, from such disasters, given that human activities, exacerbated by climate change, are exerting further pressure on forests that historically have never burned or have rarely burned.

HAYASHI Keiichi Program Director (Environment), JIRCAS



Keynote speech



Professor KITAJIMA Kaoru (Vice Dean, Graduate School of Agriculture, Kyoto University)

Keynote Speech 2 Global Policy Developments and Initiatives on Tropical Forests and Sustainable Industries

The second keynote speaker, Dr. Sonya Dewi, Director of Asia Programme at CIFOR-ICRAF, elaborated the evolution of global policies on tropical forests and sustainable agricultural industries by proposing to classify them into categories such as actors (state, non-state, and state and non-state) and degrees of compulsion (legally binding and non-legally binding).

Legally binding policy groups for state actors include the UNFCCC's Paris Agreement and REDD+, and the UN Convention on Biological Diversity's (UNCBD's) Kunming-Montreal Global Biodiversity Framework. For the former to successfully drive transformation, she stressed the need to support policy and institutional framework requirements through evidence-based decision-making, integrated approaches, multistakeholder inclusiveness at local and national levels, and investments and incentives for increased participation. For the latter, she identified the National Biodiversity Strategy and Action Plan as a critical issue for countries to develop their policy framework for national implementation of the CBD, including compliance with legislations and regulations, benefit-sharing for traditional knowledge, practices, and innovations.

The EU Deforestation-free Regulation, a legally binding global policy applicable to state and non-state actors, was recently enacted to curb the expansion of agricultural land from forests for soy, beef, palm oil, wood, cocoa, coffee, and rubber production, providing a solution to deforestation and

forest degradation problems by encouraging the EU to act as a responsible consumer. The crucial issue is the definition of forest and deforestation, which requires technical and institutional reviews and capacity strengthening to support smallholder farmers to comply. From the same group of actors but not under international hard law is the Jurisdictional Approach (JA) to sustainability, which still suffers from some challenges such as lack of financing and technical capacity for evidence-based decision-making, silo governance, and lack of monitoring and evaluation systems. Lastly, the sustainability standard in the global value chain is voluntary and contributes to global commitment through preferential sourcing. However, this often becomes a tool to exclude smallholders who lack the capacity to comply. Fostering common but differentiated responsibility (CBDR) principles across various scales is therefore crucial.

Dr. Dewi concluded her speech by saying that for global policies to be transformative, the following principles should be met: align global policy and national sovereignty; shape policy and actions based on CBDR principles; consider local contexts in geopolitics; foster multistakeholder governance with inclusive, integrated, and informed principles; and promote data, technical capacity, tools, and transdisciplinary approaches.

IIYAMA Miyuki Program Director (Information), JIRCAS



Keynote speech



Dr. Sonya Dewi (Director of Asia Programme, Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF), Indonesia)

Session 1 Enhancing Resilience of Tropical Forest Landscapes and Trees

In this session, three speakers delivered presentations relevant to enhancing the resilience of tropical forest landscapes and trees, drawing on examples from Southeast Asia, particularly Malaysia and Indonesia.

First, Dr. Wan Mohd Shukri Wan Ahmad, Director of Forestry and Environment Division, Forest Research Institute Malaysia (FRIM), gave a presentation titled "Sustainable Forest Management and Conservation." He began with an overview of Malaysia's forest resources, describing the multi-layered structure of its diverse tropical rainforests, the forest types ranging from mountains to mangroves, and the extent of forest cover. He then explained the laws, regulations, and national policies related to sustainable forest management (SFM). In particular, he stated that the national strategy for SFM encourages forest management to shift from a focus on timber production to multi-purpose forest management, including biodiversity, recreation, research, and climate change adaptation and mitigation. Regarding nature-based solutions and ecosystem-based approaches in Malaysia, he introduced the following programs: the Greening Malaysia tree planting campaign, the Central Forest Spine Masterplan, the Heart of Borneo transboundary cooperation, the Nationwide Coastal Tree SMART FOREST Planting Program, and the Forest Rehabilitation and Restoration Program. On research and development related to SFM, he presented case studies such as the mangrove rehabilitation in Sg Hj Dorani and the establishment of a 50-ha tree demographic plot in Pasoh Forest Reserve. He also highlighted the importance of monitoring, productivity, and hydrology for smart forestry. He concluded his presentation by summarizing the key challenges and opportunities in SFM implementation, and as a forest manager, he talked about the need for forest conservation, good environment and development, and the importance of balancing these points, recommending that all concerned parties work together to realize SFM.

Next, Dr. TANI Naoki, Senior Researcher in the Forestry Division at JIRCAS, gave a presentation titled "Enhancing Tropical Forest Resilience and Production through Tree Breeding Technology." Tropical forests play a pivotal role in mitigating climate change, conserving biodiversity, and supporting local livelihoods. However, these invaluable ecosystems are increasingly vulnerable to the impacts of climate change, including extreme weather events and changing environmental conditions. To address these challenges, ongoing research focuses on improving the resilience of tropical forest tree species utilized for timber production. In this symposium, he introduced an innovative approach that utilizes tropical forest genetic resources, physiological trait evaluation, and genomic selection technology to identify and propagate individuals with enhanced resilience to climate change and economic value. Genomic selection for traits, which encompass various factors including drought tolerance, growth rate, timber quality, and adaptability to climate change, represents a revolutionary contribution to tree breeding. Unlike



Session Chair: Dr. NOGUCHI Shoji (Director, Forestry Division, JIRCAS)



Dr. Wan Mohd Shukri Wan Ahmad (Director, Forestry and Environment Division, FRIM)

conventional tree breeding methods, which require lengthy evaluation periods and waiting for progenies to grow before assessing their phenotype for focal traits, genomic selection allows us to evaluate seedling phenotypes in the early stages of the progeny, significantly accelerating the breeding cycle. This faster approach not only increases the efficiency of breeding programs but also reduces resource requirements and expedites the development of resilient tree populations in tropical forests. He stated that ultimately, the current research contributes to broader discussions on tropical forest conservation, climate change mitigation, and sustainable resource management. He also described activities that combine conventional tree breeding techniques with genomic technology while enhancing the resilience of tropical forest species and contributing to global ecological stability and livelihood improvement.

Finally, Dr. MIYAMOTO Motoe, Team Leader, Forest Environmental Policy, Forestry and Forest Products Research Institute (FFPRI), gave a presentation titled "Deforestation Mechanisms and Sustainable Solutions." Tropical deforestation is a global environmental problem and a major source of greenhouse gas emissions. Efforts to halt deforestation have been promoted worldwide, but they have not met initial expectations. Effective efforts require an understanding of the causes of deforestation and the adoption of appropriate strategies. She explained deforestation mechanisms through three factors: poverty, agricultural rent (agricultural profitability), and forest scarcity. Poverty, the chief underlying cause, has the strongest impact on deforestation. The main proximate causes (e.g., road construction and expansion of export crops) are related to the increase in agricultural rent. In contrast, forest scarcity is an important factor that decreases deforestation. She stated that deforestation rates would be high if all the three conditions coexisted at high rates, i.e., high poverty rate, high increase in agricultural rent, and high forest coverage. She pointed out that current efforts to decrease deforestation mainly focus on lowering agricultural rent, which can be effective but may not be sustainable due to the high costs and social impacts. Studies have shown that poverty reduction strategies can sustainably reduce deforestation and, to this end, global efforts need to shift from agricultural rent reduction to poverty reduction. Sustainable solutions to tropical deforestation require multifaceted strategies to reduce poverty rates in developing countries. She concluded her speech by proposing the need to develop comprehensive social infrastructure (agriculture, health care, education, etc.) to help impoverished populations overcome poverty.

As described above, the participants learned about activities and recommendations for realizing SFM, efforts to strengthen tropical forest resilience for climate change adaptation, and the need to reduce poverty to halt tropical deforestation. Supplementary comments by each speaker were made during the panel discussion.

NOGUCHI Shoji Director, Forestry Division, JIRCAS



Dr. TANI Naoki (Senior Researcher, Forestry Division, JIRCAS)



Dr. MIYAMOTO Motoe (Team Leader, Forest Environmental Policy, FFPRI)

Session 2 Improving Industrial Sustainability of Tropical Timber/ Non-Timber Products

In this session, three speakers from Japan and abroad shared their insights on improving the industrial sustainability of tropical timber and non-timber products.

Despite the critical importance of tropical forests to the functioning of the Earth system, tropical forests are under great pressure from humanity's insatiable demand for food, fuel, and fiber, which has led to the overexploitation of tropical forest resources. While industries have long been considered a leading driver of deforestation in tropical countries, the speakers in this session presented evidence that it is possible for environmental conservation and sustainable industry to co-exist in harmony through practical and tangible implementation of innovative approaches.

First, Dr. Mohammad Na'iem, Professor in the Faculty of Forestry at Universitas Gadjah Mada, Yogyakarta, Indonesia, presented success stories in restoring and rehabilitating tropical forests through science-based sustainable forest management using improved varieties and native species. In his presentation, titled "Contributions of Tree Improvement Program to Increase Forest Productivity and Achievement of Indonesian Nationally Determined Contributions (NDCs)" and jointly prepared with Prof. Widiyatno, Prof. Na'iem shared with the audience the case of Indonesia, which has the second-largest tropical forest in the world and supports 18.7% of the world's plant biodiversity. Indonesia's tropical forests have been declining due to forest fires, illegal logging, overexploitation, and the conversion of forests to other land uses, while the deforestation rate has dropped sharply in recent years. The Government of Indonesia is implementing an array of climate actions to achieve ambitious NDCs through the establishment of plantation forests, the sustainable management of natural forests, and the rehabilitation of forests on degraded lands. Forest rehabilitation uses improved seeds to increase forest productivity through intensive silviculture (SILIN). For example, implementing tree improvement in clonal teak plantations could increase forest productivity by >300% compared to using unimproved teak seed. Meanwhile, the rehabilitation of natural forests dominated by dipterocarp species could be established through enrichment planting with native species, which could increase forest productivity as well as carbon storage in the secondary natural forest. Prof. Na'iem stressed that tree improvement programs using the SILIN technique should be implemented to improve land forest cover and forest productivity and achieve Indonesia's NDCs.

Palm oil extracted from palm fruits is the most consumed vegetable oil in the world, accounting for about 30% of total vegetable oil production. In Indonesia and Malaysia, where 80% of the world's palm oil is produced, approximately 3.6 million hectares of tropical rainforest have been converted to oil palm plantations over the past 20 years. An estimated 63 million oil palm trunks (OPTs) are felled annually, and about 440,000 hectares are reforested each year. The plantation is like a waste dump for biomass, leading to the failure of replantation due to the spread of



Session Chair: Dr. IIYAMA Miyuki (Program Director for Information, JIRCAS)



Dr. Mohammad Na'iem (Professor, Faculty of Forestry, Universitas Gadjah Mada, Yogyakarta, Indonesia)

pests, resulting in further deforestation to establish new plantations, while the decomposition of OPTs causes greenhouse gas (GHG) emissions. Dr. KOSUGI Akihiko, Project Leader in the Biological Resources and Post-harvest Division at JIRCAS, showed how scientific and technological innovations can allow value addition and better utilization of oil palm trunks, thus reducing the pressure for uncontrolled deforestation of tropical forests. In his presentation, titled "Oil Palm Trunk - High Value Technology for Tropical Forest Conservation," he introduced a technological system that enables efficient production of renewable energy and chemical materials from OPTs through field surveys and research on OPTs at a palm plantation in Malaysia. One such product developed by a private sector partner is a recycled OPT board for making furniture and as a building material, providing several positive benefits such as reducing deforestation, storing the absorbed CO₂ in OPT for a long time, producing a "new material that can replace wood," and creating new jobs in oil palm-producing countries. Dr. Kosugi emphasized that the project members and JIRCAS would contribute to the protection of tropical forests through sustainable management of palm plantations by adding value to OPT.

Dr. SAMEJIMA Hiromitsu, Research Manager in the Biodiversity & Forests Area at the Institute for Global Environmental Strategies, in his presentation titled "Development of Timber and Oil Palm Industries in Southeast Asia and International Policy for Tropical Forest Conservation," first reviewed the process by which Southeast Asian tropical ecosystems have faced degradation and decline. For commercial timber, selective logging caused irreparable damage to forest ecosystems and local communities, which was further exacerbated by the rapid increase in illegal logging around 2000. In response, timberimporting countries introduced policies restricting imports of illegally logged timber. At the same time, timber-producing countries also introduced measures such as timber legality assurance systems and mandatory forest certification. Meanwhile, smallholders have cultivated fast-growing trees, which have become an integral part of the timber supply chain. In Malaysia and Indonesia, the expansion of oil palm cultivation has been a significant driver of deforestation, although it should be noted that not all oil palm plantations were established by destroying natural forests. In addition, an increasing number of small-scale farmers are turning to oil palm cultivation as their main source of livelihood. Oil palm is a significant contributor to deforestation and a primary target of the EU Deforestation Regulation (EUDR) introduced this year. Given this situation, stakeholders advocating for sustainable sourcing in consuming countries should aim to create supply chains that not only promote due diligence but also contribute to the sustainable development of local communities in the producing countries by recognizing the increasing role of smallholders in the value chains and facilitating access to scientific innovation through policy support.

IIYAMA Miyuki Program Director (Information), JIRCAS



Dr. KOSUGI Akihiko (Project Leader, Biological Resources and Post-harvest Division, JIRCAS)



Dr. SAMEJIMA Hiromitsu (Research Manager, Biodiversity & Forests Area, Institute for Global Environmental Strategies)

Panel Discussion Proposals for Innovation to Achieve Coexistence of Resilient Tropical Forests and Sustainable Forestry

Following the session lectures, a panel composed of keynote and session speakers discussed "Proposals for Innovation to Achieve Coexistence of Resilient Tropical Forests and Sustainable Forestry."

First, Professor Kitajima commented on deforestation and the conservation of forest functions from a holistic perspective, confirming the need to consider governance that allows forests themselves to maintain their value, given that resilience is a management approach to restore forests. Next, Dr. Shukri shared information on the role of research institutions in forest management in Malaysia and their contribution to national forest management, including research results on selective logging cycles and selective logging management systems. Dr. Miyamoto explained the relationship between poverty and deforestation, and the role of Japanese and international research institutions in implementing long-term policies to reduce poverty in developing countries. She also confirmed the importance of collecting long-term and reliable data. Furthermore, Dr. Dewi talked about the efforts of international organizations in global trends such as forest certification and the introduction of due diligence. She also explained the importance of approaches through policy analysis, governance, and capacity building of smallholder farmers as a green value chain. Next, Professor Na'iem presented the root causes and required initiatives to solve the problems related to sustainable forestry, which remain a challenge in Indonesia, even though timber production is minimizing environmental impacts through forest certification programs.

Dr. Samejima also highlighted the role and importance of due diligence in conserving forest functionality and the need to ensure that smallholders are not excluded from the supply chain.

After hearing the remarks of each panelist on the panel topics, the audience was invited to participate in a lively discussion on the social implementation of the development of technology to use old oil palm trees and its potential for deployment in palm-producing countries near Malaysia, the promotion of small and medium enterprise participation in afforestation and reforestation, and the negative impacts of using profitable agricultural land and technologies to alleviate poverty and reduce deforestation. The case study of Peninsular Malaysia showed that the trend of converting forests to agricultural land is rapidly converging due to its high profitability, and the role and importance of governance in reforestation was introduced through a case study of reforestation in the Edo period in Japan. The importance of sharing information among agriculture, forestry, and other land use stakeholders was also discussed, as well as the importance of each of us acting responsibly. The hour-long panel discussion concluded with the affirmation that innovation for conservation and sustainable use of forests requires a combination of corporate and government initiatives and technological development through research.

HAYASHI Keiichi Program Director (Environment), JIRCAS



The eight panelists on stage, including one participating remotely



Moderator: HAYASHI Keiichi (Program Director for Environment, JIRCAS)

JIRCAS TODAY

[Research Highlights]

Discovery of New Drought Stress Response Mechanism in Plants —Overcoming "invisible drought" and paving the way for improvement in crop yields—

A research team from JIRCAS, Kyoto University, Nagoya University, RIKEN, the University of Tokyo, and the National Agriculture and Food Research Organization (NARO) has discovered for the first time in the world that phosphate level within the plants decreases and triggers a phosphate starvation response at very early stages of drought, when leaf wilting is not observed.

Among various environmental factors such as abnormal temperatures, salinity and pests, drought is the most severe environmental stress causing significant damage to crop production. Not only does visible wilting from drought cause damage, but even mild drought, where leaves do not wilt, can cause extensive damage, reducing yields by half. However, understanding how plants actually respond to this "invisible drought" in real field conditions has remained elusive, not only because of the complex changes in field environments, but also because drought tests cannot be conducted when there is sufficient rainfall.

To artificially induce mild and persistent drought, the research team developed an experimental system using ridges, which raise the soil in the field to improve drainage and mimic mild drought stress in the field — a method not previously used in drought research. Over six years of field trials, the ridges were used to induce stable drought, even under annually changing environmental conditions. Comprehensive analyses of soybean in the field using this experimental system showed that in early drought at the level where leaves do not wilt, phosphate levels in the plant decrease before the previously known abscisic acid (ABA) response occurs, and a phosphate starvation response is triggered in the plant. Laboratory analysis using *Arabidopsis thaliana* revealed that key genes associated with the phosphate starvation response play

a critical role in plant growth during the early stages of drought.

The results of this study have made it possible to quantitatively determine the level of plant response to "invisible drought" in the early stages of drought. This breakthrough paves the way for the development of innovative technologies to optimize water supply before crop yields are affected by drought.

Consequently, the development of the experimental ridge drought system and the discovery of the phosphate starvation response as an indicator to capture "invisible drought" in this study are expected to contribute to improving food security in the future.



Thailand Approves Cultivation of Sugarcane Variety Developed by JIRCAS —Expectations on increased bioenergy production from bagasse—

The sugarcane variety TPJ04-768, characterized by high bagasse productivity, is the result of a collaboration between JIRCAS and the Khon Kaen Field Crops Research Center of the Department of Agriculture in Thailand. This innovative sugarcane variety has been officially named "DOA Khon Kaen 4 (KK4)" and approved by the Thai government, marking a significant milestone in the Thai sugarcane industry. This is the first time that the results of joint research with Japan have been adopted by the Thai sugarcane sector.

KK4 is derived from interspecific hybridization between sugarcane variety used for sugar production and wild sugarcane that grows naturally in Thailand and has excellent productivity in ratoon crops. Compared to KK3, the currently dominant sugarcane variety in Thailand, KK4 produces approximately 1.5 times more bagasse due to its higher fiber content, while maintaining a similar sugar yield.

In recent years, the Thai sugarcane industry has increasingly focused on bioenergy production through the use of bagasse in addition to traditional sugar production. Particularly in the northeastern region of the country, where sugarcane cultivation is most concentrated, inadequate yields in ratoon crops have been a challenge, mainly due to harsh dry seasons.

The introduction of KK4 promises to improve productivity in areas with historically low yields in ratoon crops, facilitating the expansion of bioenergy production without competing with food production. This will be achieved by producing more bagasse while maintaining sugar production levels. With the endorsement of KK4 as the recommended variety in Thailand, the Thai Department of Agriculture has established a system for the annual production of seed canes for planting. These will be made available to farmers and sugar mills wishing to grow this breakthrough variety, thereby promoting its widespread adoption.



JIRCAS TODAY

[2023 (The 17th) Japan International Award for Young Agricultural Researchers (Japan Award) and Commendation Ceremony]

About the Japan Award

The Japan International Award for Young Agricultural Researchers (Japan Award), which began in 2007, is organized and presented by the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan to honor young foreign researchers whose outstanding achievements promote research and development of agricultural, forestry, fishery and other related industries in developing regions.

Up to three young researchers under age 40 (as of January 1st, award year) who have shown (1) outstanding performance in research and development in agriculture, forestry, fisheries, or related industries in developing regions and

(2) outstanding achievements in research and development that will lead to future technological innovation in agriculture, forestry, fisheries, or related industries in developing regions

are invited yearly to Japan to receive certificates of commendation from the Chairman of the Agriculture, Forestry and Fisheries Research Council.

The 2023 Japan Award ceremony was held on November 17 (Friday) at the U Thant International Conference Hall, United Nations University, Tokyo, Japan.

The 2023 (The 17th) Japan Award Winners

*Ages are as of January 1, 2023

Khalisanni KHALID

(37 years old, Male, Malaysian)

Professional Affiliation: Malaysian Agricultural Research and Development Institute (MARDI)

Research Achievement: Development of Nanofertilizer Using Flexible Nanoparticle Catalysis Technology

Avijit GHOSH

(30 years old, Male, Indian)
 Professional Affiliation: ICAR-Indian Grassland and Fodder Research Institute (IGFRI)
 Research Achievement: Development and Evaluation of Ecofriendly Soil Health Management Strategies for Semi-arid and Sub-humid Region of India

Martin Paul Jr. TABE-OJONG

(30 years old, Male, Cameroonian) Professional Affiliation: International Food Policy Research Institute (IFPRI) Research Achievement: Improving Smallholder Commercialization and Reducing Poverty through the Adoption of Improved Crop Varieties in Africa

JIRCAS Mail Magazine (English) Registration Guidance

JIRCAS Mail Magazine, the online quarterly publication of JIRCAS, provides information on the latest topics, events, seminars and workshops, as well as new technologies, research highlights, and guidance publications. To subscribe online, please use the following link. Thank you very much.

https://www.jircas.go.jp/en/public_relations/jircas_mailmagazine

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