50th Anniversary

— Achievements from the Past and Expectations for the Future —

Japan International Research Center for Agricultural Sciences

50th

1970-2020

JIRCAS Japan International Research Center for Agricultural Sciences (JIRCAS)

50th Anniversary

— Achievements from the Past and Expectations for the Future —

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Greetings from the President of JIRCAS

The Japan International Research Center for Agricultural Sciences (JIRCAS), a National Research and Development Agency under the Ministry of Agriculture, Forestry and Fisheries, plays a core role in international collaborations in the field of agriculture, forestry and fisheries research in Japan. The year 2020 marks the 50th year since JIRCAS was first established in 1970 as the Tropical Agriculture Research Center (TARC). As part of the celebration, we have decided to publish this brochure to commemorate the 50th anniversary of our founding to summarize the changes in the organization and the history of activities to date and move towards a new era.

In the 21st century, the Earth we live in is confronted by a host of pressing global problems, among them, the poverty of more than 800 million people, a tightening global food market, climate change, and environmental degradation. These problems have been deeply affecting sustainable production in agriculture, forestry, and fisheries. In particular, they present threats to the maintenance of basic human needs and human security in economically and socially vulnerable developing countries. I believe the solutions for these global issues cannot be achieved without global cooperation.

As summarized in this brochure, JIRCAS has been conducting joint research with many international organizations and partner countries in the developing regions centering on tropical and subtropical regions for 50 years, which leads to the resolution of food and environmental issues more efficiently and more effectively.

I would like to express my sincerest gratitude to all the staff members for making the publication of this commemorative issue possible. All together we can overcome further challenges, leaps, and development. I wish JIRCAS every success and look forward to its next thriving 50 years to come.

IWANAGA Masa
President, JIRCAS

Paddy fields in Baobab, Kilimanjaro (Tanzania)

Message from the Director General of AFFRCS

In recent years, research and development (R&D) on agricultural production and food safety in developing countries has come to play an extremely important role in addressing global issues such as poverty, hunger, malnutrition, climate change, and transboundary plant pests and diseases. Also, the international expansion of SDG's efforts towards a sustainable society is changing people's awareness and attitude, and it is important to take the initiative in contributing to the achievement of the SDGs and lead to the sustainable development of agriculture in the future. On the other hand, the world is seeking to deal with the possible effects of "Post-COVID-19", in which it is necessary to reconsider the world's food supply and adopt new ways of thinking and systems for sustainable production and consumption activities.

In such a global-scale movement, the Japan International Research Center for Agricultural Sciences (JIRCAS) has already established its position as a main player in promoting international collaborative research, developing technologies that contribute to international cooperation and strategically endorsing advanced technologies worldwide. I wish your role to continue in the future.

HISHINUMA Yoshihisa
Director General
Agriculture, Forestry and Fisheries Research Council Secretariat (AFFRCS)
Ministry of Agriculture, Forestry and Fisheries (MAFF)

(Translated by the Editorial Committee)

Fishing on the Mekong River (Cambodia)

1. History of JIRCAS

The History of JIRCAS

1970	Establishment of the Tropical Agriculture Research Center (TARC) by the Ministry of Agriculture and Forestry
1977	TARC Headquarters was transferred from Kita-ku, Tokyo, to Tsukuba City, Ibaraki Prefecture.
1993	TARC was reorganized as JIRCAS under the Ministry of Agriculture, Forestry and Fisheries.
2001	JIRCAS was restructured as an Incorporated Administrative Agency (IAA). Formulation of the First Medium-Term Plan (April 2001-March 2006)
2006	The Second Medium-Term Plan (April 2006-March 2011)
2007	Launched the "Japan International Award for Young Agricultural Researchers (Japan Award)" in cooperation with the Ministry of Agriculture, Forestry and Fisheries (MAFF)
2011	The Third Medium-Term Plan (April 2011-March 2016)
2015	JIRCAS was restructured as a National Research and Development Agency.
2016	The Fourth Medium to Long-Term Plan (April 2016-March 2021)
2020	The 50th Founding Anniversary of JIRCAS

JIRCAS Through the Years: A Look Back in Photographs

TARC Main Office and Geodesic Dome Greenhouse (Kannondai, Tsukuba City). In 1977, TARC Main Office was transferred from Nishigahara, Kita-ku, Tokyo, to Kitanakazuma, Yatabe-machi, Tsukuba-gun.

Different types of tropical crops were grown in the Geodesic Dome Greenhouse (1980).

Tropical Agriculture Research Center (TARC), Okinawa Branch (March 1977)

Research on the breeding of useful crops such as sugar cane and pineapple at the Okinawa Branch (March 1977)

Researchers who returned from abroad gave oral presentations with a written summary of their activities (JIRCAS Overseas Return Seminar).

Architectural view of JIRCAS Main Building, which was moved from Kannondai to its current location in Ohwashi

Full view of the present JIRCAS Headquarters in Tsukuba (31 March 2004)

JIRCAS Main Building (30 April 2008)

Hachimandai Experimental Field (23 May 2018)

Full view of the current Tropical Agricultural Research Front

2. 50 Years of Research History

From TARC to JIRCAS

(1) Tropical Agriculture Research Center

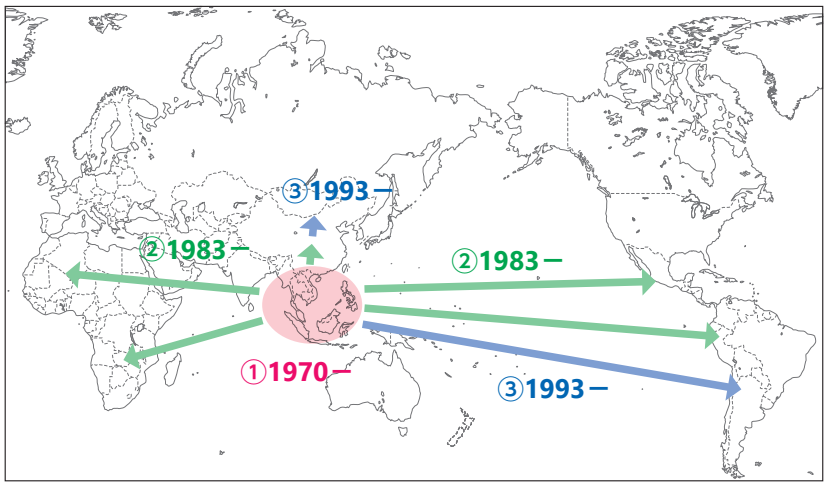
①FY1970–

Missions

- Development of technologies needed to promote agriculture and increase food production in developing countries mainly located in the tropical and subtropical regions
- Contribute to the development of national agricultural technologies and the promotion of research and development at the national level

Research・Target Areas

- Research activities focused mainly on rice cultivation and forest management in the tropical and subtropical regions in Southeast Asia. Researchers were dispatched overseas to conduct long-term research with partner countries.



Expansion of target areas (from TARC to JIRCAS)

②FY1983–

Missions

- Elucidation of the problems in agricultural production occurring naturally in tropical regions and development of appropriate agricultural technologies
- Gathering and analysis of information on the economic and social aspects of agriculture in developing countries and using the results to identify priority areas for research and dissemination

Research・Target Areas

- Research activities in agriculture and forestry were expanded to include research on fruits, vegetables, and livestock. The target areas were also expanded to include arid regions, semi-arid regions, and cold humid areas in China and Africa, among others. Long-term research activities were pursued by dispatching individual researchers or teams of researchers to target countries.

(2) Japan International Research Center for Agricultural Sciences

③FY1993–

Missions

- Conduct research for promoting agriculture and forestry production in partner countries in the tropical and subtropical regions, and contribute to various research cooperation needs such as measures for global environmental problems
- Integration of technologies developed from a wide range of research areas using conventional and applied approaches to promote collaboration and dissemination of research outputs

Research・Target Areas

- Fisheries research was added to crop cultivation and forest management so that research areas covered the agriculture, forestry and fisheries industries. A socio-economic approach was also added to the natural science approach in tackling research on agriculture, forestry and fisheries. The target areas were further expanded to include the developing regions in temperate and cold zones of Northeastern China, and high latitude areas in Central and South America. Research activities were organized into projects to tackle specific problems in target countries. Individual researchers or teams of researchers were dispatched to target countries for short-term or long-term research projects.

④**FY2001-2005: First Medium-Term Plan**

Missions

- Promotion of research that contributes to stable global food supply-demand in harmony with the environment
- Implementation of cross-disciplinary research projects in natural and social sciences related to agriculture, forestry and fisheries in collaboration with developing countries and international organizations in order to contribute in finding solutions to problems on agriculture, food, and environment in developing countries

Research・Target Areas

- Implementation of research programs according to a five-year Medium-Term Plan approved by the Ministry of Agriculture, Forestry and Fisheries (MAFF). Projects in agriculture, forestry and fisheries research were tackled using natural science and socio-economic approaches. Depending on research activities for each project, researchers were dispatched to target countries for long-term or short-term research activities.

⑤**FY2006-2010: Second Medium-Term Plan**

Missions

- Research and development on agricultural, forestry and fisheries technology geared towards providing solutions to international food and environmental problems
- Collection, analysis and dissemination of information to grasp trends related to international food, agriculture, forestry, fisheries and rural areas

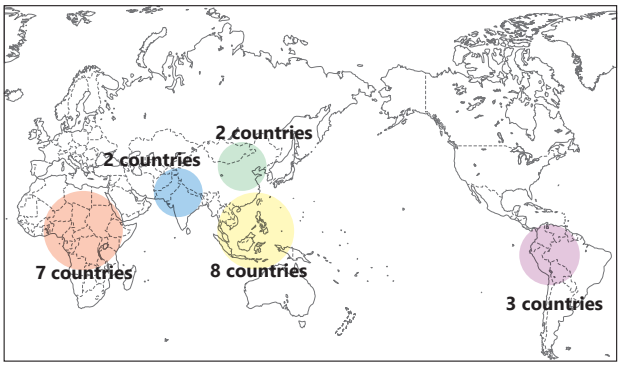
Research・Target Areas

- Projects covered research in agriculture, forestry and fisheries using natural science and socio-economic approaches. Based on the project, researchers were dispatched mainly for short-term research in partner countries. The target areas included 24 countries.

⑥**FY2011-2015: Third Medium-Term Plan**

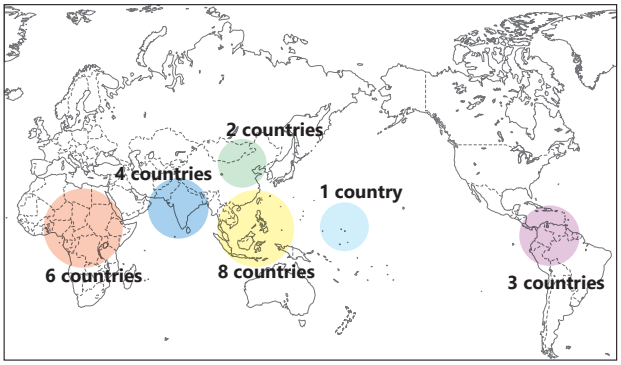
Missions

- Development of agricultural technologies based on sustainable management of the environment and natural resources in developing regions
- Development of technologies for increased productivity and stable production of agricultural products in the tropics and other unstable environments, and for income and livelihood improvement of the rural population in developing regions
- Information gathering, analysis, and dissemination of domestic and overseas data of the agriculture, forestry and fishery industries in developing regions



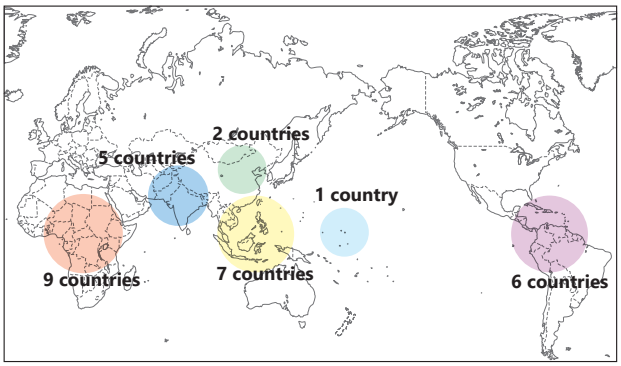
Target areas in the 1st Medium-Term Plan

China, Mongolia, Thailand, Philippines, Vietnam, Laos, Cambodia, Myanmar, Malaysia, Indonesia, India, Syria, Kenya, Niger, Ghana, Mali, Cote d'Ivoire, Guinea, Burkina Faso, Brazil, Argentina, and Paraguay



Target areas in the 2nd Medium-Term Plan

China, Mongolia, Thailand, Philippines, Vietnam, Laos, Cambodia, Malaysia, Indonesia, East Timor, India, Bangladesh, Sri Lanka, Marshall Islands, Syria, Ethiopia, Niger, Ghana, Togo, Benin, Nigeria, Brazil, Argentina, and Paraguay



Target areas in the 3rd Medium-Term Plan

China, Mongolia, Thailand, Philippines, Vietnam, Laos, Cambodia, Malaysia, Indonesia, India, Bangladesh, Sri Lanka, Pakistan, Marshall Islands, Uzbekistan, Kenya, Tanzania, Ethiopia, Mozambique, Niger, Ghana, Benin, Nigeria, Burkina Faso, Mexico, Brazil, Argentina, Paraguay, Uruguay, and Colombia

2. 50 Years of Research History

Research・Target Areas

- The program-based management of research projects was introduced. Research activities were organized into the following "Programs" with specified goals and approaches towards achieving those goals:
  - Program A: Environment and Natural Resources Management (5 Projects)
  - Program B: Stable Food Production (6 Projects)
  - Program C: Rural Livelihood Improvement (6 Projects)
  - Program D: Information Analysis
- Each program was assigned a 'Program Director' in charge of budget, personnel, goal achievement management and evaluation. A total of 17 "projects" were placed under "Programs" including the so-called flagship projects that represent the most important project in each program.

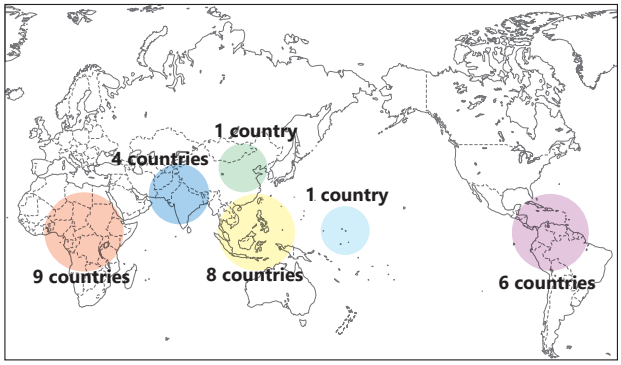
⑦FY2016-2020: Fourth Medium to Long-Term Plan

Missions

- Development of agricultural technologies for sustainable management of the environment and natural resources in developing regions to cope with climate change and environmental degradation
- Development of technologies for stable production of agricultural products in the tropics and other adverse environments to promote food production and to improve nutrition in Africa and other developing regions
- Development of high value-adding technologies with various local resources in developing regions to establish sustainable agriculture, forestry and fisheries in harmony with the environment, and value chain contributing to processors and consumers as well as farmers
- Collection, analysis and dissemination of information for grasping trends in international agriculture, forestry and fisheries to solve global food and environmental problems

Research・Target Areas

- The overall structure of program-based management was retained with some modification of the project level components. The number of projects was reduced to 14. The four "Programs" developed based on the missions of the 4th Medium to Long-Term Plan are as follows:
  - Program A: Environment and Natural Resource Management (4 Projects)
  - Program B: Stable Food Production (4 Projects)
  - Program C: Rural Livelihood Improvement (5 Projects)
  - Program D: Information Analysis (1 Project)

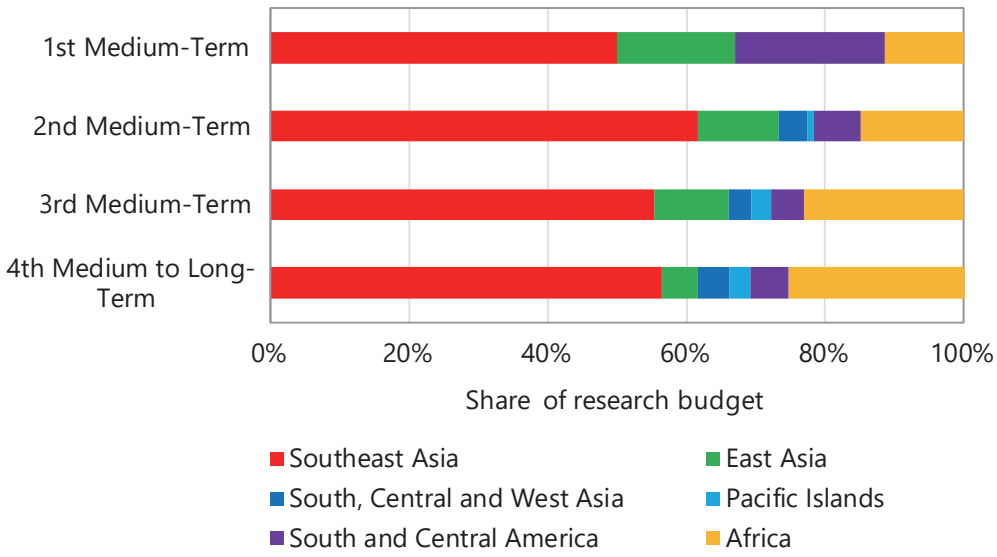


Target areas in the 4th Medium to Long-Term Plan
China, Thailand, Philippines, Vietnam, Laos, Cambodia, Myanmar, Malaysia, Indonesia, India, Bangladesh, Nepal, Palau, Uzbekistan, Tanzania, Ethiopia, Mozambique, Madagascar, Ghana, Nigeria, Burkina Faso, Guinea, Mauritania, Mexico, Brazil, Argentina, Paraguay, Uruguay, and Bolivia

Agreements・Research Budget

- Agreements: A total of 199 research agreements such as Memorandum of Understanding (MOU), Joint Research Agreement (JRA), Collaborative Research Agreement (CRA) etc., including 112 valid agreements as of 2020, have been concluded. Collaborative research is conducted with 66 research organizations in 29 developing countries.
- The budget allocation for research in Africa has doubled in the past 20 years (11% → 25%). The budget allocation for research in Southeast Asia is maintained at over 50%.

Countries with active MOUs, JRAs, CRAs, etc. with JIRCAS (2020)



Changes in regional budget allocations from the 1st Medium-Term Plan to the 4th Medium to Long-Term Plan

Programs and Projects in the 4th Medium to Long-Term Plan

Program A Environment and Natural Resource Management

Development of agricultural technologies for sustainable management of the environment and natural resources in developing regions

Environmental problems such as climate change, desertification, and soil degradation are escalating on a global scale due to intensive agricultural activities particularly in vulnerable developing regions. Fertile soils are eroded, salts are accumulated due to rising groundwater level, agricultural chemicals are leached into the ecosystem, and greenhouse gases such as methane and nitrous oxide are emitted into the atmosphere. The four research projects under this program aim to sustainably manage soil, water, and fertilizer resources for agricultural production, and develop agricultural technologies to mitigate these problems and adapt to environmental changes.

- **Climate Change Measures in Agricultural Systems:** Development of agricultural technologies for reducing greenhouse gas emissions and climate-related risks in developing countries
- **Watershed Management in Africa:** Development of intensive watershed management models for soil erosion-prone areas in Sub-Saharan Africa
- **Resource Management in Asia and Pacific Islands:** Development of sustainable resource management systems in the water-vulnerable areas of Asia and the Pacific islands
- **BNI Utilization:** Development of ecologically sustainable agricultural systems through practical use of the biological nitrification inhibition (BNI) function

Program B Stable Agricultural Production

Technology development for stable production of agricultural products in the tropics and other adverse environments

The agricultural potential in many developing regions has not been fully realized due to adverse environments such as low fertility and frequent occurrence of droughts, pests and diseases, which compromise food and nutrition security. This program aims to enhance agricultural productivity and improve nutrition in developing regions including Africa through the development of agricultural technologies for enhancing yield, breeding of crops adaptable to adverse environments, utilization of high-yielding biomass crops, and application of efficient methods for pest and disease control. The program also aims to disseminate the developed technologies by conducting demonstration tests and providing manuals and reference materials to researchers, plant breeders, farmers, and government staff.

- **Food Security in Africa:** Development of sustainable technologies to increase agricultural productivity and improve food security in Africa
- **Environmental Stress-Tolerant Crops:** Development of breeding materials and basic breeding technologies for highly productive crops adaptable to adverse environments
- **High-Yielding Biomass Crops:** Development of technologies for the breeding and utilization of promising high-yielding biomass crops in unstable environments
- **Pest and Disease Control:** Development of technologies for the control of migratory plant pests and transboundary diseases

Program C Value-adding Technologies

Development of high value-adding technologies and utilization of local resources in developing regions

This program aims to promote the utilization of various regional resources in Asia and to facilitate the development of high value-adding technologies to increase the income of local farmers in developing regions. To ensure high-quality products and a stable food value chain, various initiatives such as identification of regional food characteristics, development of efficient food processing technologies, and elucidation of consumer needs will be pursued. Rural development in the developing regions is supported by practicing sustainable agriculture, forestry, and fisheries in harmony with the environment such as the utilization of unused biomass to create high value-added products. This program also aims to contribute to the "Global Food Value Chain Strategy" launched by the Japanese government.

- **Food Value Chain:** Formation of food value chain through value addition of food resources to support sustainable rural development
- **Asia Biomass:** Development of saccharification and utilization technology for lignocellulosic biomass resources in Southeast Asia
- **Multiple use of Regional Resources:** Multiple use and value addition of regional resources for improvement of sustainable productivity in semi-mountainous villages in Indochina
- **Higher Value Forestry:** Development of silvicultural and forest management techniques for indigenous tree species in Southeast Asia to achieve higher value production
- **Aquatic Production in Tropical Areas:** Development of technologies for sustainable aquatic production in harmony with tropical ecosystems

Program D Information Analysis

Collection, analysis and dissemination of information for grasping trends of international agriculture, forestry and fisheries

The global challenges surrounding agricultural production and the food market as well as food and nutrition supply are extremely complex and diverse, and constantly affected by global phenomena such as climate change along with deteriorating natural environments and international socio-economic trends. To address the needs of the agriculture, forestry and fisheries sectors in achieving the sustainable development goals (SDGs), it is essential to analyze the current status, identify the problems, assess the impact of past efforts, and integrate foresight studies. In coordination with Programs A, B, and C, this program plays a role in analyzing the global research trends and research needs in agricultural sciences through the following activities:

- **Food and Nutritional Balance:** Evaluation of the current status and development of a foresight model of global food supply-demand and nutritional balance
- Implementation of the "Goal-Oriented Basic Research Projects" which feature novel research ideas and expected outputs on technological innovations, and promising business opportunities in the agriculture and food industries
- Analysis of global research trends in agricultural sciences to update, analyze, and disseminate the latest information

3. Research Highlights

(1) Press Releases

JIRCAS publishes press releases of outstanding research results. Below is a list of press releases published in the past 15 years, from 2006 to 2020, and the summaries of six select (☆) press releases.

2006.08.08	Promising constituents of tropical plants for preventing insect pests and fungi in stored rice
2006.09.01	Development of technique which can stably supply large quantity of tropical fish larvae
2006.09.19	Control measures on citrus greening disease which devastated citrus production in Southeast Asia
2006.11.10	A promising biological function to improve nitrogen-use efficiency and reduce environmental load – Substances exuding from pasture grass roots inhibit soil-nitrification and decrease loss of applied nitrogen –
2007.01.11	An Arabidopsis transcription factor DREB2A is involved in both water-stress-responsive and heat-stress-responsive gene expression
2007.12.14	Identification of AHK1/ATHK1, a cytokinin receptor histidine kinases, in response to abscisic acid, drought and salt stresses in Arabidopsis
2009.10.14	Elucidation of the mechanism by which plants control the loss of nitrogen fertilizer – Contribution to improving the efficiency of use of nitrogen fertilizer, reducing groundwater pollution, suppressing greenhouse gas emissions –
2010.05.19	Identification of genes that control the production of aroma components peculiar to aromatic soybean — Towards the development of high-quality aromatic soybeans —
2010.09.30	The Indoor Shrimp Production System (ISPS) and the delicious taste of shrimp produced byrecirculating aquaculture – Scientific verification and high hopes for technology transfer –
2011.11.11	Development of a method to measure the photosynthetic activity in submerged rice in the field – Contributing to the breeding of submergence resistant rice for stable rice production in flood-prone areas such as Southeast Asia and West Africa –
2012.02.28	Elucidation of seed production conditions for healthy generational change in tropical forests – Expected to secure healthy seeds necessary for improving sustainability of tropical forests –
2012.08.24	A gene which confers tolerance of phosphorus deficiency in rice was elucidated for the first in the world – Improving the productivity of rice in developing countries with low phosphorus soils – ☆
2012.09.11	Elucidation of the mechanism for rice growth restriction under drought conditions – Expected to develop technology to improve poor growth of crops under drought –
2012.12.14	"Kitamizuho", a new rice variety adaptable to Hokkaido and with high amylose content suitable for processed food such as rice noodle
2013.12.02	Discovery of a novel gene that increases grain yield of Asian rice in tropics – Enhancement of breeding in Indica Group variety by marker-assisted breeding with the genetic information –
2015.07.06	Registration of new sugarcane varieties collaboratively bred in Thailand – Development new varieties using wild sugarcane species –
2015.12.14	Identification of genes that control leaf yellowing during drought – Towards the development of technology to improve yellowing of crops under drought –
2016.01.12	Combating salinity stress in soybean – Discovery of a tolerance gene enables development of salt tolerant varieties using molecular breeding –
2016.03.29	Enhancement of ozone tolerance by adjusting stomatal aperture on leaf surface – Toward the development of crops with increased tolerance to atmospheric pollutants –
2016.07.26	Quinoa draft genome was sequenced for the first time in the world – Aiming for utilization of quinoa through the elucidation of outstanding environmental adaptability and nutritional properties –
2016.11.17	Design of an optimal promoter involved in the heat-induced transcriptional pathway in plants – Controlling target gene expression by temperature –

2017.04.04	Biotech rice with increased yield under drought – A big step toward practical cultivation of dream crops –	
2017.05.31	Mitigation of climate change by plant breeding – Required revolutionary techniques to decrease greenhouse gas from agricultural land –	☆
2017.07.27	Forecasting mass synchronized flowering in Southeast Asian tropical forest – For stable production of lauan timber and adoption of climate change measures –	☆
2017.08.28	Stagnation of crop yields in response to climate change – Adaptation technology is increasingly important to meet the world's food demand –	☆
2017.09.17	Utilization of Erianthus crops for regional fuel self-sufficiency – Commercialization model from research to practical application –	
2017.09.19	Elucidating the whole genome sequence of white Guinea yam – Addressing food security in tropical Africa through international collaboration –	☆
2017.09.19	BPM-CUL3 E3 ligase modulates thermotolerance by facilitating negative regulatory domain-mediated degradation of DREB2A in Arabidopsis	
2018.02.15	Identification and modification of gene for genetic barrier among Oryza species – Expanding possibilities for genetic improvement in rice breeding using wild species –	
2018.08.08	Quick soil characterization method with high spatial resolution – For fighting desertification and hunger in West Africa –	
2020.02.17	Nitrogen assimilation enzymes are important in the formation of root – Elucidation of subtle use of rice glutamine synthetase isozyme –	
2020.02.19	Improved photosynthetic efficiency in rice increases yield by up to 30%	
2020.02.21	Identification of factors that determine carbohydrate content in old oil palm trees	
2020.02.27	Microbial enzyme serves as potential replacement for expensive human enzymes – Towards the development of new functional foods and pharmaceuticals –	
2020.04.23	Phosphorus dipping treatment of rice seedlings increases yield and avoids cold damage – Towards stable rice production in Africa with minimal fertilizer input –	☆

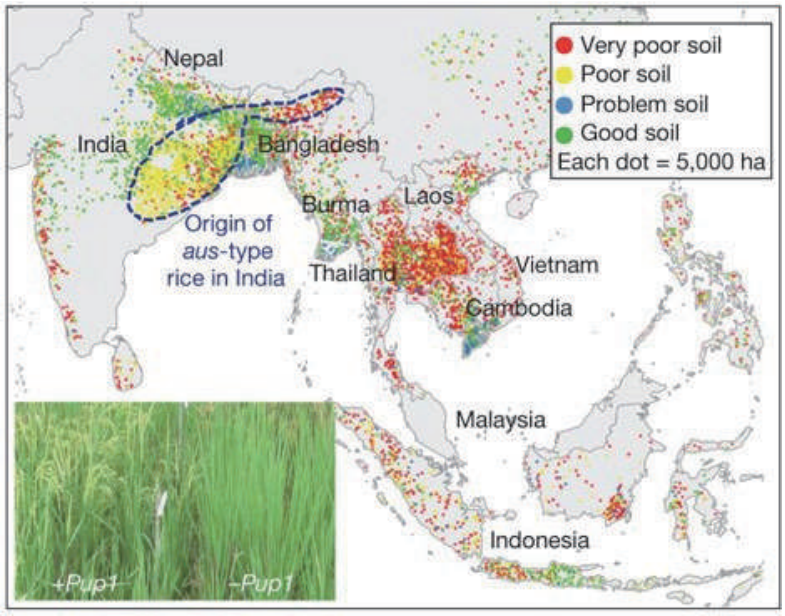
3. Research Highlights

Press Release 1

A gene which confers tolerance to phosphorus deficiency in rice was elucidated for the first time in the world

— Improving the productivity of rice in developing countries with low phosphorus soils —

A gene which can increase absorption of phosphorus under low phosphorus soil condition was identified from a traditional indica type rice variety with tolerance to phosphorus deficiency. The phosphorus-starvation tolerance 1 (*PSTOL1*) gene acts as an enhancer of early root growth, increasing root number and root surface area that enables the rice plant to acquire more phosphorus and other nutrients from the soil. Introgression of the gene in locally adapted rice varieties in developing countries is expected to enhance rice productivity under low phosphorus soil conditions.



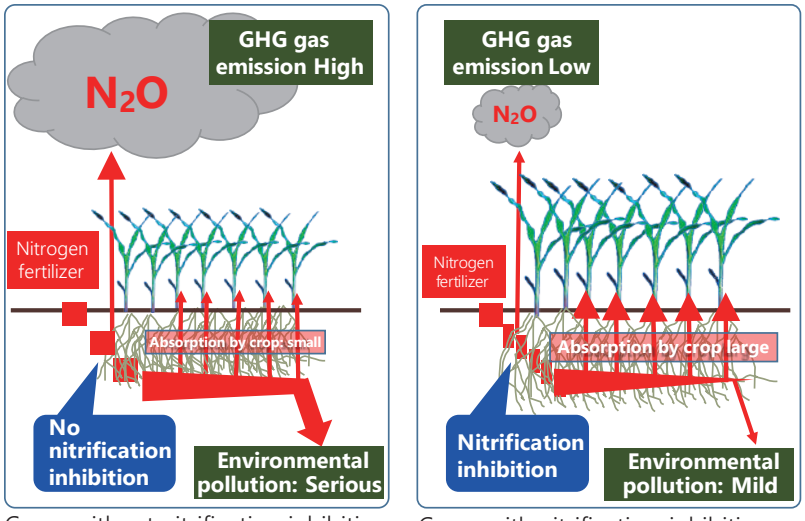
JIRCAS
2012.08.24〈https://www.jircas.go.jp/press/2012/press05〉(In Japanese)

Press Release 2

Mitigation of climate change by plant breeding

— Required revolutionary techniques to decrease greenhouse gas from agricultural land —

Nitrogen fertilizer is transformed by microbial activity to readily absorbable form for plant use. However, at the same time, a part of nitrogen fertilizer becomes dinitrogen oxide, one of the major contributors of greenhouse gas emissions from agriculture, and it is released to the atmosphere without being used by plants. JIRCAS found that tropical forage crops and field crops, such as sorghum, have the potential to produce substances that can solve the dilemma of nitrogen fertilizer transformation in soil.



Crops without nitrification inhibition
- Less nitrogen fertilizer absorption by crops
- Much N_2O emission and nitrogen loss

Crops with nitrification inhibition
- Much nitrogen fertilizer absorption by crops
- Less N_2O emission and nitrogen loss

Potential of biological nitrification inhibition of agricultural crops and nitrogen fertilizer's whereabouts

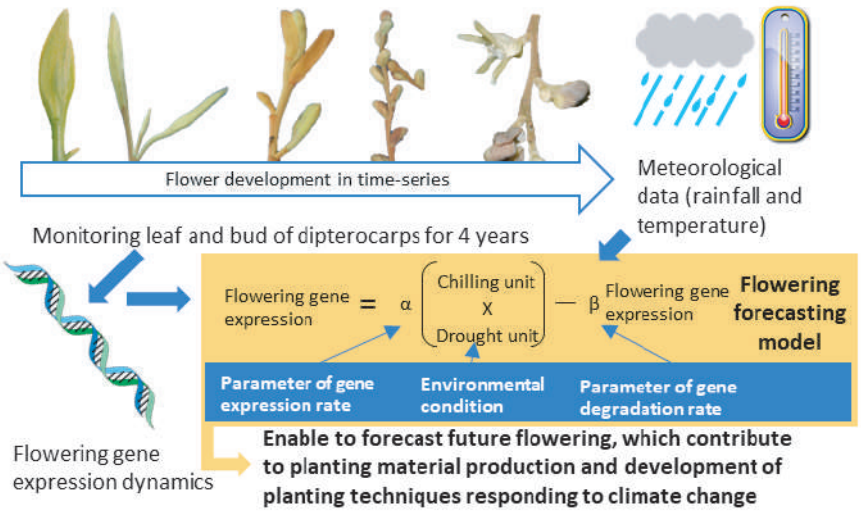
JIRCAS
2017.05.31〈https://www.jircas.go.jp/ja/release/2017/press03〉(In Japanese)

Press Release 3

Forecasting mass synchronized flowering in Southeast Asian tropical forest

— For stable production of lauan timber and adoption of measures for climate change —

A mathematical model based on gene expression analyses was used to predict synchronized mass flowering of dipterocarp trees in tropical forests of Southeast Asia. Production of seedlings of dipterocarp trees, generally known as "lauan" and mainly used for timber and plywood, depends on seed collection from natural forests during the fruiting season. However, forecasting mass synchronized flowering of lauan is difficult because it occurs irregularly. Accurate prediction of flowering rhythm will facilitate efficient management and stable production of lauan timber and forest adaptation to climate change.



Method for developing the flowering forecasting model

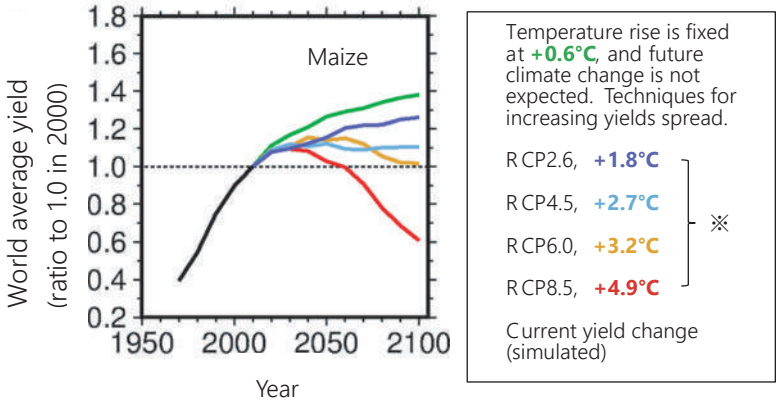
JIRCAS, Kyushu University
2017.07.27 〈https://www.jircas.go.jp/ja/release/2017/press07〉 (In Japanese)

Press Release 4

Stagnation of crop yields in response to climate change

— Adaptation technology is increasingly important to meet the world's food demand —

The effect of climate change on yields of major cereals in the world was predicted by considering the increase in the amount of fertilizer application, usage of improved varieties, and change in sowing date. The results show that yields of maize and soybean will level off even though temperature rises by 1.8°C which is under the most moderate scenario from the Industrial Revolution to the end of 21st century. Higher temperature leads to much lower yields of these crops in the other scenarios. On the other hand, the results revealed that yields of rice and wheat are not expected to be affected by higher temperature if the rising air temperature is less than 3.2°C by the end of this century.



Change in world average yield of maize (predicted)

※Global temperature rise from the pre-Industrial Revolution (1850-1900) to the end of the 21st century (2091-2100). Technologies for increasing yield and simple countermeasures will spread reflecting advance in climate change.

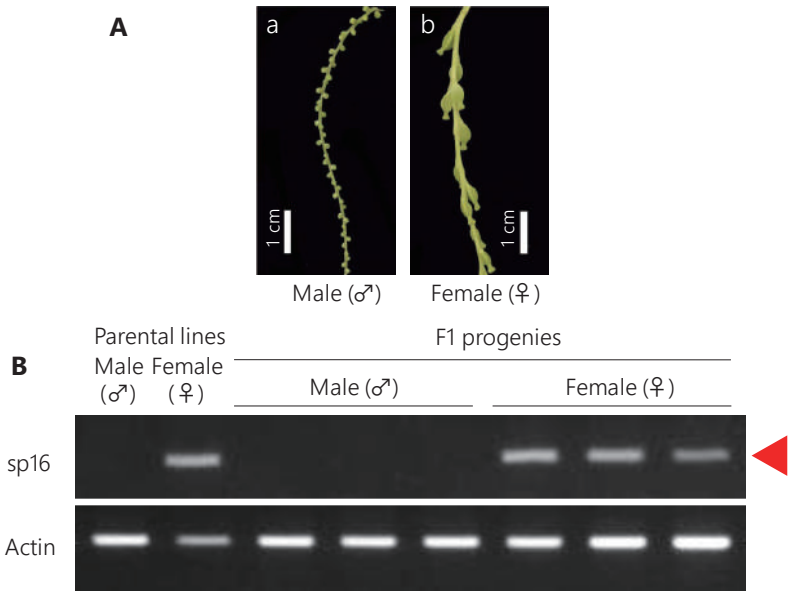
NARO, JIRCAS, NIES
2017.08.28 〈https://www.jircas.go.jp/ja/release/2017/press10〉 (In Japanese)

Press Release 5

Elucidating the whole genome sequence of white Guinea yam

— Addressing food security in tropical Africa through international collaboration —

The white Guinea yam (*Dioscorea rotundata*), a staple food crop for people in tropical Africa was successfully decoded for the first time in the world, revealing a 594-Mb genome assembly and 26,198 predicted genes distributed among 21 linkage groups. The genome sequence facilitated the development of a molecular marker for sex identification of Guinea yam plants at the seedling stage. It is expected that the genome sequence information will accelerate marker-assisted breeding of yam and improvement of other root and tuber crops to address food security in tropical Africa.



Sex identification using a DNA marker developed in this study.
A: Male and female inflorescence. B: Marker sp16 in female progeny

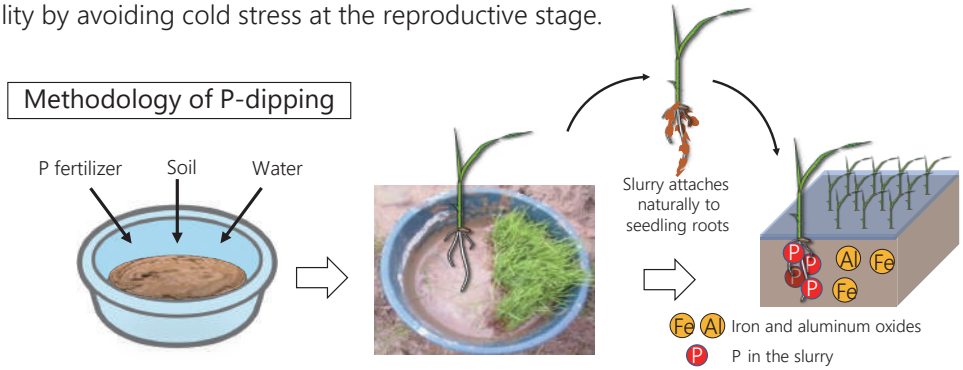
Iwate Biotechnology Research Center, JIRCAS, International Institute of Tropical Agriculture (IITA)
2017.09.19 〈https://www.jircas.go.jp/ja/release/2017/press09〉 (In Japanese)

Press Release 6

Phosphorus dipping treatment of rice seedlings increases yield and avoids cold damage

— Towards stable rice production in Africa with minimal fertilizer input —

Phosphorus dipping (P-dipping) treatment of seedlings has been found to significantly improve the fertilizer use efficiency and yield of rice, thereby overcoming phosphorus deficiency which is a major yield constraint for lowland rice production on highly weathered soils in Sub-Saharan Africa. In this technology, rice seedlings are dipped in a mud-like mixture of phosphorus fertilizer and paddy soil before transplanting. On-farm field trials in Madagascar have shown that P-dipping shortened the number of days from transplanting to maturity and improved grain fertility by avoiding cold stress at the reproductive stage.



1. Preparation of P-enriched slurry
P concentration = 1.3 ～2.3％

2. Dipping of rice seedlings
Less than 4h of dipping duration to avoid chemical injury

3. Transplanting
Positioning of P close to the roots facilitates efficient uptake even in high P-fixing soils with abundant iron and aluminum oxides.

JIRCAS, National Center for Applied Research on Rural Development (FOFIFA) of Madagascar, JST, JICA
2020.04.23 〈https://www.jircas.go.jp/en/release/2020/press202001〉

(2) JIRCAS Research Highlights

Major research accomplishments are selected every year and published as research highlights. From FY1984 to FY1992, a total of 85 research results were selected and published as *TARC Research Highlights*. With the reorganization of TARC into JIRCAS, selected research accomplishments were categorized as 'International', 'Research', and 'Administration', and published as *JIRCAS Research Highlights*.

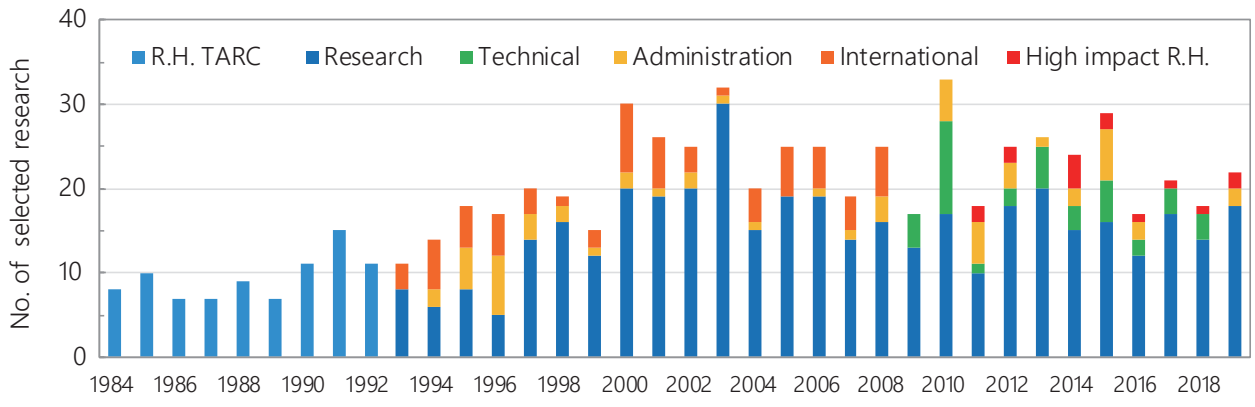
Classification of selected research results from FY1999~2008

International	<Research accomplishments with potential for application overseas> Research results or technologies developed from research with potential for application in research overseas or for dissemination overseas
Research	<Research accomplishments with potential contribution to academic development> Research results with significant contribution to basic knowledge, results that could be used to develop innovative technologies, or results that could lead to further advancement of a particular research field
Administration	<Research accomplishments with potential contribution to the needs of partner country> Research results or technologies developed from research which meet the administrative needs of a partner country, with direct or indirect effects on the promotion of agricultural development in that country

From FY2009, the research accomplishments were re-classified into 3 new categories, namely 'Technical', 'Research', and Administration', depending on the target users and content in order to clarify the potential application and identify target beneficiaries. Moreover, from FY2011, research results adopted or expected to be adopted in developing regions as well as those with high potential for dissemination in those regions have been designated as 'High-impact Research'. So far, a total of 591 research results have been selected and published in the *JIRCAS Research Highlights* for FY2009~2020, including 15 research results which have been cited as 'High-impact Research' as well.

Classification of published research results from FY2009~2020

Technical	Target: Agriculture, forestry, and fisheries workers; extension agencies; non-governmental organizations; manufacturers; consumers; inspection agencies; business enterprises Content: Mainly related to technological innovations in the agriculture, forestry and fisheries industries, and the results utilized as technologies for on-site production
Research	Target: Research organizations etc. Content: Mainly related to scientific technology and information, academic advancement, effective new methods and new findings
Administration	Target: Administrative agencies in Japan and overseas Content: Mainly related to methods for administrative measures and are extremely effective or helpful for improving administrative measures



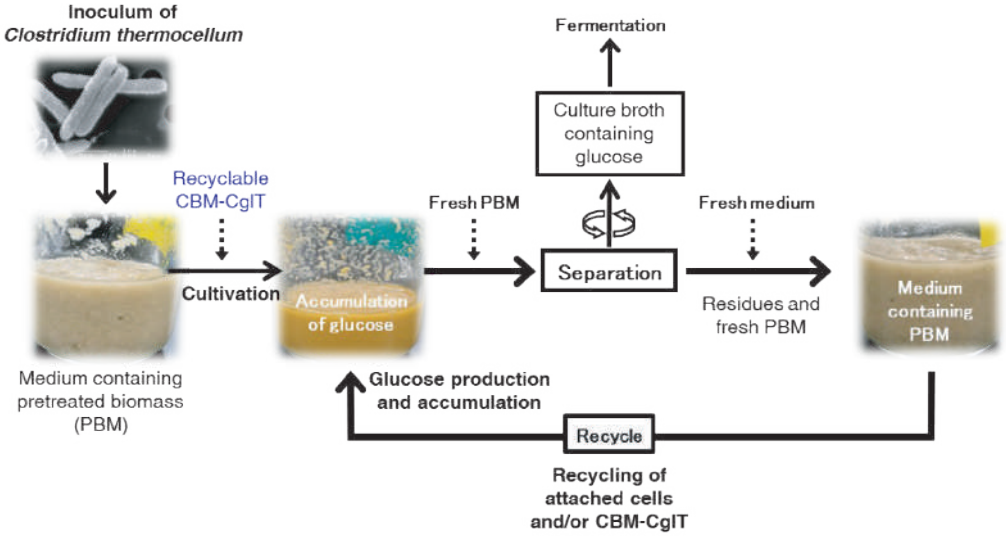
Number of selected research achievements under each category from FY1984~2019

3. Research Highlights

High-Impact Research 1

Direct saccharification technology from lignocellulosic biomass

Biological simultaneous enzyme production and saccharification can directly produce glucose from cellulosic materials. Exclusive glucose accumulation occurred when *Clostridium thermocellum*, an anaerobic, thermophilic, spore-forming bacterium, was cultured with a thermostable β-glucosidase under a high cellulose load. This approach may resolve a significant barrier to economical production of bio-based chemicals and fuels from lignocellulosic biomass.



Schema of consecutive biological saccharification method by recycling of hydrolyzed residue

Selected in FY2014〈https://www.jircas.go.jp/en/publication/research_results/2014_c05〉

High-Impact Research 2

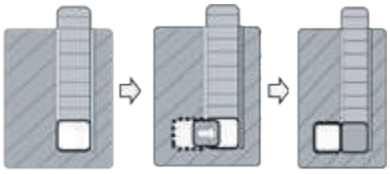
Technical manual on building a low-cost shallow subsurface drainage system for mitigating salinization

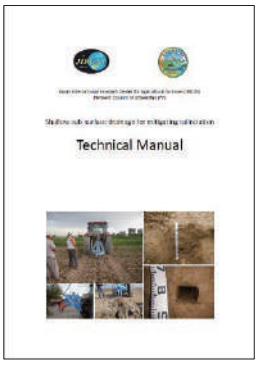
A shallow subsurface drainage technology (60 to 90 cm depth from soil surface) to ensure effective salt removal (by leaching) from the surface soil layer was investigated in Uzbekistan, which has the largest salinized area in Central Asia, to improve soil permeability and to promote salt leaching. The technology introduced is a new drain drilling machine developed for multifunctionality of paddy fields in Japan. The results obtained were compiled as a technical manual and distributed to government agencies, water consumers association, and farmers who are tackling measures to improve salinization.

Step 1: Cut a column of soil and push it up, creating space

Step 2: Cut a section of soil (side cut) and slide it into the space created in Step 1

Step 3: Underdrain (cut-drain) is completed





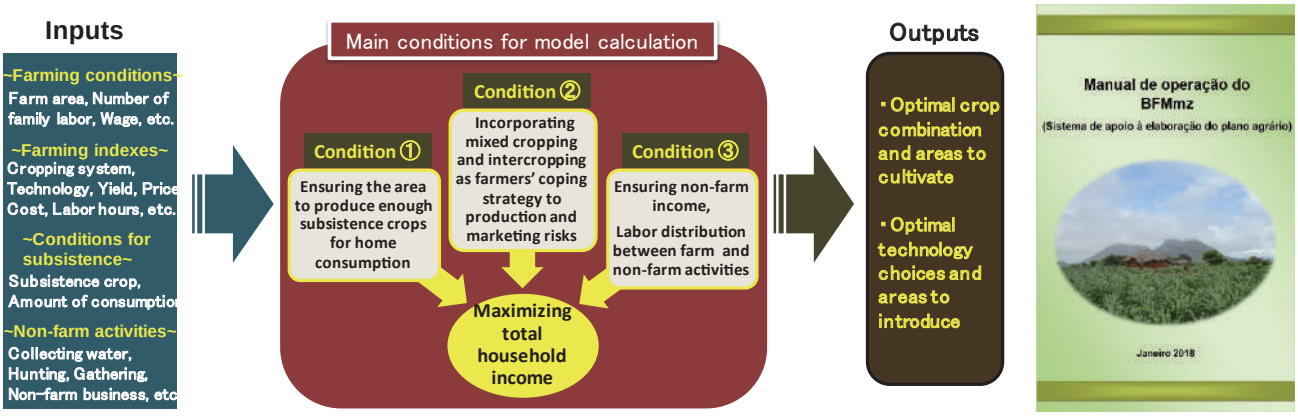
Tractor-mounted drilling machine (left), mole hole formation process (center) and technical manual (right)

Selected in FY2017〈https://www.jircas.go.jp/en/publication/research_results/2017_a03〉

High-Impact Research 3

A farm management model for assisting smallholder farmers in Africa

Most farmers in Sub-Saharan Africa are smallholders cultivating only a few hectares of farmlands, hence they face constraints on income generation. Although there is a strong focus on new agricultural technologies and policy interventions, only a few have shed light on farm management strategies that are acceptable and feasible to smallholders for improving their diets and livelihoods. Therefore, a new farm management model for assisting African smallholders was developed.



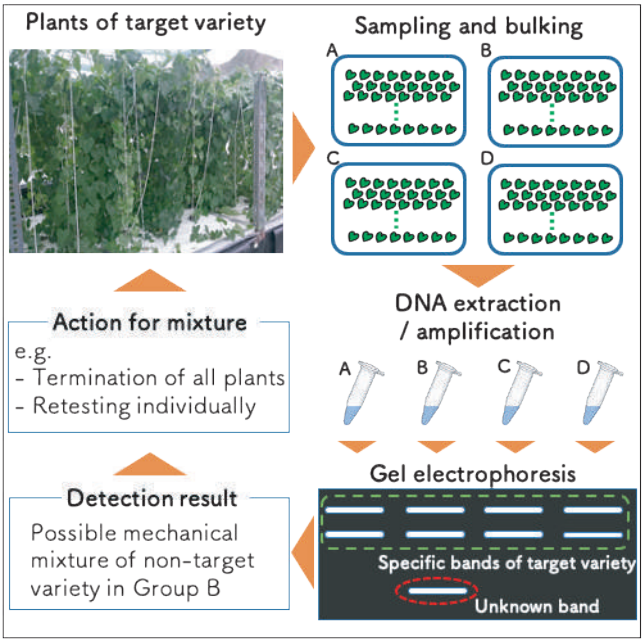
Farm management model reflecting the conditions of African smallholders and operation manual

Selected in FY2019〈https://www.jircas.go.jp/en/publication/research_results/2019_b03〉

High-Impact Research 4

SSR marker technology package for variety identification of white Guinea yam

It is difficult to distinguish varieties of white Guinea yam (*Dioscorea rotundata*), one of the most important cash crop for farmers and a major staple food for the people of West Africa, based on the visible characteristics of the shoots and tubers, and it has been a serious problem through all the steps in the breeding and propagation process, including planting, cultivation, harvesting, and storage. To overcome this problem, a simple tool was developed using DNA (SSR: Simple Sequence Repeat) markers to identify varieties that can be used in fields by seed growers, extension officers, and inspection officers.



Utilization of the sample bulking method to maintain purity of target variety

Selected in FY2019〈https://www.jircas.go.jp/en/publication/research_results/2019_b03〉

(3) Follow-up on dissemination of research outputs

Follow-up surveys of 'High-impact Research' outputs are conducted after about 2 years from publication to analyze and determine how the outputs are implemented and disseminated. The follow-up survey includes information gathering in the target area, interviews of local people, and evaluation of the current status and impact of research outputs. The results of the survey are used to make further evaluations and recommendations as well as to promote public awareness and understanding of JIRCAS research activities. So far, follow-up surveys have been conducted on 10 high-impact research results as listed below.

Year selected	Title	Follow-up year
FY2011	Manual for Improving Rice Production in Africa	FY2013
	Stock management of the fluvial shrimp Macrobrachium yui indigenous to northern Laos based on life-history characteristics	
FY2012	Guideline on On-farm mitigation measures against salinization under high groundwater level conditions	FY2015
	Soil suitability map for teak plantation in the Northeast of Thailand	
FY2014	Manual of soil fertility Improvement technologies in lowland rice ecologies of Ghana	FY2016
	Direct saccharification technology from lignocellulosic biomass	
	Economic benefits of various non-timber forstry products to Lao PDR's farm economy	FY2017
	Methods to establish transfer zones of forest reproductive materials in Peninsular Malaysia	
FY2015	A Laotian tree database including useful varieties in secondary forests after slash-and-burn agriculture	FY2018
	Discrimination of old oil palm trunks to maximize production of fermentable sugars in sap: A promising source of sugars for biofuels and biomaterials	FY2019

Follow-up survey on the research project titled "Stock management of the fluvial shrimp *Macrobrachium yui* indigenous to northern Laos based on life-history characteristics"

Follow-up survey on the research project titled "Methods to establish transfer zones of forest reproductive materials in Peninsular Malaysia"

Follow-up survey on the research project titled "A Laotian tree database including useful varieties in secondary forests after slash-and-burn agriculture"

4. Invitation Programs at JIRCAS – A brief history of the past 50 years

Since its foundation, TARC and JIRCAS have been carrying out collaborative research with research institutes in tropical or subtropical areas and developing regions. In keeping with its role as an international research center, JIRCAS has been executing invitation programs for foreign researchers and administrators from counterpart organizations. Since FY1992, JIRCAS has been implementing the "Visiting Research Fellowship Program" wherein promising researchers from developing regions are invited to conduct collaborative research to address various problems confronting developing regions on a global scale, as well as to enhance their capacities to enable them to respond to their countries' development needs effectively.

Based on the annual reports and the 30th Anniversary brochure, the total number of invitees reached 2,422 (83 countries) for an average of 48.4 per year. The breakdown of the invitees was as follows: 1,305 administrators including Japanese affiliated with international research institutes (79 countries), 759 collaborative researchers (48 countries), and 358 JIRCAS Visiting Research Fellowship (42 countries).

Here we look back at the invitation programs that have been carried out consistently for five decades. They are briefly described below along with charts.

(1) Administrative Invitation Program

The purpose of this program is to invite administrators with a high degree of specialized knowledge or management ability to Japan, to exchange information and opinions, to promote research collaboration through workshops, seminars, and international symposiums organized by JIRCAS, to discuss the progress and direction of collaborative research in evaluation and working group meetings, and to strengthen cooperation with joint research institutions.

Figure 1 shows the changes in the cumulative number of invited administrators by region. The number of invitees from Asia is significantly higher than elsewhere, so the figures are shown by dividing into Central/Middle East/West Asia, South Asia, East Asia, and Southeast Asia. JIRCAS started the Administrative Invitation Program in Southeast Asian countries such as Malaysia, Thailand, and Indonesia. Since TARC was reorganized into JIRCAS in FY1993, the number of invitations from East Asia, especially China, has been increasing rapidly in addition to Southeast Asia. After inviting administrators from these regions, the number of MoUs or Work Plans for research project promotion also increased.

For five decades, the top five countries who availed of the Administrative Invitation Program were China (244), Thailand (224), Philippines (110), Malaysia (106), and Indonesia (63) (Table 1).

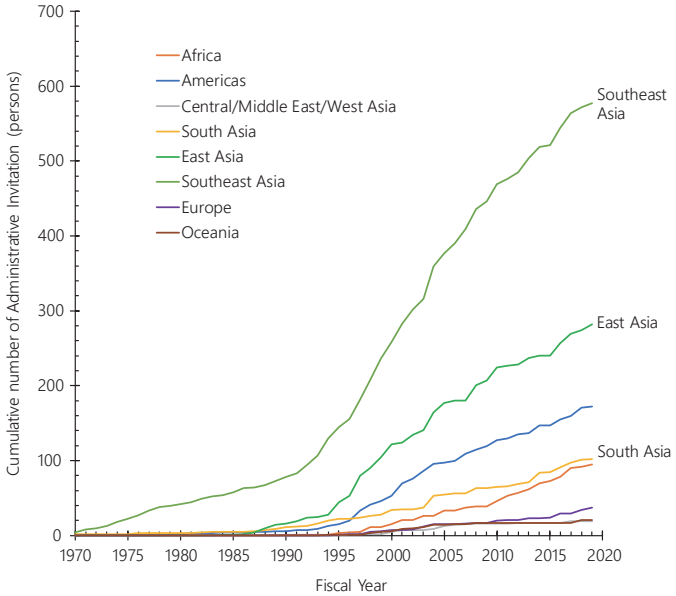


Figure 1. Changes in the cumulative number of researchers invited by region

Table 1. Top Invited Countries for Research Administrators

	Countries	Regions or Sub-regions	Total
1	China	East Asia	244
2	Thailand	Southeast Asia	224
3	Philippines	Southeast Asia	110
4	Malaysia	Southeast Asia	106
5	Indonesia	Southeast Asia	63
6	India	South Asia	57
7	Viet Nam	Southeast Asia	50
8	USA	North America	45
9	Brazil	South America	35
10	Mexico	North America	30

(2) Counterpart Researcher Invitation Program

The purpose of this program is to invite collaborative researchers from counterpart organizations of JIRCAS and to facilitate efficient collaboration by carrying out data analysis in close cooperation with Japanese researchers, conducting experiments, and promoting research activities efficiently using advanced research methods and high-precision equipment, among others.

Figure 2 shows the changes in the cumulative number of invited collaborative researchers by region for the past 50 years. Similar to the Administrative Invitation Program, many researchers from Southeast Asia have been invited since the establishment of TARC in FY1970, marked by a sharp increase in invited researchers from East Asia, especially China, in addition to Southeast Asia since 1995. On the other hand, since FY2011, collaborative researchers from Nigeria, Madagascar, and Burkina Faso have been invited to conduct project research (using funds from external sources such as SATREPS), with the aim of improving agricultural productivity and nutrition in Africa. In the last two years from FY2018 to 2019, the number of invited researchers from Africa was 24, which was the second highest after 35 from Southeast Asia.

Figure 3 shows the changes in the research fields of invitees since 1993, plotted across three distinct periods: FY1993-2000, FY2001-2010 (1st and 2nd Medium-Term Plan), and FY2011-2019 (3rd and 4th Plans). Each category axis (research field) shows the number of invited researchers during the periods. Since FY1993, the most invitees were shown to have specialized in crop breeding and genetic resources, with the number reaching a total of 149 (22% of the total). Since FY2011, with the increase in the number of invitees from Africa, the number of invitees specializing in fertilizer technology has been increasing rapidly in addition to those engaged in crop breeding and genetic resources.

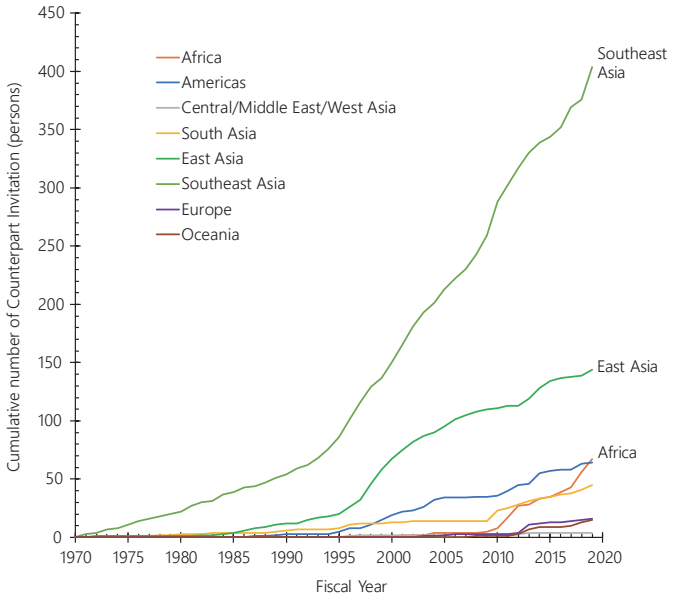


Figure 2. Changes in cumulative number of collaborative researchers invited by region

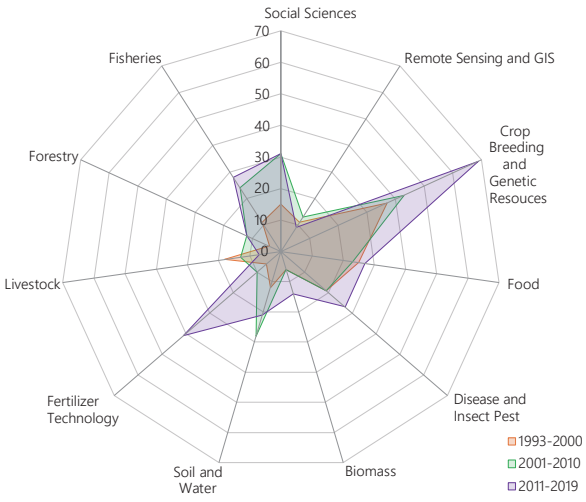


Figure 3. A comparison of the research fields of invitees across different periods

(3) JIRCAS Visiting Research Fellowship Program

This program, which aims to promote collaborative research activities that address various problems confronting countries in developing regions, was initiated in FY1992 before TARC was reorganized into JIRCAS. At that time, postdoctoral-level scientists were invited to conduct research at the Okinawa Subtropical Station (currently JIRCAS-TARF). The program was

also implemented at Tsukuba Headquarters starting in 1995 after the reorganization, and has since been categorized as "Tsukuba-type" and "Okinawa-type" for research carried out at JIRCAS Headquarters and JIRCAS-TARF, respectively.

In addition to the above, the "Project Sites-type" category was launched starting from the Second Medium-Term Plan (since FY2006) at partner research institutions in developing countries where collaborative researches are being carried out by JIRCAS researchers. It aims to promote effective implementation of ongoing collaborative researches at the project sites through the participation of local research staff.

At the time of launching the JIRCAS Visiting Research Fellowship Program, the "Okinawa-type" was for one year, "Tsukuba-type" was for two years (long-term) or five months (short-term), and the fellowship program accepted about 10 researchers per year.

Figure 4 shows the changes in the cumulative number of invitees to the JIRCAS Visiting Research Fellowship Program by region and the number of annual invitees. Most invitees were from Southeast Asia (mainly Thailand, Indonesia, and Vietnam), East Asia (mainly China), and South Asia (mainly Bangladesh and India). The breakdown of 358 invitees was as follows: 136 assigned in Okinawa, 196 in Tsukuba, and 26 in Project Sites. The number of invitees peaked at 24 in FY2004, but in recent years, about five researchers have been invited annually. On the other hand, the competition rate is around 10 percent, which is tough for applicants.

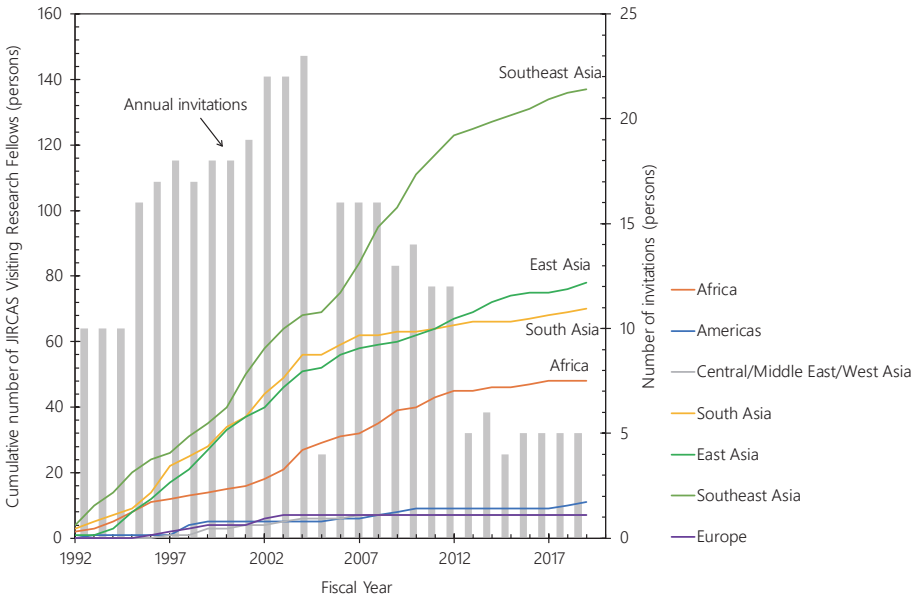


Figure 4. Changes in the cumulative number of JIRCAS Fellows by region and the number of annual invitations

5. A Golden Past Makes a Glowing Future

Establishment of TARC

The expansion and development of overseas agricultural technical cooperation, which was propelled by the foundation of the Overseas Technical Cooperation Agency in 1962, formed the background of the establishment of TARC in 1970. It became clear that it was essential to conduct full-scale studies and to gather knowledge about agriculture in tropical and subtropical countries where aid would be provided. After five years of deliberations and preparation, TARC, the predecessor of JIRCAS, was founded in Nishigahara, Kita-ku, Tokyo, as an affiliated organization of the Ministry of Agriculture and Forestry (now known as the Ministry of Agriculture, Forestry and Fisheries or MAFF). Simultaneously, the Okinawa Subtropical Station was founded as a branch station in Ishigaki City, Okinawa, even before the reversion of Okinawa to Japanese administration (Okinawa Reversion Agreement) in 1972.

The main purpose of TARC was to develop necessary technologies for agricultural promotion, such as technologies that increase food production in developing countries (most of which are located in tropical or subtropical areas), expand the experimental research field in Japan, and advance the research level in order to carry out the necessary research in tropical areas for the development of local agricultural technologies. TARC started its activities with 43 researchers. Each researcher investigated and solved one problem at a time in his or her specialized field while staying at their target areas in tropical or subtropical regions. Most researchers lived on-site for two to three years, and sometimes for extended periods.

Extension of specialized research and transfer to Tsukuba

Several years after TARC's establishment, the center began to employ a study system whereby several researchers with different specialties jointly sought solutions related to expanding agricultural development cooperation programs. In 1975, a division equipped with expertise in farm management was also created to undertake studies on the assembly of production technology systems.

During this time, TARC became the first relocated agency of the Ministry of Agriculture and Forestry, moving to Tsukuba Science City and transferring anew in 1983 to its current location in Ohwashi, Tsukuba City, in anticipation of the center's expansion.

In the 1980s, when the Cold War ended and food prices declined, the demand for agricultural development cooperation also changed. The gap between beneficiaries (i.e., emergent industrialized regions and the least developed countries) expanded, leading to the diversification of the required technological developments in each region. To cope with the changes, the system for collecting information on the agricultural condition and research system in each region was enhanced, and a project study team system was established to achieve cooperation between on-site TARC researchers (long-term overseas dispatch researchers) and those engaged in basic and supportive studies in Japan. The number of members gradually increased. During this time, research was started in the field of forestry, and the Southeast Asia-centric dispatch area was expanded to include the Middle East, China, Africa, and Central and South America.

Establishment of JIRCAS

In the 1990s, the importance of dealing with environmental issues and realizing sustainable development was increasingly advocated by such bodies as the United Nations Conference on Environment and Development (UNCED, also known as the Rio de Janeiro Earth Summit, in 1992). Although TARC's research areas were limited to tropical and subtropical regions, there were requests to the Japanese government for research cooperation from the northeastern part of China, the high latitude areas in Central and South America, and Central Asia, among others, following the collapse of the Soviet Union. The number of research fields related to fisheries, which was closely linked to local life, was also increasing. As a result, the need arose for the incorporation of interdisciplinary, broader-based and long-term viewpoints in agricultural, forestry and fisheries studies. Accordingly, JIRCAS was established in 1993 in response to the need for research cooperation for developing

countries in areas other than the tropics and subtropics, and to incorporate the fisheries field, which plays an important role in ensuring food supply and maintaining ecosystems.

At JIRCAS, we were building on the extensive experience and knowledge accumulated at TARC, but at the same time, we were shifting our emphasis from a "focal" approach to a "comprehensive" approach to agricultural research through the lens of social science to address problems in those days, with the aim of achieving a form of sustainable food production compatible with environmental conservation. Comprehensive study-type projects were funded separately, and they gradually became the main activities of JIRCAS. Each project had distinctive characteristics, and new types of activities were undertaken. Basic studies were also being conducted in Japan, including biotechnology studies, to improve the technical standards of developing countries. JIRCAS attached importance to deepening its relationship with international research centers of the Consultative Group on International Agricultural Research (CGIAR), Japan International Cooperation Agency (JICA), and other organizations, and dispatched its researchers to those organizations and utilized the research facilities of those organizations. These activities brought JIRCAS to the attention of the international community.

Reorganization as an Incorporated Administrative Agency

In 2001, the government of Japan engaged in administrative reform and reorganized many national research institutes, including JIRCAS, into Incorporated Administrative Agencies. The reform allowed JIRCAS individuality and autonomy as regards its project implementation. The First Medium-Term Goals and Plans (FY2001 to 2005) stressed the continuity of studies and followed the basic research plan of the center before the reorganization. In addition to the comprehensive projects, new individual projects were introduced, which were based on the long-term dispatch of researchers and aimed to achieve results within a predetermined period.

At the same time, the new Food, Agriculture, and Rural Areas Basic Act (1999) was enacted, which clarified the status of agricultural technology cooperation in developing regions vis-a-vis Japan's agricultural policies. The UN Millennium Development Goals (2000) advocated common goals for mankind, such as halving poverty and starvation. In 2003, the Agriculture, Forestry, and Fisheries Research Council determined policies for promoting international agricultural studies as challenges for Japan, aimed at solving food and environmental issues and setting a new approach of contributing to solving global issues by providing study results as global public goods. On the other hand, there were apprehensions about the relationship between international cooperation in the fields of agriculture, forestry, and fisheries and competing domestic industries in Japan.

Internal investigations (research strategies) were also performed on appropriate research activities that consider international conditions and procedures for making the best use of the advantages of being an independent institution, and the results suggested the need to promote research by using the project systems. The Second Medium-Term Goals and Plan (FY2006 to 2010) was decided against this backdrop, and a system was set up in which almost all research activities were performed under the responsibility of project leaders. The introduced system involved defining goals for a given period, strictly controlling the schedule and accounts in each fiscal year and assessing the study results. In 2008, JIRCAS took over the overseas agricultural operation of the former Japan Green Resources Agency (J-Green), which enabled it to conduct on-site verification surveys of study results and strengthened its capacity to deal with and solve problems on target sites. In response to movements at the Tokyo International Conference for African Development (TICAD), JIRCAS gradually expanded its research cooperation in Africa by establishing the JIRCAS Africa Liaison Office in Accra City, Ghana (in 2009), in addition to the Southeast Asia Liaison Office in Bangkok, Thailand (in 2004).

5. A Golden Past Makes a Glowing Future

Global issues and reorganization as a National Research and Development Agency

In the 2010s, in response to the steep rise in food prices and the subsequent financial crisis between 2008 and 2009, there was a return to productivity research due to further globalization and destabilization. On the other hand, new research topics included those related to measures to be taken by the agriculture, forestry, and fisheries industries to cope with climate change and to protect biodiversity. In Japan, while the reorganization and integration of research institutions have progressed due to the administrative reforms and the deterioration of the financial situation, new policy issues such as the expansion of domestic agricultural, forestry, and fisheries into foreign markets and the concept of science and technology diplomacy have also been introduced. The direction of the Official Development Assistance (ODA) had also changed significantly.

Against this backdrop, the Third Medium-Term Goals and Plans (FY 2011 to 2015) and the Fourth Medium to Long-Term Goals and Plans (FY 2016 to 2020) were formulated so JIRCAS can respond to global challenges and government policy objectives, through a "program-project system" that encompasses three research programs that clarified the research outcomes, and enabled the collection and provision of information on agriculture, forestry, and fisheries. Through this system, all research activities of the center were linked to global agricultural, forestry, and fisheries problems, and JIRCAS was able to conduct its research activities effectively and specifically.

In FY2015, due to reforms to the Incorporated Administrative Agency System, JIRCAS was reorganized to become one of 27 National Research and Development Agencies in Japan with the aim of maximizing the research and development results (the agencies related to MAFF were integrated into four organizations). Meanwhile, the United Nations Sustainable Development Goals (SDGs) adopted in 2015 were widely recognized both in Japan and overseas, and the contribution of science and technology relating to the SDGs goals became a government policy. JIRCAS is expected to play a major role as an important promotion agency.

Changes in surrounding environment and the future of JIRCAS

The rapidity of changes surrounding global environmental issues such as climate change is accelerating. Tackling urbanization and nutritional issues are important in transforming future food systems, with current production technology and consumption practices revealing that sustainable agriculture, forestry, and fisheries, as well as food system innovations, are required in order to achieve food security in terms of both quantity and quality and minimize the burden on the earth system. Furthermore, with the emergence of a multi-layered international society in recent years, a new technology development system is required to make the most of the latest technology and tools, and cooperation must be carried out in different fields to meet the various needs during times of uncertainty and change.

Through accumulation of collaborative research with developing regions for half a century, JIRCAS has built a domestic and overseas network that can collaborate with various institutions. Furthermore, JIRCAS possesses a certain degree of technological superiority that enables it to handle a wide range of research activities, employing a global perspective to field research through experimental studies and connecting the results of basic research to development and dissemination. Taking advantage of its capabilities, JIRCAS will continue to contribute to the achievement of SDGs by developing mitigation and adaptation technologies for climate change and environmental conservation technologies that can be applied in developing regions, and by establishing a sustainable food system based on new science and technology. It is expected that collaborative research will be led by promoting cooperation in different fields and introducing cutting-edge technologies. JIRCAS's core principle of conducting collaborative studies anchored on relationships built through fairness and trust and fostered by face-to-face human relations over a long period of time has not changed. These will not only contribute to international cooperation but also improve the world's research standards and consequently benefit both Japan and partner countries.

As a final note, it is important for JIRCAS to return to its founding philosophy, strengthen its role as the core organization engaged in international agriculture, forestry, and fisheries research in Japan, and deepen cooperation with domestic and overseas research institutions and related organizations. JIRCAS presents an ideal type of collaborative research in international agriculture, forestry, and fisheries, with an approach that contributes toward solving common human issues. It can further enhance its global presence by collecting, analyzing, and providing information for that purpose, and through active involvement in international conferences, etc., on behalf of Japan, the world's largest net food importer.

Chronological Table

	Historic Events	History of JIRCAS	Changes in Research Promotion Method
1960	Cuban Missile Crisis (1962)	Consideration of overseas agricultural research institute (1965)	
1970	Establishment of CGIAR (1971) Oil shock (1973) Establishment of JICA (1974)	Establishment of TARC (1970) Transferred to Tsukuba (1977)	Individual long-term dispatch of researchers Technical system assembly research
1980		Relocated to Ohwashi,Tsukuba City (1983)	Development of survey/information analysis system
	Fall of Berlin wall (1989)		Basic support research
1990	Earth Summit (1992)	Reorganization as JIRCAS (1993)	Comprehensive study projects
2000	MDGs (2000) China joined the WTO (2001)	Reorganized as an Incorporated Administrative Agency (2001) The Second Medium-Term Plan (FY2006-10)	Individual projects Making all issues into projects
	Lehman Brothers collapse (2008)	Took over the overseas agricultural operation of J-Green (2008)	
2010		The Third Medium-Term Plan (FY2011-15)	Program-Project system
	Sustainable Development Goals(2015)	Reorganization as a National Research and Development Agency (2015)	
2020	COVID-19 pandemic (2020)	The Fourth Medium to Long-Term Plan (FY2016-20)	
2030	Target year of SDGs (2030)		

As part of the celebration of this milestone, a commemorative logo has been created to be used throughout the year. The logo is designed to symbolize a better future for our planet Earth. The two-colored circles represent the earth at sunrise, symbolizing hope for the future of JIRCAS. In addition, the Sustainable Development Goals (SDGs) color wheel icon is used as the number zero to show our commitment to contribute in achieving the United Nations' SDGs.

6. Congratulatory Messages – Expectations Towards JIRCAS

KOBAYASHI Yoshio

Chairman
Agriculture, Forestry and Fisheries Research Council

It is our great pleasure to congratulate the Japan International Research Center for Agricultural Sciences (JIRCAS) on its 50th anniversary and we express our appreciation for its continued efforts in promoting international research in agriculture, forestry, and fisheries sectors in Japan and for their brilliant achievements.

Since its inception, JIRCAS has been undertaking comprehensive experimental research in the field of agriculture, forestry, and fisheries in developing regions like the tropical and subtropical regions and has contributed to the development of the technologies of the agriculture, forestry, and fisheries sectors of these regions. In recent years, global warming and food security issues have underscored the urgent need to address the progress of globalization. For the future initiatives of JIRCAS, we believe that there is a need for professional development that will benefit not only the other country but also Japan, and that it eventually leads to international contribution.

Nowadays, the coronavirus outbreak is making environmental activities difficult due to the limits on human mobility. Because the research project activities of JIRCAS are mainly carried out overseas, and is based on cooperation and communication with the local people such as researchers, government staff, and farmers, it would be necessary to find the best way, including online correspondence, for the continuation of future activities. As a National Research and Development Agency, you are expected to continue your activities, playing a core role and delivering outstanding results nationally and globally. We wish you more success and we look forward to a bright and successful future together.

MOTAI Shigeru

Former Chairman
Agriculture, Forestry and Fisheries Technology Council

The Japan International Research Center for Agriculture Sciences (JIRCAS) was established in 1970 through the initiative of Dr. OGURA Takekazu, former Chairman of the Agriculture, Forestry, and Fisheries Research Council (AFFRC) and one of the founders of TARC. As a member of the AFFRC Secretariat at the time, I have found many nostalgic memories of being involved in the concept and ratification of the center.

Over the last half-century, the domestic and international affairs have changed principally, and the organization and activities of the center have also changed. In this context, I would like to express my sincere acknowledgment to the many stakeholders who have continued to develop the expected role of the center.

The goal of international cooperation in agriculture, forestry, and fisheries research is to contribute to the path of self-reliance and self-sustenance in each country for food security and sustainable development in the world. It is different from a dependency such as aid or trade that arises in accordance with the interests of one country.

The recent international tensions between the United States and China has left the world divided. Despite this situation, it is hoped that the universal philosophy of international cooperation remain connected more positively from Japan's standpoint. The relationship of trust with collaborating countries is a great asset to the center and to Japan.

Also, JIRCAS has taken over the “Center” function of its predecessor, which was unusual for a national institution. It is expected that the center function will accumulate even more cooperation activities relating to industry, academia, and government, which, in recent years have significantly expanded in the framework of new international relationships. My best wishes to your work and I expect that this role will continue to grow in the future.

KYUMA Kazuo

President
National Agriculture and Food Research Organization (NARO)

Over the past 50 years, the Japan International Research Center for Agricultural Sciences (JIRCAS) has been working to resolve issues in the field of agriculture, forestry, and fisheries in developing regions, and has developed and maintained integrity in its relationship with other countries. Currently, there are many internationally relevant social issues such as world population growth, global warming, and the frequent occurrence of natural disasters, and I think that the world's expectations for JIRCAS will be rising further in the future.

Meanwhile, to realize "Society 5.0", a concept introduced in the "5th Science and Technology Basic Plan" in agriculture and food production, the National Agriculture and Food Research Organization (NARO) is making full use of information and communication technology (ICT) to improve the self-sufficiency rate of food, agriculture and food production. Also, we strongly promote R&D to strengthen global competitiveness and achieve both productivity improvement and environmental conservation. We believe that "collaboration" is important to achieve and realize “Society 5.0" ahead of the rest of the world and to contribute to the resolution of various global issues along with Japan's economic growth. JIRCAS has gained a great deal of trust from all over the world and has become an indispensable partner for NARO. I would ask for a stronger collaboration that takes advantage of our mutual strength towards the global expansion of “Society 5.0” .

I wish for the further development of JIRCAS by utilizing its 50-year experience.

NAKASHIZUKA Tohru (ASANO Tohru)

President
Forest Research and Management Organization

I would like to congratulate the Japan International Research Center for Agricultural Sciences (JIRCAS) on its 50th anniversary. I belonged to JIRCAS for two years, from 1992 to 1994, and it was a valuable experience for me. Since then, I have continued doing forest and environmental research in developing countries and constantly learned about the success of the JIRCAS. I have always felt that JIRCAS is extraordinary and trustworthy.

In collaboration with JIRCAS, through the Forestry and Forest Products Research Institute, the Forest Research and Management Organization has continued research in various fields related to forest management, sustainable use, and conservation since the establishment of the Tropical Agriculture Research Center (TARC) in the 1970s. JIRCAS has been an essential part of our organization’s journey and success. We are grateful for your continuous cooperation.

In recent years, the international research direction has been emphasized to achieve a sustainable society, represented by the Sustainable Development Goals (SDGs). JIRCAS plays a core role in international collaborations in the field of agriculture, forestry, and fisheries-related research globally that is deeply related to the goals of many other SDGs and is truly a multifaceted approach to sustainability on a global scale. We expect that the roles of JIRCAS will be enhanced significantly in the future.

We sincerely hope for the continued expansion of relationships, and I am delighted to have you with us in future initiatives.

(Translated by the Editorial Committee)

6. Congratulatory Messages – Expectations Towards JIRCAS

MIYAHARA Masanori

President
Japan Fisheries Research and Education Agency

It is our great pleasure to congratulate the Japan International Research Center for Agricultural Sciences (JIRCAS) on its 50th anniversary. We would like to express our appreciation for its continued efforts in promoting international research in agriculture, forestry, and fisheries in Japan. JIRCAS was established in 1993 through the reorganization of its predecessor, the Tropical Agriculture Research Center (TARC); at the same time, JIRCAS started a new research division (Fisheries Division) for international collaborations in the field of fisheries-related research in Japan. Since then, we have been promoting our research activities in cooperation with JIRCAS to support developing countries.

In this 50th anniversary celebration of JIRCAS, I would like to express my greatest respect and gratitude for the significant outputs in the management of fishery resources in developing countries. Specifically, in cooperation with the Southeast Asian Fisheries Development Center (SEAFDEC), which has been provided financial and technical support by Japan, JIRCAS has achieved great results in managing fisheries resources in developing countries, conserving mangrove forests, and promoting aquaculture. I express my appreciation for your efforts and accomplishments.

We wish that JIRCAS will continue to play a superior role in providing solutions to global environmental problems and food insecurity for the future of agriculture, forestry, and fisheries in the developing world. Also, we hope to continue our journey together and contribute to the realization of SDGs in the related fields.

KITAOKA Shinichi

President
Japan International Cooperation Agency (JICA)

I would like to express my sincere gratitude at the 50th anniversary of the establishment of the Japan International Research Center for Agricultural Sciences (JIRCAS). Currently, the world is facing the COVID-19 pandemic, with the unpredicted coronavirus peril disrupting global development and progress. I am concerned about its possible impacts on the agricultural sector as it will increase the uncertainty in agricultural material procurement and overall sales of agricultural products. This in turn will affect market stability around the world, leading to reduced production and income, which play a critical role in increasing malnutrition.

After World War II, Japan faced a crisis in food security and nutrient deficiency, but with generous support and food aid from abroad, Japan was able to improve agricultural productivity and the supply network and distribution of school meals, eventually enabling Japan to finally overcome the challenges. Today, Japan is promoting high value-added agricultural products against aggressive competition with lower-priced imports in world markets. Japan's agricultural products have reached an unparalleled level due to its high quality, good taste, and high food safety standards and, coupled with the global Japanese food boom, have attracted attention overseas.

Based on these experiences, JICA, together with the Coalition for African Rice Development (CARD) and the Initiative for Food and Nutrition Security in Africa (IFNA), is promoting cooperation with developing countries toward solving food and nutrition problems. We also appreciate the contributions of JIRCAS regarding the accumulation of technologies and human resources related to stable agricultural production and high value-addition of food resources. We hope to continue our contributions to the world by taking advantage of these initiatives and strengths. I believe working together will strengthen our partnership and enhance the development of Japan.

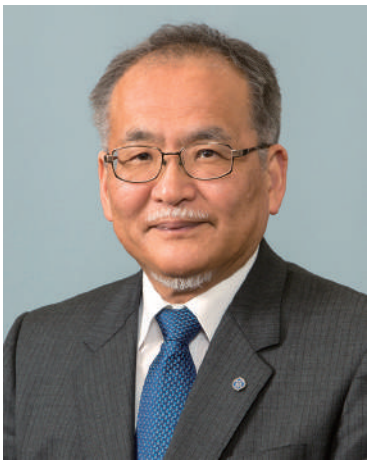
NAGATA Kyosuke

President
University of Tsukuba

Research in agriculture, forestry, and fisheries in developing areas is based on global social needs and considered as high academic research. Nowadays many students wish to conduct their research in related fields. In collaboration with the Graduate School of the University of Tsukuba and JIRCAS, research on agriculture, forestry, and fisheries in developing regions located in tropical or subtropical regions has been promoted. I would like to express my sincere gratitude for the collaboration with your center. JIRCAS is the only research institute in Japan that comprehensively conducts agriculture, forestry, and fisheries research in these regions and has greatly contributed to the enhancement of research and education at our university.

In the past, collaboration with your center and the University of Tsukuba has played an important social role in promoting project research based on international academic strategies and participating in and supporting technical cooperation with developing countries. In addition to our educational and research activities, we have achieved valuable results not only in education and research activities but also in education and research-based human network between the excellent researchers and our faculty members.

We sincerely hope for the continued expansion of relationships in the future and further initiative can grow on both sides.



NAKAJIMA Hiromitsu

President
Tottori University

I would like to extend my sincere congratulations and joy at the 50th anniversary of the establishment of the Japan International Research Center for Agricultural Sciences (JIRCAS). We have continued various exchanges with your center and our university because of the common focus on agricultural production in developing regions.

We are happy to inform you that some professors appointed from your center are playing an active role at our university, and conversely, students who studied at the Arid Land Research Center are working at your center. In 2007, the United Graduate School of Agricultural Sciences, Tottori University, signed with your center a partnership agreement on "Collaboration in Education and Research Guidance" for the promotion of education and research activities. Since then, researchers from your center have cooperated with the doctoral programs of our university as visiting faculty members. Also, I would like to extend my thanks to Dr. IWANAGA Masa, President of JIRCAS, for his service as an external committee member of Tottori University's International Platform for Dryland Research and Education, which was established in 2015 and received many valuable opinions. Furthermore, in 2019, joint research on quinoa cultivation began.

We sincerely hope that the 50th anniversary of JIRCAS will lead and continue support of our university's education and research program. I hope that through concerted efforts and various initiatives of your center, you will continue to develop on the occasion of your 50th anniversary.

(Translated by the Editorial Committee)

6. Congratulatory Messages – Expectations Towards JIRCAS

Dr. Tang Huajun

President
Chinese Academy of Agricultural Sciences (CAAS)

It is a great pleasure for me, on behalf of CAAS, to extend my heartiest congratulations to JIRCAS on the occasion of its 50th anniversary. We sincerely applaud JIRCAS for its outstanding achievements made during the past five decades, which you should be justifiably proud of.

In the last half century, JIRCAS has contributed substantially to help tackle such global problems as poverty, food insecurity, climate change and environmental degradation in Asia, South America and Africa. Through international joint efforts, JIRCAS has developed localized technologies in agricultural environment protection and resource management, agricultural productivity improvement and food chain value-adding for developing countries right to their needs. These efforts have gained JIRCAS global recognition as a role model in serving the Sustainable Development Goals (SDGs).

CAAS has enjoyed a longstanding collaboration with JIRCAS, which dates back to early 1990s. In 1997 we signed our first MOU. Operating within the framework of MOU, CAAS and JIRCAS have conducted 4 successive long-term joint projects, and now we are having our 5th one. Excellent outputs were achieved in areas of high-efficiency agricultural resource utilization, environmentally friendly agricultural management system construction and evaluation, and high value-adding food chain research. Considerable contribution to the green, ecological and sustainable development of agriculture in China has been achieved. In 2017, CAAS-JIRCAS jointly celebrated the 20th anniversary of our collaboration and with a milestone establishment of the Sino-Japanese Joint Laboratory on Agricultural Environment, which is now performing as a key pillar in shaping our future within its mandate.

As we celebrate the golden jubilee of JIRCAS, I sincerely hope that, by channeling more resources to the countries and regions that are in need of agricultural science and technology through international cooperation, JIRCAS will further amplify its global influence in international efforts towards achieving the SDGs. I would like to reaffirm that CAAS will give its full support to this activity and we keenly look forward to deepening our cooperation. Together and moving forward, we will rise up to our common agricultural challenges, contribute to the achievement of the SDGs and the betterment of people in the world.

Prof. Ha Thanh Toan

Rector
Can Tho University, Viet Nam

To commemorate the 50th Anniversary of the Japan International Research Center for Agricultural Sciences (JIRCAS), Can Tho University (CTU)would like to send warm congratulations. We deeply appreciate the great contribution of JIRCAS, the Japanese Government and the Japanese people.

CTU has collaborated with JIRCAS for the past several decades. CTU and JIRCAS have conducted researches through interdisciplinary cooperation in the fields of agriculture, fisheries, and environment, and have contributed directly in solving the problems in the Mekong Delta for several decades. The first project, "Poverty reduction and rural settlement", was in the period of 1991 to 1993. Though this project, the livelihood of farmers was dramatically improved. The second project, "Integrated farming system", was implemented in the period of 1994 to 1997, changing the traditional rice production (mono-cropping) into an integrated farming system. Through the project, farmer's income per area increased, which guaranteed food security. The other significant project entitled "Validation Study of Rural Development based on CDM in Mekong Delta" was implemented from 2008 to 2011. This was the first biogas CDM project towards the direct benefit of low-income households as well as the environment in Viet Nam. The issuance of carbon credits by CDM-EB was approved. From 2012 to present, the project entitled "Development of agriculture technologies for reducing greenhouse gas emissions from the Mekong Delta" has been conducted towards agricultural production with low greenhouse gas emissions under climate change situation. These projects helped transform the traditional method of rice production from the continuous flooding technology to the water-saving technology (alternate wetting-drying irrigation). The studies on reduction of greenhouse gas emission from livestock and use of agricultural by-products for biogas systems have been carried out under the project. The project has demonstrated a model of agricultural production with low greenhouse gas emission in Viet Nam.

On the occasion of the 50th year since JIRCAS was first established, I hope that JIRCAS will constantly develop to contribute for sustainable agriculture in developing countries and regions, and continue having tighter collaborations in the future especially with CTU in solving the problems in the Mekong Delta and Vietnam.

I wish the 50th Anniversary of JIRCAS to be greatly successful.

Datuk Dr. Abd. Latif Mohmod

Director General
Forest Research Institute Malaysia (FRIM)

It is my great pleasure to congratulate the Japan International Research Center for Agricultural Sciences (JIRCAS) on its 50th anniversary. In the last five decades, JIRCAS has been conducting international joint researches in the developing regions through interdisciplinary cooperation in the fields of agriculture, forestry and fisheries, and has contributed directly in solving the problems of partner countries and regions. Accordingly, JIRCAS is a valuable long-term collaborator to Forest Research Institute Malaysia (FRIM) in research and development works in the field of agriculture and forestry. The collaboration researches with JIRCAS not only started in 1993, but much earlier whereby from 1970 to 1980 with the former institution of JIRCAS known as Tropical Agriculture Research Center (TARC). As a milestone to our successful partnership, the FRIM-JIRCAS International Symposium on Ecology and Genetics of Dipterocarps - its Role in Sustainable Forest Management was successfully held in 2011 to disseminate research outputs aiding to develop sustainable forest management in hill dipterocarp forest. Subsequently, the publication of the special report on the "Ecology and Genetics of Hill Dipterocarp Forest to Aim Sustainable Forest Management" was a testimony of diligence and commitment by Malaysian and Japanese scientists who are involved in the project. Being one of FRIM's close working partners, JIRCAS strode into a new research collaboration with FRIM on the "Advancement of Sustainable Forest Management Practices in Dipterocarp Forests in Peninsular Malaysia" in 2019 and ending in 2021. Realizing the world is now gearing towards sustainable societies, it is now important to drive the major steps taken by our researchers in meeting global commitments such as the Sustainable Development Goals (SDGs). Future collaboration research need to consider a wide spectrum of research fields, such as synthesizing actions bridging adaptation and mitigation programs to support the development of sustainable cities and regions through climate action plans based on science, promoting the implementation of sustainable management of all types of forests, and protecting and preventing the extinction of threatened species with in-situ and ex-situ conservation. I am confident that with its strong leadership and devoted researchers, JIRCAS will achieve new heights in all spheres in the years to come, and our collaboration will continue to play a significant role in the advancement of forestry research, not only for Japan and Malaysia but also for the world.

Dr. Chay Bounphanousay

Director General
National Agriculture and Forestry Research Institute (NAFRI), Lao PDR

Happy 50th Anniversary, JIRCAS! The National Agriculture and Forestry Research Institute (NAFRI), Ministry of Agriculture and Forestry, Laos, congratulates JIRCAS on its 50th Anniversary in 2020. This 50th Anniversary marks with pride the history of Japanese participation in tropical agricultural research. We congratulate JIRCAS for their excellent agricultural scientific research worldwide, sharing valuable research insights, collaborative approaches and scientific excellence with pride and dignity. Through our valuable collaboration for 8 years, we are grateful for your contribution to our organization as well as to the Lao PDR, and NAFRI is honored to be a part of your successful 50th Anniversary. The farmers in Lao PDR and around the world enjoy benefits from JIRCAS-introduced agricultural technologies that improve their farming and their livelihoods. However, changes are happening rapidly around the world as COVID 19 has shown us. And we need to redesign our research programmes to continue to help farmers cope with many changes. The JIRCAS 50th Anniversary is the time to reflect on our achievements to date and look forward to the future which is full of new challenges for us all in the disrupted farming systems and precarious food supply chains. Vulnerable farmers and households in rural areas tend to experience more negative impacts from the COVID 19 pandemic and they must be paid special attention while researchers also need to adapt and modify their programmes in line with the "new normal" after the arrival of COVID 19. NAFRI is keenly looking forward to continuing its collaboration with JIRCAS, and to re-design and re-organize future research programmes in order to mitigate negative impacts affecting researchers and farmers while continuing to carry out scientific agricultural research. NAFRI is confident that with our strong leaderships and devoted research staff, we will together overcome the challenging times in dealing with the COVID 19 pandemic, and we can achieve new heights through our collaboration! On this very special occasion, I wish to extend my best wishes to the staff members and families of JIRCAS. Happy 50th Anniversary, JIRCAS!

6. Congratulatory Messages – Expectations Towards JIRCAS

Dr. Surmsuk Salakpetch

Director General
Department of Agriculture, Thailand

On behalf of the Department of Agriculture Thailand (DOA), I congratulate you on the 50th anniversary of Japan International Research Center for Agricultural Sciences (JIRCAS).

JIRCAS and DOA have a long history of research collaboration since 1970. Over the past five decades, a multitude of cooperative research and development projects in various fields especially in soil science, plant protection and crop production such as sugarcane, cassava and legumes have been initiated through the close cooperation with JIRCAS Southeast Asia Liaison Office located at DOA and under the Memorandum of Understanding on Technical Cooperation between JIRCAS and DOA. Together, we have made significant achievements through the existing partnership. Many collaborative research and development projects have been effectively implemented and contributed productive outcome addressing problems in various fields of agricultural science and technology.

I strongly believe that our relations happily existing will continue to deepen and further develop towards mutual interests and sustainable agricultural development goals. I wish JIRCAS every success, and congratulations once again on the 50th anniversary of your foundation.

Dr. Atinkut Mezgebu Wubneh

Bureau Head
Bureau of Agriculture and Rural Development
The Government of National State of Tigray, Ethiopia

It's been almost a decade since I started seeing the role of JIRCAS in Ethiopia, particularly in Tigray Region. JIRCAS's global contribution is passing half a century. To my knowledge, JIRCAS is among the top contributions of the people of Japan in research for the environment and natural resource management globally. We are among the beneficiaries from the support of JIRCAS. It may be good to give you why the research agendas of JIRCAS are very important to us.

In Ethiopia, poverty reduction and sustainable development are the main agendas in addition to peace, security and democracy. Livelihood improvement of small landholder farmers is the core agenda of our development strategy. However, due to poor agricultural practices and weak research support, land productivity is poor. Consequently, farmers are facing food shortages, which lead them to malnutrition and stunting. Considering all the challenges, the government has come up with a clear development strategy and policy called the conservation-based Agricultural Development-Led Industrialization. Though the policy brings differences on the livelihood, still it needs more intervention and the efforts should be more efficient and supported by recommendations based on research studies like those that JIRCAS have been conducting. We are happy and expecting more research directions while celebrating the 50th anniversary of JIRCAS. We have seen bright hope in the research outcomes and their potential as problem solutions and global contribution to combat desertification and climate change. The best quality of JIRCAS research is giving due attention to quality and making it geared for solving problems. Moreover, the challenges we have, the diversified topographic and agro-ecological conditions, and our commitment to bring change and work in collaboration with JIRCAS, make it an interesting opportunity for researchers of JIRCAS.

JIRCAS has been involved on tangible research agendas that can help our people and has come up with new, research-based recommendations to improve the livelihood of our farmers. We are expecting more engagement and would like to see these research findings implemented in our future collaboration. I hope that in the years to come, we expect to see a difference on our development interventions on natural resource management, livestock improvement and mechanization, which are highly interlinked in our development system.

Finally, I would like to thank the people of Japan for contributing to the wellbeing of human kind and global environment through JIRCAS support.

Thank you very much!

Prof. Dr. RAZAFINJARA Aimé Lala

Director-General
FOFIFA (Centre National de Recherche Appliquée au Développement Rural), Madagascar

On this very special occasion, I am pleased and honored to convey my warmest congratulations to JIRCAS for all its achievements since its inception 50 years ago.

The 50th anniversary is a time for reflecting on the past and looking ahead to the future. JIRCAS has gained international recognition for its research achievements in optimum technologies for solving difficult global issues such as food insecurity, malnutrition and sustainable management of natural resources and the environment, by making full use of the most up-to-date and cutting-edge scientific knowledge. In its approach, JIRCAS aims to contribute to the achievement of the SDGs through international joint research and information gathering and provision in the field of agriculture, forestry and fisheries. In so doing, JIRCAS is taking advantage of its strengths based on its 50-year history and is looking at global issues that will continue to grow in importance. I am confident that JIRCAS will rise to the challenge based on its solid foundation and will continue to play a significant role in the development of high value-adding technologies and utilization of local resources in developing regions, specially to Madagascar.

In crossing this significant milestone, may JIRCAS remain determined in supporting developing partner countries and regions through interdisciplinary cooperation in the fields of agriculture, forestry and fisheries and enable them in solving their production issues. Partnership with JIRCAS has significantly enriched the scientific know-how of FOFIFA researchers. FOFIFA is proud to be a partner of this prestigious, internationally renowned research institution. And, as JIRCAS prepares to embark for the next 50 years, I hope that the collaboration and cooperation between JIRCAS and FOFIFA will be even more reinforced in the future.

Mr. Seth Osei-Akoto

Director, Directorate of Crop Services
Ministry of Food and Agriculture, Ghana

On behalf of the Honourable Minister and Staff of the Ministry of Food and Agriculture, we wish to congratulate the Japan International Research Center for Agricultural Sciences (JIRCAS) in celebrating its 50th founding Anniversary.

We also acknowledge the Government and People of Japan in establishing this National Research and Development Agency to generate technologies in the areas of agriculture, forestry and fisheries which drive socio-economic development in-country and abroad.

There is no doubt that this national institute - JIRCAS, over the years, has worked tirelessly and contributed immensely towards the development of agricultural technologies in the world including Ghana.

The funding and quality human resource you have offered to research to support capacity strengthening of our rice scientists and others, including mentorship training, has enormously sharpened their capacities to undertake comprehensive experimental research for technological advancement of agriculture.

Your incalculable contribution towards sustainable agriculture in Ghana, especially in relation to rice production cannot be overemphasized. It was therefore no surprise when the publication "Soil Fertility for Sustainable Lowland Rice Production in Ghana-Farmer' s Perspectives and Soil Physicochemical Properties" received the best paper award in 2017.

Publications like "Study for the Development of Improved Infrastructure and Technologies for Rice Production in Ghana" and "Study the Improvement of Micro Reservoir Technologies for Enhancement of Rice Production in Africa" have all impacted positively towards the improvement of the rice sector in Ghana.

This has enhanced the competence of our scientists not only to collect, analyze and publish relevant information of domestic and international researches in agriculture, but also to contribute solutions to national/global food and environmental issues including the stable supply of agricultural products.

While great progress has been made globally in terms of agricultural research, the untapped agricultural potential in Ghana has contributed to deteriorating food and nutrient security to a limited extent. There is a need for a drastic change within the food and agricultural system in Ghana to meet our food and nutrition security needs in the major crops we are promoting, especially rice where the country spends millions of foreign exchange to import to fill the country's demand.

We hope for a stronger collaboration with JIRCAS and other relevant research institutes and the Ministry of Food and Agriculture to increase agriculture growth rate and specifically work tirelessly to enable Ghana to attain self-sufficiency in rice production in due course. This collaboration should empower the Next Ghanaian Relevant Agricultural Researchers and other team players to become game changers and history makers.

We would like to wish JIRCAS a fruitful and memorable golden anniversary as we look forward to continuing our partnership to achieve greater heights.

We wish JIRCAS a successful 50th Anniversary celebration and continue on the path of success for the next 50 years.

6. Congratulatory Messages – Expectations Towards JIRCAS

Dr. Hamidou TRAORE

Director of Research
Environmental Institute for Agricultural Research (INERA), Burkina Faso

The economy of Burkina Faso is based on agriculture, which employs 86% of the population and contributes to food and nutritional security and provides about 45% of households' income.

Agriculture is essentially based on staple food crops like sorghum, millet, maize, rice, and cash crops like cotton, groundnut, and sesame. The main constraints undermining agriculture productivity include climate change, low soil fertility, land degradation, low utilization of research technologies, low access of farmers to credit, and their low technical capacity. To increase the performance of agriculture, the Government of Burkina Faso maintains fruitful collaboration with the Government of Japan.

INERA and JIRCAS have worked together for more than twenty years. During a visit of the president of JIRCAS to Ouagadougou in 2014, the two research institutions signed a Memorandum of Understanding (MoU).

The collaboration includes researches on soil and water conservation methods particularly soil and water management at watershed scale, technology development to improve agro-sylvo-pastoral systems, and evaluation of technology efficacy (Watersheds). It is also focused on the "Establishment of the model for fertilizing cultivation promotion using Burkina Faso rock phosphate" through the Science and Technology Research Partnership for Sustainable Development (SATREPS) project. This project aims to manufacture compound fertilizers regionally adapted using Burkina Faso rock phosphate and to develop methods of using compound fertilizers as well as their popularization. Other areas of collaboration include the evaluation and use of genetic diversity of cultivars in tropical areas with particular emphasis on cowpea through the development of simple techniques for creating nutritious and high yielding cowpea varieties and using the technique of sowing in high density.

Many scientists of INERA, including INERA's director, visited JIRCAS headquarters in Tsukuba (Japan) in 2017. Some young scientists of INERA were hosted in Tsukuba in 2018 to train at the soil science laboratory.

I would therefore like to take this opportunity on the 50th anniversary of JIRCAS, on behalf of the Minister of Higher Education, Scientific Research and Innovation, the General Delegate of the National Center for Scientific and Technological Research (CNRST), to thank the Government and the Japanese people. I would also like to express my sincere gratitude to the president of JIRCAS for his vision and leadership.

Our expectation areas are as follows : (i) Equipment of the soil science laboratory of INERA, (ii) Training young scientists in soil science, (iii) Strengthening the internet connection, (iv) Exchange visits, (v) Small mechanization (ploughing, sowing, weeding, harvesting, threshing) and (vi) Horticulture and irrigation.

Happy anniversary to JIRCAS!

Dr. José Renato Bouças Farias

General Head
Embrapa Soja, Brazil

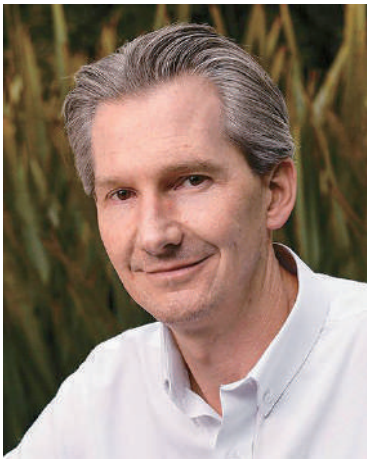
On behalf of Embrapa Soja employees and with great honor and pleasure, I congratulate the entire JIRCAS community on its 50th Anniversary. The contribution JIRCAS has made to the world agricultural sciences, and particularly to Embrapa Soja, is truly outstanding.

Embrapa Soja has a long and fruitful partnership with JIRCAS, starting in 1989 with informal contacts between researchers of both institutions on soybean breeding for human consumption. The formal collaboration started in 1997 through the signing of the first Memorandum of Understanding (MOU) between JIRCAS and Embrapa, in which the interests were widened to other areas such as soil fertility/plant nutrition and plant physiology. Subsequently, new MOUs were signed, adding new specific research interests, such as genetic transformation with drought tolerance genes and studies on Asian Soybean Rust - ASR. From 1997 to 2011, JIRCAS maintained an officer at Embrapa Soja to coordinate JIRCAS collaboration in South America. During the entire period, an intense exchange of researchers between Embrapa Soja and JIRCAS took place.

The results being attained in this win-win partnership are quite remarkable. New laboratory equipment and methodologies were introduced and incorporated into Embrapa Soja research activities. Special high protein and good tasting varieties for human consumption were developed, increasing the direct use of soybean as food and its use in the industry. Results of joint studies on soil fertility and management in the "cerrado" areas of the Brazilian NE helped farmers to increase production. The SATREPS Project brought impressive outcomes. Both Embrapa Soja and JIRCAS allocated human, financial, and material resources to support the joint research activities of the partnership. Advanced laboratory techniques were transferred to Embrapa personnel. Drought tolerance genes, introduced in several agricultural species and lines, are being successfully tested to become commercial varieties. The identification of soybean resistance genes helped to develop ASR resistant cultivars. Currently, joint research on Cercospora Leaf Blight is seeking solutions for its control.

Recent joint efforts are towards the development of drought-tolerant cultivars and the understanding of the molecular mechanisms involved in the ASR attack to soybean. We hope that Embrapa Soja and JIRCAS will further strengthen their collaboration with future joint research projects to tackle the most important problems in soybean production.

I earnestly congratulate JIRCAS and also express my deep appreciation for all these years of truly fruitful partnership in important aspects of soybean research, and sincerely wish JIRCAS the brightest and most prosperous future.



Dr. Juan Lucas Restrepo

Director General
Alliance of Bioversity International and the International Center for Tropical Agriculture

On behalf of all staff from the Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT), I extend my warmest greetings and congratulations to the members of the Japan International Research Center for Agricultural Sciences (JIRCAS) in celebration of 50 years as a Center of excellence in the field of international agricultural research. Our research partnerships with JIRCAS have created substantial benefits for rural people throughout the tropics.

The Alliance's long and productive history of collaboration with Japanese institutions dates back to 1972. Since, Japan has generously shared its significant agricultural science and technology capabilities through collaborative research efforts addressing some of the greatest challenges facing agriculture and foods systems globally.

Today, Japan's strategy is shifting in response to the advance of globalization, addressing both threats and opportunities. To achieve the Sustainable Development Goals (SDGs) by 2030, and support smallholder agriculture development and rural transformation, there are opportunities with the Alliance to further strengthen partnership with JIRCAS.

An excellent example of scientific collaboration between JIRCAS and the Alliance has been in the technical area of "biological nitrification inhibition" (BNI), in reference to a trait that was discovered for the first time in a tropical grass, *Brachiaria humidicola*, which the Japan Times called a "super grass". The trait's huge potential to mitigate climate change has opened up opportunities for pioneering reseach by the global scientific community interested in extending BNI research to other crops such as wheat and sorghum, which JIRCAS is now pursuing with our sister CGIAR centers, CIMMYT and ICRISAT.

Dr. Harold Roy-Macauley

Director General
Africa Rice Center (AfricaRice)

On behalf of AfricaRice and its 28 member countries, I am honored to congratulate JIRCAS as it celebrates its 50th anniversary which marks an important milestone in its illustrious history. We are proud of our long-term relationship with JIRCAS, which plays a key role in international rice research and is our main contact in Japan – a leading supporter of rice research for development in Africa.

Over the years, JIRCAS has not only shared its cutting-edge technology and know-how with AfricaRice, but has also provided guidance to the Center, notably through its President, Dr. Masa Iwanaga, who served on the AfricaRice Board of Trustees as Program Committee Chair from 2011 to 2017.

The research collaboration between JIRCAS and AfricaRice dates back to 1998, when the first JIRCAS scientist joined AfricaRice (formerly WARDA). JIRCAS was among the key partners in the Interspecific Hybridization Project (IHP) which focused on New Rice for Africa (NERICA) development and dissemination.

Over the years, the two organizations have conducted seminal research covering genetic improvement of rice for biotic and abiotic stress tolerance, sustainable crop management and economic analyses in Africa, among others. Young researchers have benefitted from fellowship programs coordinated by JIRCAS.

JIRCAS and AfricaRice are among the six architects of the IRRI-led CGIAR Research Program (CRP) on Global Rice Science Partnership (GRiSP) and the current CRP Rice Agri-food Systems to promote impact-driven rice research and development. Some of the achievements include the identification and evaluation of important stress tolerance genes and large-effect QTL to develop climate-ready rice for smallholder farmers.

The other strong connection that binds the two organizations is that both are steering committee members of the Coalition for African Rice Development (CARD), which was launched by JICA in 2008 in partnership with the Alliance for a Green Revolution in Africa (AGRA). They will continue to be an integral part of the CARD Phase 2, which builds on the achievements of Phase 1.

With AfricaRice and IRRI moving towards the establishment of a global rice research program, especially a single rice transformation program for Africa under 'One CGIAR', the contribution of JIRCAS will be even more critical to harness synergies and accelerate delivery of excellent research and build scientific capacity, aligned with national priorities in Africa and the goals of CARD 2.

We look forward to further strengthening our partnership with JIRCAS in support of our shared vision to address the growing needs of the African rice sector and contribute to achieving the Sustainable Development Goals (SDGs).

6. Congratulatory Messages – Expectations Towards JIRCAS

Prof. Dr. Martin Kropff

Director General
International Maize and Wheat Improvement Center (CIMMYT)

It is a pleasure to share this letter with the honorable community of JIRCAS on its 50th anniversary.

JIRCAS is the gold standard of an inclusive partner and CIMMYT applauds your rare and laudable focus on big, important research issues. You approach collaboration holistically and look at how all parts of the partnership can be enriched in the process.

At the beginning of our collaboration in the 1990s, CIMMYT benefitted from the expertise of long-term visiting scientists, Drs. Masanori Inagaki (development of wheat doubled haploid method for faster wheat variety development) and Kazuhiro Suenaga (molecular studies of wheat durable disease resistance genes), and later, Dr. Tomohiro Ban (studies to combat the globally-important Fusarium Head Blight disease) and several short-term visiting graduate students as JIRCAS-supported interns. Throughout 2002-2008, CIMMYT was led by agrobiodiversity and crop research champion, Dr. Masaru Iwanaga, who has dedicated his career to improving the livelihoods of the world's poorest. Since then, CIMMYT and JIRCAS have collaborated on numerous projects involving multiple crops and institutions.

We value past, present and future opportunities to partner with JIRCAS, particularly in the validation and application of novel technologies. In the recent past, partnering with JIRCAS inspired and strengthened CIMMYT in the application of transgenic methods and stewardship of transgenic research as together we studied the genetics of drought tolerance in wheat. Currently, you have included us as partners in a visionary, cutting-edge project, validating the importance of biological nitrification inhibition (BNI) and exploring genetic diversity that could enable breeding maize and wheat with reduced nitrogen fertilizer requirements.

As both our institutions embark on our second half century, we will be honored by opportunities to work closely with JIRCAS to meet Sustainable Development Goals and together find solutions for increased food security and sustainable management of natural resources and the environment.

We greatly appreciate the complementary strengths and roles that CIMMYT and JIRCAS play across the globe towards achieving our shared mission of agricultural research for sustainable agriculture, development and improved livelihoods.
Please receive our very best wishes for the next 50 years! We look forward to a continued impactful partnership with you.

Dr. Jacqueline Hughes

Director General
International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

I am delighted to congratulate JIRCAS on its Golden Jubilee celebrations. It is indeed a spectacular milestone and the journey has seen JIRCAS achieve major achievements all along the way.

Since 1984, ICRISAT and JIRCAS have worked on several joint research projects with significant contributions to various research areas which are of mutual interest. Between 1984 and 1994, the project on understanding the interactions between mineral nutrition and soil moisture availability in legume cropping systems and nitrogen dynamics in pigeonpea-based cropping systems had a significant impact on promoting legume cropping systems to increase yields and improve soil characteristics in the semi-arid areas.

More recently, over the last decade, our collaboration in the area of sustainable soil fertility management for the sorghum cropping system through the effective use of the Biological Nitrification Inhibition (BNI) mechanism has been very productive. It has led to an improved understanding of BNI trait in several scientific areas, including genetics, sustainable soil management, soil microbiology, genomics, crop modelling and cropping systems.

I must mention that an important highlight of these collaborations was the scientific exchange and capacity building facilitated through several fellowships and exchange visits. I would particularly like to highlight the visit of Dr. Masa Iwanaga, the president of JIRCAS, in 2014.

While our ongoing collaboration with JIRCAS on BNI research in sorghum is growing stronger with the addition of several international collaborators, we hope that the new research phase will continue to focus on our shared vision of a prosperous and resilient semi-arid tropics.

I look forward to a close collaboration and partnership between JIRCAS and ICRISAT, building on my personal and our institutional relationships. Such a partnership will enable us to harness the best of our institutions to help our partners and stakeholders achieve their Sustainable Development Goals in the face of climate change and many other global and local challenges.

Finally, on behalf of ICRISAT, I once again express our heartfelt and sincere compliments to the dedicated scientists and staff of JIRCAS on its Golden Jubilee celebrations. In the future, I trust that JIRCAS is able to continue working on its commitment to the advancement of international agricultural research for improving agro-ecosystems and livelihoods of farmers especially in the semi-arid tropics.

Dr. Nteranya Sanginga

Director General
International Institute of Tropical Agriculture (IITA)

On behalf of the Board of Trustees and staff of the International Institute of Tropical Agriculture (IITA), I wish JIRCAS a wonderful 50th anniversary celebration.

IITA and the Japan International Research Center for Agricultural Sciences (JIRCAS), then the Tropical Agriculture Research Center (TARC), have been strong research and development partners since 1989. Starting with projects on physiological studies conducted at Kano on drought resistance in cowpea (1990-1995), we have undertaken many more collaborative research including "Understanding genetic diversity of Bruchid resistance in Vigna species" (2004-2009) and "Feasibility study on JIRCAS-IITA collaboration on yam" (2009-2010).

In 2011, JIRCAS, together with several Japanese research institutions and IITA, initiated a 5-year research project called "Evaluation and utilization of diverse genetic materials in tropical field crops (EDITS)". The project focused on two regionally important crops—yam and cowpea. Its aim was to generate a solid understanding of the available wide genetic resources in these traditional West African crops, and develop efficient evaluation techniques for effective crop improvement.

EDITS 2 or "Effective utilization of genetic diversity in regional crops through the use of generated evaluation tools and scientific information" was started in 2016 and continues to the present. The outputs from this long-standing collaboration have helped strengthen the breeding programs in IITA and enhanced the genetic development of improved yam and cowpea varieties that help promote rural livelihoods in West Africa.

Many JIRCAS scientists and colleagues have worked with us in IITA in various capacities. Dr. Masa Iwanaga, JIRCAS President, has been on the IITA board and currently, Dr. Shuichi Asanuma, who worked on rhizobium as a postdoctoral fellow from 1979 to 1983, sits on the Board. Many other scientists working with JIRCAS have collaborated with IITA over the years.

We acknowledge the very strong support and collaboration with JIRCAS and the Japanese Government. JIRCAS plays a key role linking Japanese scientific capacities to African communities through IITA. The partnership has helped advance science and research through support for capacity development and joint research and development initiatives, and has been contributing to the achievement of sustainable agricultural development in sub-Saharan Africa through sharing of knowledge, expertise, and technologies.

We are looking at continuing and developing new research collaboration and stronger partnerships to meet our common goal of sustainable agricultural development in support of food and nutrition security in Africa.
Congratulations to JIRCAS and we look forward to more fruitful partnerships in the future!

Ms. Malinee Smithrithee

Secretary-General
Southeast Asian Fisheries Development Center (SEAFDEC)

On behalf of the SEAFDEC family and the Member Countries, we offer our heartfelt congratulations to JIRCAS on of its 50th Year Anniversary and for its 50 glorious years of success. The efforts and achievements of JIRCAS, especially on aquaculture research and development, are well recognized and acknowledged by the ASEAN Member States, where aquaculture has consistently and reliably enhanced its contribution to food security and economic stability.

We know that there are many challenges that confront the aquaculture industry including the emerging requirements of the international fish market that are becoming much more severe, but with the technical support of Japanese experts from JIRCAS, SEAFDEC/AQD has paved the way towards addressing the region's aquaculture concerns, and the challenges had been easily overcome with the close cooperation between the researchers from SEAFDEC/AQD and the Japanese experts.

Formerly established as the Tropical Agriculture Research Center, the Japan International Research Center for Agricultural Sciences or JIRCAS has continuously supported SEAFDEC/AQD for more than twenty years in implementing various activities aimed at promoting aquaculture technologies, especially in the areas of fish diseases, seed production, fish nutrition and breeding, seaweed aquaculture, mangrove ecosystems aquaculture, and recently aquaculture projects harmonized with tropical ecosystem, e.g. "Demonstration and Verification of Integrated Multi-Trophic Aquaculture" and "Development of Low Fish Meal Feed for Aquaculture Using Alternative Resources," that have achieved remarkable results. These have enabled SEAFDEC/AQD to address important constraints that impede sustainable aquaculture development including supply of good quality seeds, development of high quality feeds, health management, maintaining environmental integrity, etc. aligned with the needs and priorities of the ASEAN Member States. Besides, a number of research activities on sustainable aquaculture development have been implemented directly in Southeast Asian countries under the JIRCAS collaborative projects.

On behalf therefore of the whole SEAFDEC family, we want to extend our gratitude to JIRCAS for the contributions it has provided to our region. We wish JIRCAS all the success for many more years to come, and hope that it will continue to support the Southeast Asian countries and generate better aquaculture technologies for the benefit of Southeast Asia. Congratulations again to JIRCAS on its 50th Anniversary celebration.

7. Advancement of JIRCAS

Past and Present Director Generals/Presidents

	Name	Period
TARC	YAMADA Noboru	June 1970 – July 1974
	MURAKAMI Kan-ichi	July 1974 – April 1977
	OKABE Shiro	April 1977 – April 1981
	HAYASHI Ken-ichi	April 1981 – December 1981
	NAKAGAWA Sho-ichiro	December 1981 – March 1985
	HAYASHI Ken-ichi	April 1985 – September 1986
	KAJIWARA Toshihiro	October 1986 – October 1988
	KANEDA Chukichi	October 1988 – September 1989
	TSURU Shinya	October 1989 – August 1992
	KOBAYASHI Masashi	August 1992 – July 1993
JIRCAS	KAINUMA Keiji	July 1993 – August 1996
	MAENO Nobuyoshi	August 1996 – March 2001
	INOUE Takahiro	April 2001 – March 2003
	IWAMOTO Mutsuo	April 2003 – March 2005
	INANAGA Shinobu	April 2005 – March 2007
	IIYAMA Kenji	April 2007 – March 2011
	IWANAGA Masa	April 2011 – Present

Main Academic Prizes and Awards

FY	Academic Prizes and Awards
2001	"Promising Scientist Award of the Society of Japanese Women Scientists" for research on "Physiology and biochemistry of reproductive mechanisms in Crustacea and their applications toward the further development of freshwater prawn culture in Southeast Asia" Dr. Marcy N. Wilder, Fisheries Division
	"Achievement Award for Young Scientists of the Japanese Society of Fisheries Scientists" for research on "Physiochemical studies on reproduction and embryonic development in shrimp and prawns" Dr. Marcy N. Wilder, Fisheries Division
2002	"Ministry of Education, Culture, Sports, Science, and Technology Minister's Prize" for research on "Identification of abiotic stress tolerance genes in plants" Dr. Kazuko Yamaguchi-Shinozaki, Biological Resources Division
	"Tsukuba Prize of the Science and Technology Promotion Foundation of Ibaraki" for research on "Identification of abiotic stress tolerance genes in plants and the development of plants tolerant to stresses induced by drought, high salinity, and cold temperatures" Dr. Kazuko Yamaguchi-Shinozaki, Biological Resources Division (in cooperation with Dr. Kazuo Shinozaki of the RIKEN Tsukuba Institute)
2003	"Ministry of Education, Culture, Sports, Science, and Technology Minister's Prize" for research on "Basic research on crustacean biochemistry and associated applications to aquaculture technology development" Dr. Marcy N. Wilder, Fisheries Division
2005	"The Fourth Japan Prize in Agriculture Sciences, Achievement Award for Young Scientists" for research on "Basic physiological research and the development of seed production and aquaculture technology for economically important prawn species" Dr. Marcy N. Wilder, Fisheries Division
	"Certificate of Appreciation" from the Southeast Asian Fisheries Development Center (SEAFDEC) JIRCAS
	"Certificate of Appreciation" from the Minister of Agriculture, Brazil, for the sustainable soybean production by integrating agro-pastoral system into the conventional soybean cultivation JIRCAS

FY	Academic Prizes and Awards
2006	"Certificate of Appreciation" from EMBRAPA-Soybean JIRCAS
	"Certificate of Appreciation" from the Institute of Food Research and Product Development, Kasetsart University, Thailand JIRCAS
	"Certificate of Appreciation" from the Ministry of Agriculture and Livestock, Paraguay Dr. Zen-ichi Sano, Crop Production and Environment Division
	"Certificate of Appreciation" from the National Institute for Agricultural Technology (INTA), Argentina JIRCAS
2007	"Certificate of Appreciation" from the Minister of Agriculture and Livestock, Paraguay JIRCAS
	"Certificate of Appreciation" from the National University of Asunción (UNA), Paraguay JIRCAS
2009	"Award for Persons of Merit in Industry-Academia-Government Collaboration" Award of the Minister of Agriculture, Forestry, and Fisheries Dr. Marcy N. Wilder, Fisheries Division (in cooperation with Dr. Takuji Okumura, the National Research Institute of Aquaculture, and Mr. Setsuo Nohara, IMT Engineering)
	"Certificate of Appreciation" at the 10th anniversary celebration of the Lao National Agriculture and Forestry Research Institute (NAFRI) Dr. Ryuichi Yamada, Development Research Division, Drs. Akira Ito and Shinsuke Morioka, Fisheries Division
	"Tianshan Prize" from the Government of Xinjiang Uygur Autonomous Region of China Mr. Hirofumi Iga, Rural Development Planning Division
2010	"Award of Appreciation" from the Royal Forest Department, Ministry of Natural Resources and Environment, Thailand, during the commemoration ceremony of the latter's 114th Anniversary Forestry Division, JIRCAS
	"Certificate of Appreciation" from Khon Kaen University, Thailand JIRCAS
	"Certificate of Appreciation" from the Faculty of Agriculture, National University of Lao PDR, for the project titled "Establishment of a feeding standard for beef cattle and a feed database for the Indochinese peninsula" JIRCAS
2011	"Commendation Award in Science and Technology" from the Ministry of Education, Culture, Sports, Science and Technology (MEXT) for research on "Innovative Utilization System for New Sugarcane Varieties" Dr. Akira Sugimoto, Tropical Agriculture Research Front (TARF)
	"Certificate of Appreciation" from the Ministry of Agriculture, Niger, for collaborative research on "Growth promotion of dry season vegetables utilizing limited water resources" JIRCAS
	"Certificate of Appreciation" from the Bureau of Soil and Water Management (BSWM), Department of Agriculture, Philippines, for the project titled "Development of Environmental Management Technology for Sustainable Crop Cultivation in Tropical and Sub-tropical Islands" Tropical Agriculture Research Front (TARF)
2012	"Certificate of Appreciation" from the Pak Xuang district government, Lao PDR, for collaborative research on shrimp biology in northern Laos Dr. Akira Ito, Fisheries Division
	Souvenir and "Certificate of Appreciation" from the Governor of Uvurkhangai in Mongolia, for the project titled "Development of planning methods for a participatory management of rangelands to combat yellow dust outbreaks at source area" Mr. Yasuo Kamiya, Rural Development Division
2013	"Friendship Award" from the Chinese Government Dr. Masayoshi Saito, Director of JIRCAS's Rural Livelihood Improvement Program "Certificate of Appreciation" from the Department of Agriculture (DOA), Thailand, for contribution to collaborative research on wild sugarcane Dr. Akira Sugimoto, former principal plant breeder for development of tropical crops at JIRCAS-TARF
	"Certificate of Appreciation" and Medals from Vietnam's Ministry of Agriculture and Rural Development Dr. Yoshimichi Fukuta, Tropical Agriculture Research Front (TARF)

7. Advancement of JIRCAS

FY	Academic Prizes and Awards
2013	"Certificate of Appreciation" from King Mongkut's University of Technology Thonburi (KMUTT), Thailand Dr. Akihiko Kosugi, Biological Resources and Post-harvest Division
	"Certificate of Appreciation" from Kasetsart University, Thailand JIRCAS
2014	"Certificate of Appreciation" from the National Agriculture and Forestry Research Institute (NAFRI), Lao PDR JIRCAS
	"Certificate of Appreciation" from the National University of Laos (NUOL) JIRCAS
	"Honorary Professor Award" from the Mongolian University of Life Sciences (MULS) Dr. Seishi Yamasaki, Crop, Livestock and Environmental Division
	"Certificate of Appreciation" from the Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang (KMITL), Thailand Dr. Isao Tsutsui, Fisheries Division
	"Environment Minister's Prize" at the 2014 Environmental Awards ceremony hosted by the Hitachi Environment Foundation and Nikkan Kogyo Shinbun (The Business and Technology Daily News) Dr. Kenta Ikazaki and Dr. Satoshi Tobita, Crop, Livestock and Environment Division
	"Achievement Award for Young Scientists" at the 13th Japan Prize in Agricultural Sciences ceremony hosted by the Foundation of Agricultural Sciences of Japan Dr. Kenta Ikazaki, Crop, Livestock and Environment Division
	JIRCAS scientists among Thomson Reuters' "Highly Cited Researchers" in the Plant and Animal Science category Dr. Yasunari Fujita and Dr. Kyonoshin Maruyama, Biological Resources and Post-harvest Division
2015	"Prize for Creativity" from the Ministry of Education, Culture, Sports, Science and Technology (MEXT), for the project titled "Improving the cost-performance and workability of wind-resistant net houses." Mr. Masato Shimajiri and Mr. Yasuteru Shikina, technical support staff of the Tropical Agriculture Research Front (TARF)
	"JICA Recognition Award" at the 11th JICA President Commendation ceremony Dr. Masa Iwanaga, President of JIRCAS
	"Excellence Award" at the 25th Nikkei Global Environmental Technology Awards Dr. Kenta Ikazaki and Dr. Satoshi Tobita, Crop, Livestock and Environment Division
	JIRCAS ranks 6th in Japan in the "Plant Science and Zoology" category of highly cited papers released by Thomson Reuters
	JIRCAS scientists among Thomson Reuters' "Highly Cited Researchers" in the Plant and Animal Science category for 2nd straight year Dr. Yasunari Fujita and Dr. Kyonoshin Maruyama, Biological Resources and Post-harvest Division
	"Certificate of Appreciation" from the Lao PDR Forest Science Research Center Dr. Masa Iwanaga, President of JIRCAS
	"Certificate of Appreciation" from the Department of International Cooperation of the Chinese Academy of Agricultural Sciences (CAAS) JIRCAS
	"Golden Gerege" Prize — a form of diplomatic passport in Mongolian tradition— from the Mongolian University of Life Sciences Dr. Shunji Oniki, Mr. Takeshi Matsumoto, and Dr. Akira Hirano
	Awarding of an honorary doctorate in biochemistry from King Mongkut's University of Technology Thonburi (KMUTT), Thailand Dr. Akihiko Kosugi, Biological Resources and Post-harvest Division
	"Certificate of Appreciation" from the Faculty of Agriculture, National University of Laos Dr. Jun-ichiro Marui, Biological Resources and Post-harvest Division
	"Trophy of Appreciation" awarded during "Thailand's National Science and Technology Fair" organized by the Ministry of Science and Technology, Royal Thai Government JIRCAS
	"Certificate of Appreciation" from the Forest Research Institute Malaysia (FRIM) JIRCAS
	The Fourth Niigata International Food Award (Main Prize) Dr. Masa Iwanaga, President of JIRCAS

FY	Academic Prizes and Awards
2016	The Fourth Niigata International Food Award (Sano Touzaburo Special Prize) Dr. Marcy N. Wilder, Fisheries Division
	JIRCAS ranks 6th in Japan in the "Plant Science and Zoology" category of highly cited papers released by Clarivate Analytics (formerly Thomson Reuters)
	JIRCAS scientists among Clarivate Analytics' (formerly Thomson Reuters') "Highly Cited Researchers" in the Plant and Animal Science category for 3rd straight year Dr. Yasunari Fujita and Dr. Kyonoshin Maruyama, Biological Resources and Post-harvest Division
2017	JIRCAS ranks 6th in Japan in the "Plant Science and Zoology" category of highly cited papers released by Clarivate Analytics
	JIRCAS scientists among Clarivate Analytics' "Highly Cited Researchers" in the Plant and Animal Science category for 4th straight year Dr. Yasunari Fujita and Dr. Kyonoshin Maruyama, Biological Resources and Post-harvest Division
	"Young Agricultural Researcher Award" from the Agriculture, Forestry and Fisheries Research Council (AFFRC) Dr. Kenta Ikazaki, Crop, Livestock and Environment Division
	"Achievement Award for Young Scientists" from The Foundation of Agricultural Sciences of Japan Dr. Kotaro Maeno, Crop, Livestock and Environment Division
	"Certificate of Appreciation" from the Philippine Sugar Regulatory Administration (SRA) JIRCAS
2018	"Public LOD Award" at the Linked Open Data Challenge Japan 2018 Information Management Subsection of the Information and Public Relations Office
	JIRCAS ranks 7th in Japan in the "Plant Science and Zoology" category of highly cited papers released by Clarivate Analytics
	JIRCAS scientists among Clarivate Analytics' "Highly Cited Researchers" in the Plant and Animal Science category for 5th straight year Dr. Yasunari Fujita and Dr. Kyonoshin Maruyama, Biological Resources and Post-harvest Division
	21st Century Hope Prize at the Fifth Niigata International Food Award Dr. Kotaro Maeno, Crop, Livestock and Environment Division
	"Certificate of Appreciation" from the Philippine Sugar Regulatory Administration (SRA) JIRCAS

7. Advancement of JIRCAS

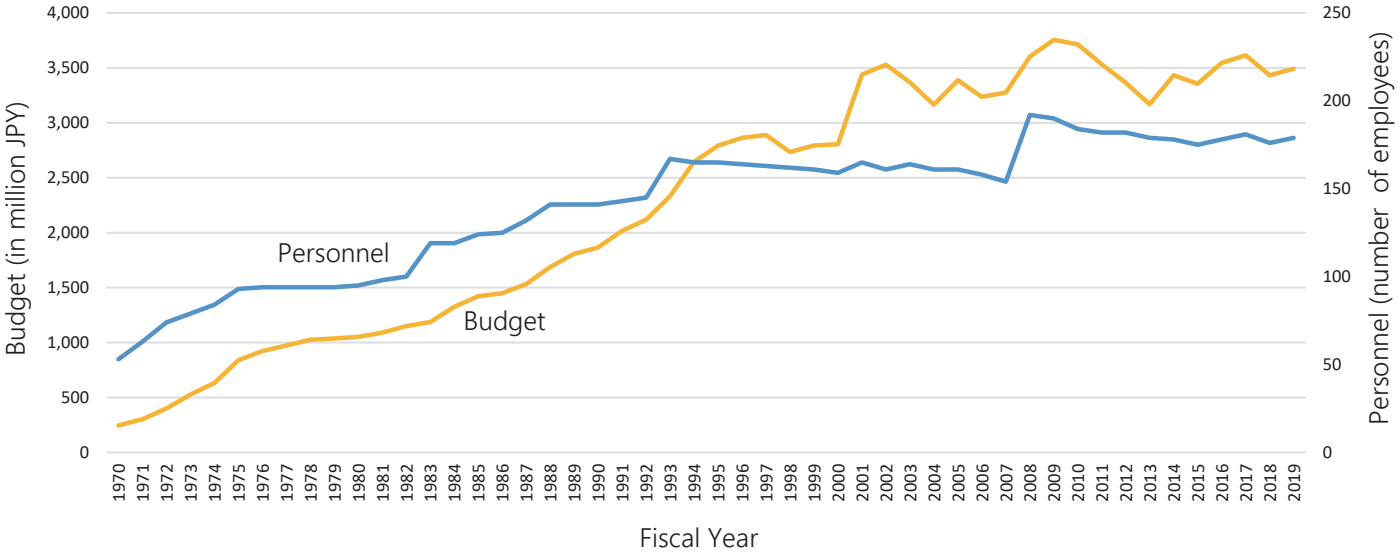
Winners of the Japan International Award for Young Agricultural Researchers (Japan Award)

FY	Awardees	Research Achievements	Affiliations
2007	Zhengqiang Jiang	Research and application of enzymes & development of innovative technology in the field of food processing	China Agricultural University
	Chalermpol Kirdmanee	Research, development and extension on *in vitro* selection and mass-propagation for producing high quality transplants of medicinal, food and industrial crops	National Center for Genetic Engineering and Biotechnology, Thailand
	Jonathan Hosier Crouch	Molecular breeding of major tropical staple crops for drought-prone environments	International Maize and Wheat Improvement Center (CIMMYT)
2008	XiaoYuan Yan	Developing greenhouse gases emission inventories for croplands and evaluating their environmental impacts	Institute of Soil Science, Chinese Academy of Sciences
	Maryam Ambundo Imbumi	Promotion and research of African leafy vegetables for improved nutrition, health and incomes	Kenya Resource Centre for Indigenous Knowledge (KENRIK)
	Thuy Thi Thu Nguyen	Application of molecular genetics in aquaculture and fisheries management	Network of Aquaculture Centres in Asia-Pacific (NACA)
2009	Ma. Junemie Hazel Leonida Lebata-Ramos	Stock enhancement of commercially important and threatened marine invertebrates in tropical areas	Southeast Asian Fisheries Development Center (SEAFDEC)
	Amos Adeyinka Onasanya	Molecular and pathotyping characterization of blast, rice yellow mottle virus, bacterial leaf blight and African rice gall midge in West Africa	Africa Rice Center (AfricaRice)
	Kevin Kit Siong Ng	Spatial structure and impact of logging on genetic diversity of selected tropical tree species	Forest Research Institute Malaysia (FRIM)
2010	Dewpura Acharige Lilisiya Leelamanie	Experimental study on soil water repellency and its behavior	University of Ruhuna, Sri Lanka
	Rattiya Waeonukul	Development of multienzyme complexes for the effective degradation of lignocellulosic biomass	King Mongkut's University of Technology, Thonburi (KMUTT)
	Jianbing Yan	Provitamin A biofortification in maize grain	International Maize and Wheat Improvement Center (CIMMYT) - China
2011	Roel Rodriguez Suralta	Significance of root plasticity in maintaining dry matter production in rice under fluctuating soil moisture stresses	Philippine Rice Research Institute (PhilRice)
	Muhammad Abdul Alim	Study on tick molecular biology with a view to development of novel control strategies for ticks and tick-borne diseases	Bangladesh Agricultural University
	Jonne Rodenburg	Developing socially acceptable weed management strategies for resource-poor rice farmers	Africa Rice Center (AfricaRice)
2012	Sudisha Jogaiah	Antimildew compounds from wood rot fungi and sequence characterized amplified region markers associated with downy mildew disease resistance in pearl millet	University of Mysore, India
	Kanokwan Srirattana	Improvement of reproductive biotechnology techniques for livestock and endangered species	Suranaree University of Technology, Thailand
	Lijun Yin	Development of technology for quality and functionality improvement of traditional foods, and application of novel emulsifying technology for new processing system	China Agricultural University
2013	Lee Hong Tnah	Timber tracking system of an important Malaysian timber species, *Neobalanocarpus heimii* (Dipterrocarpaceae) using DNA approach	Forest Research Institute Malaysia (FRIM)
	Nouhoun Belko	High-throughput phenotyping and selection for drought tolerance in cowpea (*Vigna unguiculata L.* (Walp.))	Senegalese Agricultural Research Institute (ISRA)

FY	Awardees	Research Achievements	Affiliations
2013	Panuwan Chantawannakul	Honey bee pathology and development of beekeeping in Asia	Chiang Mai University, Thailand
2014	Giriraj Amarnath	Enhancing Resilience to Agricultural Flood-Risks and Adaptation for Smallholder Farmers in Asia and Africa	International Water Management Institute (IWMI)
	Ho Le Thi	Allelopathy and Allelochemicals in Vietnam Local Cucumber Variety and Vietnamese Rice Cultivars	Vietnam Academy of Agricultural Sciences (VAAS)
	Asad Jan	Analysis of Plant Growth Regulation under Abiotic Stress Conditions	The University of Agriculture, Peshawar, Pakistan
2015	Ani Widiastuti	Mechanism, Potency and Practical Application of Heat Shock-Induced Resistance	Universitas Gadjah Mada, Indonesia
	Viengsakoun Napasirth	Development and utilization of silage technique and agro-industrial by-products for cattle feed for the promotion of sustainable livestock agriculture in Laos	National University of Laos
	Atef Swelam	Development of a cost-effective raised-bed machine for small-scale farms to improve land and water productivity in the Nile Delta	International Center for Agricultural Research in Dry Areas (ICARDA)
2016	Musaida Mercy Manyuchi	Production of Vermicompost and Vermiwash Bio-fertilizers from Food Waste	Harare Institute of Technology, Zimbabwe
	Gezahegn Girma Tessema	Research Achievement: Novel Approaches for the Improvement of Yam Germplasm Conservation and Breeding	International Institute of Tropical Agriculture (IITA)
	Alonzo Alulod Gabriel	*Precision Food Processing:* Establishment of Mathematical Models for Microbiological and Physicochemical Food Properties for Food Safety, Food Defense, and Food Quality	University of the Philippines, Diliman
2017	Chandra Siddaiah Nayaka	Plant-pathogen system biology and biotechnological approaches for plant disease management	University of Mysore, India
	Min Aung	Dairy researches on production performances and health of dairy cows, livelihoods of local farmers and environmental concerns	University of Veterinary Science, Myanmar
	Sheetal Sharma	Development of innovative approaches to enable small-holder farmers of South Asia to achieve gains in productivity and profitability through use of cutting-edge Information & Communication Technologies to guide application of site-specific nutrient and crop management options	International Rice Research Institute (IRRI)
2018	Andry Andriamananjara	Organic matter dynamics in agroecosystems of Madagascar and its effective use for crop production	University of Antananarivo, Madagascar
	Farah Fazwa Md Ariff	Production of high-quality planting materials of popular herbal species in Malaysia, *Labisia pumila*	Forest Research Institute Malaysia (FRIM)
	Jinyong Zhang	Study on diverse micro-organisms responsible for fatal parasitic disease outbreaks in farmed freshwater fish, and development of biology-based preventative measures against the diseases	Institute of Hydrobiology, Chinese Academy of Sciences
2019	Jacobo Arango Mejia	Research on tropical forage grasses to mitigate greenhouse gas emissions and combat climate change	International Center for Tropical Agriculture (CIAT)
	Mai Thi Ngan	Development of a simple, accurate, and economical diagnostic test and pooled testing system for detection of porcine epidemic diarrhoea virus	Vietnam National University of Agriculture
	Rebijith Kayattukandy Balan	Molecular approaches in identification, diversity and management of important insect pests in India	Plant Health and Environment Laboratory, Ministry for Primary Industries, New Zealand

7. Advancement of JIRCAS

Budget and Personnel Overview



Details

Fiscal Year	S45 1970	S46 1971	S47 1972	S48 1973	S49 1974	S50 1975	S51 1976	S52 1977	S53 1978	S54 1979	S55 1980	S56 1981	S57 1982	S58 1983	S59 1984	S60 1985	S61 1986
Personnel (number of employees)	53	63	74	79	84	93	94	94	94	94	95	98	100	119	119	124	125
Budget (in million JPY)	246	301	400	527	632	840	923	972	1,027	1,037	1,051	1,090	1,149	1,187	1,324	1,422	1,449

Fiscal Year	S62 1987	S63 1988	H1 1989	H2 1990	H3 1991	H4 1992	H5 1993	H6 1994	H7 1995	H8 1996	H9 1997	H10 1998	H11 1999	H12 2000	H13 2001	H14 2002	H15 2003
Personnel (number of employees)	132	141	141	141	143	145	167	165	165	164	163	162	161	159	165	161	164
Budget (in million JPY)	1,533	1,687	1,808	1,865	2,017	2,118	2,332	2,645	2,793	2,863	2,890	2,735	2,795	2,805	3,439	3,530	3,369

Fiscal Year	H16 2004	H17 2005	H18 2006	H19 2007	H20 2008	H21 2009	H22 2010	H23 2011	H24 2012	H25 2013	H26 2014	H27 2015	H28 2016	H29 2017	H30 2018	R1 2019
Personnel (number of employees)	161	161	158	154	192	190	184	182	182	179	178	175	178	181	176	179
Budget (in millionJPY)	3,166	3,388	3,237	3,275	3,601	3,756	3,714	3,532	3,364	3,170	3,433	3,355	3,546	3,615	3,433	3,493

Note: The budget since FY2001, when JIRCAS was restructured as an Incorporated Administrative Agency, includes the budget for Operating Cost Subsidy.

Closing message from the Vice-President of JIRCAS

Since the establishment of the Tropical Agriculture Research Center (TARC) in 1970, we have been publishing JIRCAS brochures at the turning point of every 10 years.

This 50th Anniversary Commemorative Brochure is a recapitulation of the changes in the center and research from the time of its establishment, as well as resources related to organizational management, research results, and advanced research techniques that have attracted attention internationally over the past few years. This brochure also contains heartwarming encouragements from our partner organizations from overseas and in Japan, through letters expressing their "expectations for JIRCAS" in the coming years and decades. I believe that this is also a symbol of the strong partnership that we have built through 50 years of research activities. I would like to express my deepest respect for the efforts of our collaborative partners and seniors over the past half-century.

I hope that JIRCAS will continue to represent Japan as a leading research organization that will come up with scientific solutions to solve the increasingly complex global issues "for the future of global agriculture, forestry and fisheries". We will work in partnership with relevant agencies and organizations to fulfill our mission.

Finally, we were able to put together and publish this 50th Anniversary brochure within a very limited time since it was planned. I would like to express my sincerest gratitude to all staff for their support in making this commemorative issue possible.

KOYAMA Osamu
Vice-President, JIRCAS

Planthopper-collecting at dusk (Vietnam)

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50th Anniversary

— Achievements from the past and expectations for the future —

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