Information and Public Relations Magazine on Agriculture, Forestry and Fisheries Research in Developing Regions



Special Feature

# JIRCAS International Symposium 2022



Japan International Research Center For Agricultural Sciences

## IN THIS ISSUE

## In This Issue

## Foreword

## Special Feature

JIRCAS International Symposium 2022	
JIRCAS International Symposium 2022 Report	
• Keynote Address 1 ······6	
• Keynote Address 2 ······7	
• Session 1 · · · · · 8	
• Session 2 · · · · 10	
• Panel Discussion ······ 12	
JIRCAS TODAY	
[Research Highlights]	
<ul> <li>Development of New Salt Tolerant Soybean Variety with High Yield</li> </ul>	
and Disease Resistance —Contributing to stable soybean production	
in salt-affected agricultural areas— ······ 13	
World's First Clarification of Genetic Diversity of 'Hiyuna,'a Traditional	
Asian Vegetable — Four subpopulations distributed in India,	
China, and other countries—	
<ul> <li>Development of Organic Fertilizer Production Technology Using</li> </ul>	
Low-Grade Phosphate Rock —Yield increase effect comparable to	
chemical fertilizer due to the action of soil microorganisms—	
<ul> <li>Phosphorus Limitations Reduce Total Tropical Forest Production by 36%</li> </ul>	
-Contributes to improved accuracy of terrestrial carbon	
balance models—•••••••14	
[2022 (The 16 <sup>th</sup> ) Japan International Award for Young Agricultural	
Researchers (Japan Award) and Awarding Ceremony]	
• About the Japan Award •••••• 15	
• The 2022 (The 16 <sup>th</sup> ) Japan Award Ceremony Report ••••••••••••••••••••••••••••••15	
• Introduction of the 2022 (The 16 <sup>th</sup> ) Japan Award Winners	

## **Reflections on JIRCAS International Symposium 2022**

The year 2022 was designated as the International Year of Artisanal Fisheries and Aquaculture (IYAFA 2022) by the United Nations. Artisanal fisheries and aquaculture are commonly practiced by family businesses with small capital or inputs, therefore, production per business unit is not always large. However, they constitute the majority of producers engaged in fisheries and aquaculture directly or indirectly, and they assume a dominant role in providing "blue food," i.e., fish, shellfish, and seaweed harvested from marine and freshwater environments. Since blue food provides essential nutrients such as protein, minerals and so on, its importance in realizing SDG 2, which seeks to "end hunger, achieve food security and improved nutrition and promote sustainable agriculture," is attracting attention.

In the Nature commentary article titled "Food systems: seven priorities to end hunger and protect the planet" written by the chair and vice-chairs of the Scientific Group for the United Nations Food Systems Summit 2021, the authors identified seven priority agendas for accelerating the transformation to a healthier, more sustainable, equitable, and resilient food system. "Sustain aquatic foods" is listed along with "De-risk food systems," "Boost bioscience," "Protect resources," and so on. Food issues have been discussed mainly in the context of agricultural crops; however, aquatic production worldwide exceeded 200 million tons in 2020, and annual per capita consumption more than doubled, from 9.9 kg in the 1960s to 20.2 kg. This strong and growing demand for aquatic products implies that blue food is an important component of the food system, and that it has been sustaining global food security and human nutrition. On the other hand, various problems such as overexploitation of fisheries resources and environmental impacts due to aquaculture, are becoming apparent.

The Food and Agriculture Organization of the United Nations (FAO), in its June 2022 report titled "The State of World Fisheries and Aquaculture," emphasized the importance of Blue Transformation, a strategy that calls for structural reorganization to



enable a system that ensures sustainable production, management, trade, and consumption of aquatic products. Blue Transformation requires the strengthening and expansion of sustainable aquaculture, the effective management of fisheries resources, and the development of aquatic value chains that at the same time consider the social, economic, and environmental aspects. However, coastal areas in developing regions, where artisanal fisheries and aquaculture are implemented, are often located in ecologically and economically fragile environments, and they face various technical challenges combined with the increasing risk of climate change.

JIRCAS International Symposium 2022 entitled "Artisanal Fisheries and Aquaculture in the Sustainable Food Systems" was held based on global interest in blue food in regional and global food systems, and the artisanal fisheries and aquaculture that provide them. We hope that the knowledge and experiences on artisanal fisheries and aquaculture shared through this symposium will serve as an impetus for the development of technologies that will contribute to further sustainability and improved productivity.

YAMAMOTO Yukiyo Vice-President, JIRCAS

## SPECIAL FEATURE : JIRCAS International Symposium 2022

## **JIRCAS International Symposium 2022 Report**

JIRCAS International Symposium 2022, themed "Artisanal Fisheries and Aquaculture in the Sustainable Food Systems," was held as a follow up on the discussions made during the 2021 UN Food Systems Summit and to commemorate the International Year of Artisanal Fisheries and Aquaculture 2022. It was held in hybrid format (in-person at the Hitotsubashi Hall of Hitotsubashi University in Chiyoda, Tokyo and online) on November 22 under the auspices of the Ministry of Agriculture, Forestry and Fisheries (MAFF) and the Japan Fisheries Research and Education Agency, with 253 participants (55 at the venue).

In his opening remarks, Mr. KOYAMA Osamu, President of JIRCAS, noted that the role of artisanal fisheries and aquaculture, despite its critical importance, has not been adequately discussed in the context of food systems, and that in order to unlock the full potential of the fisheries and aquaculture sectors for food and nutrition security without leaving anyone behind. all stakeholders including academic development agencies and practitioners should be able to share their experiences and lessons to accelerate the solutions provided by science, technology, and innovation.

In his welcome remarks, Mr. TAKASHI Koya, Director General of the Fisheries Agency, stated that the world's food supply is facing challenges such as population growth, climate change, hunger, and poverty, and that the fisheries and aquaculture industries, using natural productivity, are becoming increasingly important in building a sustainable food production system. He mentioned that MAFF is also working on policies to build sustainable fisheries and food systems. He added that JIRCAS has been making important efforts such as international joint projects for the development and dissemination of sustainable aquaculture technologies in the tropics, focusing on small-scale fisheries and aquaculture in sustainable food systems. He expressed hope that this symposium would stimulate active discussions on the importance of sustainable food production systems and the compatibility between sustainability and productivity improvement.

The symposium program consisted of two keynote speeches, two thematic sessions, and a panel discussion as on the next page.

In her closing remarks, Dr. YAMAMOTO Yukiyo, Vice-President of JIRCAS, noted that accelerating innovation in artisanal fisheries and aquaculture requires not only local research activities but also the commitment of stakeholders, local communities, research institutions, private sectors, and policymakers, and that the symposium had provided some insights into these issues. She concluded by expressing her gratitude to the speakers, participants, supporting organizations, and staff.

#### MIYATA Tsutom Director, Fisheries Division, JIRCAS



Group photo of JIRCAS International Symposium 2022 organizers and speakers

#### SPECIAL FEATURE : JIRCAS International Symposium 2022

JIRCAS International Symposium 2022

## ne ens 0.0 1 -Ē

Date

# November 22, 2022 13:00 ~ 16:15 (Registration 12:30 ~ 13:00)

lime		Slot	Speakers	
3:00~		Opening ceremony	0	
<b>13:10~</b> 13:50	Keynote address	The role of artisanal fisheries and aquaculture in sustainable food systems	YAGI Nobuyuki Professor, Graduate School of Agricultural and Life Sciences, The University of Tokyo	
	Keynote address	Transforming Food Systems: Aquatic Foods for Nourishing People and Planet	Shakuntala Haraksingh Thilsted Global Lead for Nutrition and Public Health, WorldFish	
	Session 1	The Challenges of Artisanal Fisheries and Aquaculture in the Sustainable Food Systems		
<b>13:55 ~</b> 14:40	1-1	The issues of artisanal fisheries and aquaculture in sustainable food systems in Southeast Asia	MIYATA Tsutom Director, Fisheries Division, JIRCAS	
	1-2	Issues of sustainable aquacultural seedlings in Japan	SAKIYAMA Kazutaka Director of Aquaculture Research Department Production Engineering Division, Fisheries Technology Institute, FRA	
	1-3	Potential of seaweed utilization for greenhouse gas emissions reduction	Jeffrey T. Wright Associate Professor, Institute for Marine and Antarctic Studies, University of Tasmania	
<b>14:40 ~</b> 15:25	Session 2	Research and Application to Enhance Sustainability and Productivity of Artisanal Fisheries and Aquaculture		
	2-1	Development of sustainable bivalve aquaculture technology adapted to tropical monsoon region	YURIMOTO Tatsuya Senior Researcher, Fisheries Division, JIRCAS	
	2-2	Management, production and utilization of small indigenous species "Zako" for nutritional improvement in rural areas and biodiversity conservation in inland Southeast Asia	MORIOKA Shinsuke Professor, University of Human Environments	
	2-3	Improving artisanal fisheries through community-based prawn stock enhancement in a mangrove estuary	Jon P. ALTAMIRANO Head of Farming Systems & Aquatic Ecology Section, Research Division, SEAFDEC/AQD	
<b>5:35 ~</b> 6:10		Panel discussion	Panel Chair Marcy N. Wilder Project Leader, Fisheries Division, JIRCAS and speakers	
		diadaa		

#### Contact

Information and Public Relations Office, JIRCAS Address 1-1 Ohwashi, Tsukuba, Ibaraki, Japan Phone +81-29-838-6708 Email koho-jircas@ml.affrc.go.jp

> 5 JIRCAS Newsletter No.94 2023-

8

JIRCAS

INTERNATIONAL YEAR OF ARTISANAL FISHERIES AND AQUACULTURE 2022

## Keynote Address 1 The role of artisanal fisheries and aquaculture in sustainable food systems

The first keynote address, titled "The role of artisanal fisheries and aquaculture in sustainable food systems," was given by Professor NAGI Nobuyuki of Graduate School of Agricultural and Life Sciences, The University of Tokyo. He began his talk by stating that there are three key elements to sustainable development, the first of which is environmental, the second economic, and the third socio-cultural factors.

He showed pictures of fish landing sites and processing plants in Indonesia, Tanzania, Cambodia, India, Japan, and Norway, and noted that most fishing vessels in Asia and Africa are small-scale, while those in Norway are large-scale. He also mentioned that there are many distributors and female workers in Asia and that the business style is labor-intensive, with many people playing different roles, in contrast to Norway where there are no landing sites and only a few employees. He explained that the difference between Norwegian fisheries and Asian and African fisheries is due to Norwegian fisheries having low species diversity, with almost all products from fisheries exported, whereas Asian and African fisheries have a high diversity of fish species and are mainly aimed at satisfying the domestic market. Considering these differences, he stated that the Food and Agriculture Organization of the United Nations (FAO) has developed guidelines for sustainable small-scale fisheries, in which it hopes to uphold values such as respect for human rights, gender equality, equity and fairness, and adopt participatory approaches to decision-making. In addition, FAO has a mechanism to grant Globally Important Agricultural Heritage Systems (GIAHS) certification to organizations that employ best practices, and this certification could help raise the profile of local communities engaged in food consumption and green tourism. He said that further use of these FAO tools could maintain the unique value of artisanal fisheries and aquaculture as a sustainable food system.

He concluded his speech by mentioning that artisanal fisheries and aquaculture play an important role in sustainable food systems, and that preserving traditional knowledge is essential for humans to live in harmony with nature.

#### MIYATA Tsutom Director, Fisheries Division, JIRCAS



Dr. YAGI Nobuyuki (Professor, Graduate School of Agricultural and Life Sciences, The University of Tokyo)

## Keynote Address 2 Transforming Food Systems: Aquatic Foods for Nourishing People and Planet

The second keynote speaker, Dr. Shakuntala Haraksingh Thilsted, Global Lead for Nutrition and Public Health, WorldFish, gave a presentation entitled "Transforming Food Systems: Aquatic Foods for Nourishing People and Planet."

Dr. Thilsted is the 2021 recipient of the World Food Prize, which is awarded to individuals who have made significant contributions to address global food issues. She was recognized in particular for her outstanding efforts to increase food production and micronutrient intake, and improve the livelihoods of the local population by introducing micronutrient- and fatty acid-rich local small fish farming to commercial fish farming systems and facilitating changes related to the food system.

In this keynote address, she described her previous research and lessons learned at WorldFish on the potential and role of aquatic foods in feeding people and the planet. She said that global hunger and malnutrition rates have been increasing, exacerbated by disruptions such as climate change, conflicts, and COVID-19, and that over the past three years, these disruptions have reversed the progress made towards achieving Agenda 2030, especially meeting the targets of SDG 2: Zero Hunger.

She explained, based on scientific data, the potential and role of aquatic foods, which are very important in transforming the food system to feed people and the planet. She also noted that aquatic food systems provide food and nutrition security and livelihood opportunities for more than 3 billion people, especially in low- and middle-income countries. Further, her research has shown that aquatic foods have lower economic and environmental costs compared to terrestrial foods.

In addition, she stated that a paradigm shift is needed to diversify and build resilience in aquatic food systems in order to maximize the ability of aquatic foods to nourish people and the planet. She concluded her talk by emphasizing that this will require a strong commitment on the part of the enablers of the food system: governments, policy makers, research institutions, the private sector, and local communities.

#### KANAMORI Norihito

Project Leader, Information and Public Relations Office, JIRCAS



Dr. Shakuntala Haraksingh Thilsted (Global Lead for Nutrition and Public Health, WorldFish)

## Session 1 The Challenges of Artisanal Fisheries and Aquaculture in the Sustainable Food Systems

In this session, three speakers delivered presentations relevant to addressing the challenges of artisanal fisheries and aquaculture in sustainable food systems, drawing on examples from Southeast Asia, Japan, and Australia.

First, Dr. MIYATA Tsutom, Director of the Fisheries Division, JIRCAS, gave a presentation titled "The issues of artisanal fisheries and aquaculture in sustainable food systems in Southeast Asia." According to a previous study in the Philippines, fishers in the research site were aware that their fishing grounds and fisheries resources had been deteriorating since the 1980s; therefore, almost all fishers expressed the need for fisheries management to be introduced in the site. However, most fishers indicated that they would not implement fisheries management until the main target fish stock was reduced to about half its current level. Even though almost all fishing households were getting poor and fishing remained their main source of income, they insisted on postponing the implementation of fisheries management. A bottom-up fisheries management cannot be introduced without the agreement of almost all fishers. Therefore, implementation of fisheries management in the area was very difficult due to the fact that fishing regulations associated with fisheries management had avoided catch reduction, and the majority of fishermen believed that fishery resources would someday recover without the need to implement fisheries management by themselves. Based on these results, it was considered necessary to implement measures that will enable fisheries management, such as catch restrictions, while generating alternative income. In addition, a previous study showed that

marine protected areas were effective in the Philippines. Thus, it is highly recommended that measures be taken to generate new income through oyster farming and to simultaneously declare particular areas as "marine protected" so ordinary fishing gears cannot be used or deployed while installing oyster aquaculture facilities. JIRCAS is collaborating with universities and research institutions in the Philippines, Myanmar, Thailand, and Malaysia to promote research and development and dissemination of ecosystem-sustaining, community-based aquaculture that contributes to such measures.

Next, Dr. SAKIYAMA Kazutaka, Director of Aquaculture Research Department, Production Engineering Division, Fisheries Technology Institute, Fisheries Research and Education Agency, gave a presentation titled "Issues of sustainable aquacultural seedlings in Japan." The Japanese archipelago, extending from north to south, is home to a variety of ocean regions ranging from subarctic to temperate to subtropical, with complex coastlines, and is interrupted by ocean currents such as the Kuroshio Current and Oyashio Current, making it one of the world's richest fishing grounds and suitable habitat for a rich variety of fish and shellfish species. In order to secure a stable supply of marine products and sustainably develop the fishing industry, the release of juvenile fish and the cultivation of fish, bivalves, crustaceans, and seaweeds are being conducted in many areas to maintain and increase resources. Currently, yellowtail, red seabream, and scallop account for more than 50% of domestic production. Even the less abundant grouper species such as yellowtail amberjack and Japanese jack



Session Chair: Dr. NAKASHIMA Kazuo (Program Director, Food Program, JIRCAS)



Dr. MIYATA Tsutom (Director, Fisheries Division, JIRCAS)

mackerel are also available and highly valued in the Japanese markets. Although slightly different from aquaculture, capture-based aquaculture (short-term aquaculture) of Japanese spiny lobster, Japanese blue crab etc. has also been underway for quite some time. For sustainable development of aquaculture, it is important to secure a large and stable supply of artificial seeds rather than natural seeds. Currently, there are ongoing researches to achieve 100% artificial seedling production of yellowtail, eel, and tuna, which are representative species for Japanese aquaculture. Similarly, a technology to produce artificial seedlings is needed for new cultivated species. Fortunately, Japan has a number of seedling production technologies that have been developed through sea farming. Over the past 60 years, a total of 150 seedling production technologies have been developed. In recent years, new technologies such as closed recirculating aquaculture systems and LED lighting have been introduced, making it possible to produce seedlings of various fish species that were previously considered difficult to breed. Seedling production technologies for spotted halibut, common octopus, pen shell, and hiziki, which are being researched and developed as new target species for release of seedlings and aquaculture, were also introduced in the presentation.

Finally, Dr. Jeffrey T. Wright, Associate Professor, Institute of Marine and Antarctic Studies, University of Tasmania, gave a presentation titled "Potential of seaweed utilization for greenhouse gas emissions reduction." Methane is a powerful greenhouse gas that contributes significantly to global warming. Agriculture is the largest contributor to anthropogenic methane emissions (~40%), with emissions from livestock via enteric production the dominant process (~32% of anthropogenic methane emissions). Consequently, a range of approaches to reduce methane emissions are being examined including a major focus on using feed supplements to inhibit enteric methane

production in livestock. Of all the feed supplements tested, the red seaweed Asparagopsis demonstrates the highest potential to inhibit methane production in livestock. The two Asparagopsis species, temperate A. armata and tropical A. taxiformis, both produce bioactive compounds of which bromoform is the most abundant. Low doses (0.2%-3% dry weight) of Asparagopsis incorporated into livestock feed reduce enteric methane production by up to 98%. Importantly, this reduction in methane by Asparagopsis is achieved with limited quantifiable effects on the animals or products bound for human consumption. However, in Australia alone, ~35,000 tonnes (dry weight) of Asparagopsis per year would be required to supply the ~1 million cattle feedlots. Until recently, cultivation methods for Asparagopsis were not well-established but in the last years, Australian three seaweed companies have developed commercial-scale cultivation methods for Asparagopsis. Although Asparagopsis represents a significant opportunity, and despite rapid progress, the Asparagopsis industry is in its early stages and optimisation of these methods is ongoing. Moreover, there are still many knowledge gaps surrounding its cultivation and future directions will be discussed.

As described above, the participants learned about the issues and challenges of artisanal fisheries and aquaculture in Southeast Asia and Japan to realize sustainable food systems, and the potential of seaweed as a new product for reducing greenhouse gas emissions and combating climate change. Supplementary comments by each speaker were made during the panel discussion.

NAKASHIMA Kazuo Program Director Food Program, JIRCAS



Dr. SAKIYAMA Kazutaka (Director, Aquaculture Research Department, Production Engineering Division, Fisheries Technology Institute, Fisheries Research and Education Agency)



Dr. Jeffrey T. Wright (Associate Professor, Institute of Marine and Antarctic Studies, University of Tasmania)

## Session 2 Research and Application to Enhance Sustainability and Productivity of Artisanal Fisheries and Aquaculture

Session 2 featured three national and international researchers who spoke on research and applications to enhance sustainability and productivity of artisanal fisheries and aquaculture.

The session began with a lecture by Dr. YURIMOTO Tatsuya, Senior Researcher, Fisheries Division, JIRCAS, on the "Development of sustainable bivalve aquaculture technology adapted to tropical monsoon region."

Blood cockle (Tegillarca granosa) farming on the west coast of Peninsular Malaysia is carried out by collecting naturally occurring young spats in mud flats and sowing them in managed farm plots owned by farmers. Although aquaculture in this region is simple as it does not require feeding and can be easily initiated with a small budget, he pointed out its susceptibility to changes in the natural environment, such as biomass, coastal topography, ocean currents, and weather conditions. He found that the full-grown larvae do not settle nor adhere on substrates during transition from planktonic to benthic stages and that they start benthic life directly on the surface sediment of the muddy bottom, with the early spats moving and accumulating in muddy areas with weak currents. However, the soft bottom and high turbidity make the habitat unsuitable for the cockles, and fishers have achieved good growth and survival rates by collecting the early spats and transplanting them to suitable bottom-condition plots. As they grow, the cultured cockles take in organic matter and absorb CO<sub>2</sub> to make their shells. These substances are also transported to land upon harvesting, so the fishermen's activities play an important role in the material cycle of the

coastal ecosystem. Although environmentally sustainable, blood cockle farming has problems to solve in order to realize sustainability. He pointed out the importance of sustaining the reproductive adult population of blood cockles and maintaining not only the coastal but also the terrestrial environments such as rivers. In order to achieve these goals, he added that it is important to have an organized community of farmers that work together and a system for environmental management, from land to coastal areas, based on mutual agreement and cooperation between fishermen, government, researchers, and citizens. In recent years, the Malaysian Fishermen's Community has been organized and has begun efforts to scientifically evaluate and redefine farm plots set up by the government. In collaboration with the Fisheries Research Institute Malaysia (FRI), JIRCAS has developed a method that allows fishermen to rapidly evaluate the habitat conditions of the blood cockles during the aquaculture process using simple tools, and has also started marine litter countermeasure activities in collaboration with citizens as part of coastal environment management. He concluded by saying that these activities are in line with the concept of "satoumi," which has spread from Japan, and are expected to lead to the realization of sustainable aquaculture in tropical monsoon regions.

Next, Dr. MORIOKA Shinsuke, Professor, University of Human Environments, gave a presentation titled "Management, production and utilization of small indigenous species 'Zako' for nutritional improvement in rural areas and biodiversity conservation in inland Southeast Asia."



Chair: Dr. KANAMORI Norihito (Project Leader, Information and Public Relations Office, JIRCAS)



Dr. YURIMOTO Tatsuya (Senior Researcher, Fisheries Division, JIRCAS)

## SPECIAL FEATURE : JIRCAS International Symposium 2022

In recent years, commercial aquaculture has contributed to economic growth and improved national food security in Southeast Asia, but health problems remain unresolved, especially in inland rural areas, such as stunting in children under 5 years old and prevalence of anemia in women of reproductive age. Since these symptoms are considered to be attributable to deficiencies in micronutrients and vitamins, Professor Morioka strongly recommends increasing the intake of small fish "Zako," which are rich in minerals and vitamins. Small native fish species are important not only for their nutritional value but also for biodiversity conservation. However, he pointed out that there is a significant risk of loss of local biodiversity due to the impact of introduced alien species and the aquacultural development of hybrid/alien species, and that the development of aquaculture, stock assessment, and multiplication of indigenous fish species is becoming necessary. In other words, the management, production, and utilization of small native species "Zako" are important key issues for nutritional improvement and biodiversity conservation. He mentioned that biological and aquaculture-related studies on several "Zako" species have progressed in recent years, and that technical improvements in their efficient/value-added utilization are ongoing. On the other hand, considering the diversity of unexploited "Zako" species as well as a large number of residents under health risks due to micronutrient/vitamin deficiencies in Southeast Asia, he recommended further investigations of their biology, aquaculture and processing techniques contributory to management, production and utilization.

Finally, Dr. Jon P. ALTAMIRANO, Head of Farming Systems & Aquatic Ecology Section, Research Division, Southeast Asian Fisheries Development Center/Aquaculture Department (SEAFDEC/AQD), gave a presentation on "Improving artisanal fisheries through community-based prawn stock enhancement in a mangrove estuary."

Tropical seafood, especially prawns, have always been

in high demand with high market prices. As a result, the number of fishers has been increasing and, due to frequent overfishing, the catch volume and sizes have been declining year by year. Prawn aquaculture has significantly contributed to the total yield over the past decades, but the expansion of farms and ponds has often negatively affected the natural nursery grounds in the estuaries and mangroves. To address the above issues, he presented efforts to enhance black tiger stocks in the New Washington Estuary (NWE) in Aklan, central Philippines. The NWE was a productive fishing ground, providing >24 kg/gear/day of catch in the 1970s but steadily declined to <0.7 kg/gear/day in the 2010s. Prawn catches declined both in quality and quantity. Meanwhile, mangrove cover was reduced from 4,800 ha in the 1950s to only <800 ha in the 2010s. He has conducted studies on shrimp nursery, small-scale releases, monitoring experiments, and social assessments to obtain important scientific data to guide future resource enhancement activities, and even at an experimental scale, his results showed that releases could significantly increase catch by at least 8% and daily income by >400%. He concluded that a long-term management plan between all stakeholders, especially the community and local government, is needed to sustain shrimp fishery and maximize its benefits.

Throughout the presentations and Q&A in Session 2, there was agreement on the importance of strengthening local communities in addition to conducting research on sustainable and productive fisheries and aquaculture. It was further confirmed that, as in the case studies presented by the speakers, the local environment in which aquaculture is practiced varies greatly, and that innovation must be tailored to the specific needs of the region.

#### KANAMORI Norihito Project Leader, Information and Public Relations Office, JIRCAS



Dr. MORIOKA Shinsuke (Professor, Faculty of Environmental Science, University of Human Environments)



Dr. Jon P. ALTAMIRANO (Head, Farming Systems and Aquatic Ecology Section, Research Division, SEAFDEC/AQD)

## Panel Discussion How can research support resilient, efficient and sustainable fisheries and aquaculture activity?

The symposium concluded with a panel discussion in which all eight speakers took to the stage. The session was moderated by Dr. Marcy Wilder, Project Leader (JIRCAS Fisheries Division), who began by explaining the purpose and overview of the panel discussion. In particular, she stated that JIRCAS hopes to contribute to the realization of the relevant SDGs by promoting further development of 'blue food' — animals, plants, and algae harvested from freshwater and marine environments — and that the symposium was held to create awareness and exchange views on how science and technology can support artisanal fisheries and aquaculture with the aim of contributing to poverty reduction and economic development. Next, the moderator asked one question to each panelist.

In response to how Japanese scientists and administrators should work toward achieving global success drawing upon domestic examples, the first keynote speaker, Dr. YAGI Nobuyuki, stated that the use of local resources, such as pertaining to social organization or local knowledge, is key to the successful establishment of small-scale fisheries in other countries as well. This is because there is a diversity of people's attitudes and understanding of nature and local conditions. He added that we cannot simply transfer the Japanese way of engaging in fisheries and aquaculture to other countries as they have their own natural settings and human organizations, and that we must respect the local situation.

Next, when asked how more women and youth can be engaged in jobs and opportunities related to fisheries and food systems, the second keynote speaker, Dr. Shakuntala Haraksingh Thilsted, expressed the view that hands-on experience during the educational stage is very important and suggested that learning traditional methods and acquiring new technologies in the community, combining modern technologies (e.g., data technology) with traditional knowledge, and developing targeted policies and instruments of change should be given emphasis.

The remaining panelists then offered comments in response to questions from the moderator. Dr. MIYATA Tsutom stated that promoting farmer-participatory aquaculture methodologies based on interdisciplinary approaches, and explaining scientific evidence in a clear manner to local farmers, are essential. Dr. SAKIYAMA



Panelists and moderator on stage

Kazutaka emphasized the importance of observing target species and being willing to improve their related seed production technology for application to other countries. Dr. Jeffrey T. Wright stated that incentives are needed to persuade livestock farmers to use seaweed as a component in feed as a means of mitigating greenhouse gas emissions. Dr. Wright also noted that an emission reduction fund was introduced into Australia under which carbon credits may be claimed. Dr. YURIMOTO Tatsuya stated that for the further promotion of sustainable bivalve aquaculture in Malaysia, it is important to assess coastal environmental conditions together with the needs of local fishermen. Dr. MORIOKA Shinsuke put forth that in order to convince more local governments and fishermen to use small native fish known as "Zako" in the human diet, it would be effective to make use of processing methods that provide added value to the product, and that cooperation among researchers, the government, and the private sector is essential in achieving this goal. The last panelist, Dr. Jon P. ALTAMIRANO, in response to a question from the moderator on how artisanal fisheries can be improved through community-based stock enhancement programs using the example of the tiger shrimp, replied that a thorough understanding of the local environment as well as the biology and habitat of the target species is of foremost importance. Finally, the panelists answered questions that had been received in advance from overseas online participants, and then engaged in a question-and-answer session with the audience.

In conclusion, as delineated above, this panel discussion confirmed that in order to support artisanal fisheries and aquaculture in developing regions through science and technology, it is requisite to improve and disseminate technologies with the participation of local fishers, based on a thorough understanding of the "local environment." In other words, this means that success can only be achieved if the local culture and environmental conditions are taken into consideration, because everyone has a different way of thinking.

#### Marcy Wilder, Project Leader, Fisheries Division, JIRCAS NAKASHIMA Kazuo, Program Director, Food

Program, JIRCAS



Moderator: Dr. Marcy N. Wilder (Project Leader, Fisheries Division, JIRCAS)

## [Research Highlights]

#### Development of New Salt Tolerant Soybean Variety with High Yield and Disease Resistance —Contributing to stable soybean production in salt-affected agricultural areas—

As part of research aimed at stabilizing agricultural production in poor environmental regions of the world, JIRCAS has been developing crops that apply salt tolerance genes for China, Vietnam, and India. Using the gene *Ncl* discovered by JIRCAS, a new soybean variety 'Sudou27,' which can be grown in salt-affected areas along the Chinese coast, has been developed in collaboration with the Jiangsu Academy of Agricultural Sciences of China.

'Sudou27' is a salt-tolerant soybean variety developed primarily for use as a food oil ingredient in response to the growing demand for soybeans in China. The hybrid progenies, obtained from an artificial cross between

a Chinese soybean intermediate maternal line and a line containing the salt-tolerant gene *Ncl*, which was discovered by JIRCAS in a Brazilian soybean variety, were used for generation and selection of superior lines in China. The local New Variety Review Committee has recognized the superiority of 'Sudou27' due to its high seed yield, salt tolerance, and disease resistance, and registered it as a new variety in China on August 29, 2022.

The success of the new variety will open the way for the application of the salt-tolerant gene, the result of basic research, in soybean breeding, and is expected to stabilize soybean production in areas where farmland is affected by salt damage.



#### World's First Clarification of Genetic Diversity of 'Hiyuna,' a Traditional Asian Vegetable —Four subpopulations distributed in India, China, and other countries—

JIRCAS, in collaboration with the University of Tsukuba, the World Vegetable Research Center, and the Kazusa DNA Research Institute, has elucidated the genetic diversity of edible amaranth (*Amaranthus tricolor* L.) also known as 'hiyuna' in Japanese, a traditional vegetable in Asian regions, for the first time in the world.

Cultivated in developing regions of Southeast Asia such as Vietnam and Indonesia, 'hiyuna' is a highly nutritious crop that is resistant to environmental stress. However, breeding research has been delayed due to low demand in developed countries. In this study, the research group analyzed the genetic diversity of 465

'hiyuna' genetic resources and identified 5,638 single nucleotide polymorphism (SNP) markers in order to establish a breeding platform. A core collection was also created consisting of 105 accessions originating from diverse countries and regions such as India, Bangladesh, and China.

Marker selection breeding using the SNP markers and core collection obtained this time will pave the way for the development of breeding techniques and new varieties to improve nutritional value, eating quality, and yield. It is also expected to contribute to sustainable vegetable production in tropical and subtropical regions.



#### Development of Organic Fertilizer Production Technology Using Low-Grade Phosphate Rock —Yield increase effect comparable to chemical fertilizer due to the action of soil microorganisms—

A joint research group of JIRCAS, the Institute of Environment and Agricultural Research of Burkina Faso (INERA), and University Joseph KI-ZERBO has developed a technology for the production of organic fertilizers that increase yields by fermentation of locally available crop residues (such as sorghum stalks) with rhizosphere soil rich in low-grade phosphate rock, an underutilized resource in Burkina Faso, and phosphate-solubilizing microorganisms. In a demonstration test on the central plateau of Burkina Faso on sorghum, a major cereal crop, organic fertilizers with added phosphate rock and other materials added (referred to as phosphate soil-added compost), which were prepared using this technology, showed a yield increase effect comparable to that of chemical fertilizers. It was also found that the number of soil microorganisms effective for phosphorus solubilization increased.

The phosphate rock soil-added compost developed in this research is a new organic fertilizer that uses only materials available to local farmers, such as plant residues, low-grade phosphate rock, and rhizosphere soil. This technology will provide a new option for local farmers and is expected to be an effective technology for improving soil fertility. Furthermore, the results of this research are expected to contribute to solving the food problems in sub-Saharan Africa through the utilization of unused local resources and to be an effective technique for dealing with the sharp rise in global chemical fertilizer prices.



rganic fertilizer production technology using low-grade Burkina Faso phosphate rock

#### Phosphorus Limitations Reduce Total Tropical Forest Production by 36% —Contributes to improved accuracy of terrestrial carbon balance models—

An international research group including JIRCAS and Kochi University, and led by Professor David Ellsworth of Western Sydney University (Australia), has successfully elucidated the photosynthetic capacity of tropical forest trees under phosphorus constraints. The group has shown that incorporating the limitation of photosynthesis by phosphorus, one of the essential elements of plants, into a model predicting total forest production reduces the total production of tropical and subtropical forests worldwide by 36%, compared to a model that does not incorporate this limitation.

Tropical forests account for more than one-third of the total production of terrestrial ecosystems and play an important role in climate change mitigation and adaptation. On the other hand, tropical soils have been weathered and are phosphorus deficient, but there are few measured data on the extent to which phosphorus limits photosynthesis, and its impact on total forest production was unknown.

Therefore, an analysis of a dataset sampled from 52 sites on four continents around the world clarified

the relationship between phosphorus concentration in leaves and photosynthetic capacity. The results showed that even if nitrogen was abundant, phosphorus limitation caused a reduction in photosynthetic capacity. Furthermore, by incorporating phosphorus limitation into a model for predicting total forest production, the impact of phosphorus constraints on the total production of tropical and subtropical forests worldwide has been successfully quantified.

This study also found that the impact of phosphorus on photosynthesis in the tropics is considerably greater than previously assumed, and will contribute to the improvement of the prediction accuracy of carbon balance in land areas.



### [2022 (The 16<sup>th</sup>) Japan International Award for Young Agricultural Researchers (Japan Award) and Awarding 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 2022 (The 16<sup>th</sup>) Japan Award Ceremony Report

The 2022 (16th) Awarding Ceremony was held on November 22nd (Tuesday) in a hybrid format (inperson at Hitotsubashi Hall, Hitotsubashi University, and online).

On behalf of the organizers, Mr. KOBAYASHI Yoshio, Chairman of the Agriculture, Forestry and Fisheries Research Council (AFFRC) of the Ministry of Agriculture, Forestry and Fisheries, greeted the participants. This was followed by congratulatory remarks, an introduction of the guests, and a report on the screening process from Dr. IWAMOTO Mutsuo, Chair of the Selection Committee. The certificates of commendation (Chairman's Award) were presented by AFFRC Chairman Kobayashi, and the cash incentives (Motai-JIRCAS Award) were given by Mr. KOYAMA Osamu, President of JIRCAS. The 2020 (The 14th) winners, who were not able to personally receive their awards due to the COVID-19 pandemic, were in attendance at the ceremony.

There was a brief photo session after the award ceremony, followed by commemorative lectures of their research achievements by the 2022 winners and a welcome lunch reception to celebrate the event.



## Introduction of the 2022 (The 16<sup>th</sup>) Japan Award Winners

\*Age as of 01 January 2022

#### Tovohery RAKOTOSON (39 years old, Male, Malagasy)

Professional Affiliation: University of Antananarivo

Research Achievement: Addressing phosphorus deficiency in rice in Sub-Saharan Africa

Reason for the Award: The awardee quantified the amount of solubilized phosphorus in the soil when compost is applied in various soils, showing that application of compost to phosphorus-deficient paddy fields can greatly increase the phosphorus uptake of paddy rice and its yield. This study is highly evaluated as a problem-solving study based on the needs of the field in Africa. The results of this research could reduce the amount of purchased fertilizer while maintaining the yield.

#### Leonardo CRESPO HERRERA (39 years old, Male, Mexican)

Professional Affiliation: International Maize and Wheat Improvement Center (CIMMYT)

Research Achievement: Genetic improvement of global wheat, including progress for enhancing insect resistance

Reason for the Award: The awardee developed an efficient method of breeding wheat lines with aphid resistance through the identification of insect resistance genes in wheat and the development of genetic markers. This study has been highly evaluated for developing lineages that have been distributed worldwide for use in wheat breeding, and the methods of this study have been applied to develop varieties with resistance mechanisms against various kinds of insects, not only aphids.

Athanasia Amanda SEPTEVANI (37 years old, Female, Indonesian)

Professional Affiliation: National Research and Innovation Agency (BRIN) Research Achievement: The value of agricultural waste: Cellulose as a building block for materials

Reason for the Award: The awardee established a simple, low-cost, and environmentally friendly process for producing high-purity cellulose from empty fruit bunches of discarded oil palm. Since the oil palm industry plays an important role in the Indonesian economy, the prevalence and practical application of the processing method developed in this study will lead to the effective use of oil palm waste in the future. This research is highly recognized for its potential to reduce the environmental impact and improve the management of producers.

#### 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 in advance.

https://www.jircas.go.jp/en/public\_relations/jircas\_mailmagazine

## JIRCAS Newsletter No.94

March 2023

Information and Public Relations Office 1-1 Ohwashi, Tsukuba, Ibaraki 305-8686, JAPAN Phone: +81-29-838-6313 Fax: +81-29-838-6316









