Japan International Research Center for Agricultural Sciences

Annual Report 2007

(April 2007-March 2008)

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JAPAN

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JIRCAS 2007 ANNUAL REPORT

Message from the President

President
Dr. Kenji Iiyama

Steep rises in food, commodity and crude oil prices are slowing progress towards the United Nations Millennium Development Goal of "eradicating extreme poverty and hunger," and have triggered popular protests in more than 30 countries in developing areas. These serious matters were discussed at the 4th Tokyo International Conference for African Development (TICAD IV) held on May 28–30 in Yokohama. They were also on the agenda of the High Level Conference on World Food Security: the Challenges of Climate Change and Bioenergy, organized by the FAO on June 3–5 in Rome, and the G8 Summit on July 7–9 in Hokkaido.

The Japan International Research Center for Agricultural Sciences (JIRCAS) was closely involved in these conferences, especially TICAD IV. We organized a Round Table Meeting together with the Consultative Group on International Agricultural Research (CGIAR), and discussed strategies for research into agriculture, a core industry in developing countries, especially in Africa, the day before TICAD IV in Tokyo. We also contributed to the establishment of the Coalition for African Rice Development (CARD), an initiative to support the efforts of African countries to increase rice production, and have expressed our readiness to become members of the CARD steering committee, together with the Alliance for a Green Revolution in Africa (AGRA), the Africa Rice Center (WARDA), the Forum for Agricultural Research in Africa (FARA), the New Partnership for Africa's Development (NEPAD), the International Rice Research Institute (IRRI) and the Japan International Cooperation Agency (JICA). CARD comprises a consultative group of bi- and multilateral donors, and regional and international organizations working in collaboration with rice-producing African countries. The headquarters of CARD will locate to Nairobi, Kenya this coming October.

The High Level Conference on World Food Security has issued a declaration that the participants from 180 countries, including heads of state and governments, ministers and representatives, will address the challenges of bioenergy and climate change. The current situation of soaring food prices is having an adverse impact on food security, particularly in developing countries and countries in transition, all the more because indications are that food prices will remain high in the years to come. The declaration stated that the relevant United Nations agencies should be guaranteed the resources to expand and enhance their food assistance and support safety net programs to address hunger and malnutrition, where appropriate through the use of local or regional purchases, as their urgent response. The declaration also urged the international community to act to set up investment in science and technology for food and agriculture. Increased efforts in international cooperation should be directed toward researching, developing, applying, transferring and disseminating improved technologies and policy approaches as medium and long-term measures.

Prior to the above international events, the Council for Science and Technology Policy advocated "The Promotion of Science and Technology Diplomacy" on April 24, 2007. It calls for addressing the enhancement of cooperation in science and technology in Africa and other developing countries, and disseminating information on Japan's outstanding environmental technology to the world. Furthermore, on June 1st, 2007, the "Innovation 25" long-term strategic guidelines adapted by the Cabinet Council called for Japan to make international contributions on food, the environment and other issues. The policy sets out a plan to realize a future for Japan full of hope and prosperity over a set time frame leading up to 2025. With the development of these policies and major changes anticipated in global agriculture, forestry and fisheries, already apparent in the recent global food situation and global warming, the Agriculture, Forestry and Fisheries Research Council, Ministry of Agriculture, Forestry and Fisheries (MAFF) formulated the "International Research Strategies: targeting international research reflecting recent changes surrounding agriculture, forestry and fisheries" on May 20, 2008. These strategies first identify recent

developments in international research and then list important research topics to be tackled and crosscutting policies for promoting international research, mainly for those developing countries being assisted by Japanese international agricultural research.

Thus, the missions of JIRCAS, which 1) undertakes comprehensive experimental research for the technological advancement of agriculture, forestry, fisheries and related industries in tropical and subtropical zones of developing regions, 2) collects, analyzes and publishes information on domestic and international research which are relevant to agriculture, forestry and fisheries as well as farming systems in these developing areas; and through the above, 3) JIRCAS seeks to contribute solutions to global food and environmental problems as well as to the stable supply of agricultural, forestry and fisheries products and resources, are becoming more and more important. To accomplish the above objectives, JIRCAS is promoting international collaborative research with more than 60 research institutions in 22 developing countries and inviting more than 100 researchers from developing countries.

The major projects extend over quite a wide area, such as (1) developing an impact assessment model and formulation of a food supply stabilization plan, (2) elucidation of the impact of global environmental changes on agriculture, forestry and fisheries and development of mitigating technologies, (3) development of management technologies for environmental resources and production systems for sustainable agriculture, forestry and fisheries, and (4) development of technologies to utilize biological resources for stable production and multi-purpose applications under adverse environments. Other research areas are: (5) improvement of the abiotic stress tolerance of crops, (6) effective utilization of genetic resources in tropical and subtropical crops, (7) development of biomass utilization technology suited to Southeast Asia, (8) developing pest control management technology for major pests in the tropics and subtropics, (9) identification of pathogenic races of important diseases and selection of resistant germplasm in major crops, (10) development of sustainable management technologies for tropical soils, (11) integrated management systems for improved water utilization aiming at increasing economic options and reducing environmental impact, (12) sustainable utilization of tropical and subtropical marine resources and development of aquaculture technology, (13) improvement of feeding technology for livestock in the tropics and subtropics and establishment of sustainable agro-pastoral systems in Asian dry areas, (14) development of nurturing techniques for beneficial indigenous tree species in Southeast Asia, and (15) development of environmental management technology for sustainable crop production in tropical and subtropical islands.

JIRCAS Main Building

All the scientific and technological activities for FY 2007 of JIRCAS are documented in this annual report. We sincerely hope that readers will find our activities in this booklet interesting, and that they will suggest further issues to be resolved in the fields of agriculture, forestry, and fisheries in developing areas.

HIGHLIGHTS FROM 2007

IMPORTANT NEW DEVELOPMENTS

Japan International Award for Young Agricultural Researchers launched in 2007

The purpose of this award is to increase motivation among young researchers contributing to research and development in agriculture, forestry, fisheries, and related industries in developing countries, which is promoted by Japan for the benefit of those countries. Young researchers who show outstanding performance and research achievements that lead to future innovation will be commended by the Chairman's Award of the Agriculture, Forestry and Fisheries Research Council (AFFRC), launched in 2007. Three awardees were selected in early June.

They were Dr. Zheng-qiang Jiang of China Agricultural University, Dr. Chalermpol Kirdmanee of the National Center for Genetic Engineering and Biotechnology, Thailand and Dr. Jonathan Hosier Crouch of the International Maize and Wheat Improvement Center (CIMMYT).

The award ceremony was held on September 11 at U Thant International Conference Hall at UN House in Tokyo. Mr. Shigeru Motai, Chairman of AFFRC, as well as our president, Dr. Kenji Iiyama, presented testimonials and prize money to the three awardees.

The titles of their research achievement are as follows: (1) "Research and application of enzymes & development of innovative technology in the field of food processing" by Dr. Jiang, (2) "Research, development and extension on in vitro selection and mass-propagation for producing high quality transplants of medicinal, food and industrial crops" by Dr. Kirdmanee, and (3)

JIRCAS senior administrators pose for group photograph at the JIRCAS front entrance. Front row: O. Koyama, O. Nakamura, K. Iiyama, T. Senboku, S. Matsui, M. Yasunaka, Back row: S. Kitamura, M. Ando, T. Ota, O. Ito, T. Goto, S. Oshio, T. Kumashiro.


T. Imbe


Y. Mori


H. Yonekura

"Molecular breeding of major tropical staple crops for drought-prone environments" by Dr. Crouch.

Certificates of Recognition for International Research Cooperation

In November 2007, a Letter of Gratitude was presented to JIRCAS by Ing. Agr. Alfredo Molinas, a minister at the Ministry of Agriculture and Livestock (MAG) in Paraguay for contributions to the development of research in the field of agriculture and livestock in Paraguay.

In November 2007, a Letter of Appreciation was presented to JIRCAS from Faculty of Agricultural Science of Asuncion University, which was the oldest university in Paraguay, for the distinguished research collaboration of Agro-pastoral system in CETAPAR-JICA by the dean, Prof. Ing. Agr. Lorenzo Meza Lopez.

POR LA CUAL SE AGRADECE AL JAPAN INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES (JIRCAS), LA COOPERACIÓN BRINDADA EN EL ÁMBITO DE LA AGRICULTURA Y LA GANADERÍA EN NUESTRO PAÍS.

Asunción, 15 de noviembre del 2007.

VISTO: La presentación realizada por el Gobierno del Viceministerio de Ganadería, a través de la cual comunica sobre la visita a nuestro país de funcionarios del **JAPAN INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES (JIRCAS)**, del Japón. (Nota VMG Nº 1059/07), y

CONSIDERANDO: Que el **JIRCAS** siempre se ha caracterizado por apoyar el desarrollo de la investigación en el ámbito de la Agricultura y la Ganadería en nuestro país.

Que, en consecuencia dicho organismo internacional se hace digno merecedor del reconocimiento de esta Secretaría de Estado.

EL MINISTRO DE AGRICULTURA Y GANADERÍA

R E S U E L V E :

Art. 1º.- Hacer presente al **JAPAN INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES (JIRCAS)**, el reconocimiento de esta Secretaría de Estado por la cooperación brindada a nuestro país en el ámbito de la Agricultura y la Ganadería.

Art. 2º.- Entréguese una copia de la presente Resolución al **JAPAN INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES (JIRCAS)**.

Art. 3º.- Comuníquese a quienes corresponda y cumplido archívese.-

ING. AGR. ALFREDO MOLINAS
MINISTRO

ES COPIA:
LOURDES KANAGUM
Secretaria General

AM/RM

Letter of Gratitude from MAG, Paraguay.

Presented by Mr. Miguel A. Angrazio, MAG Viceminister.

Letter of Appreciation from the Faculty of Agricultural Sciences of Asunción University.

Presented to Dr. M. Yasunaka from Prof. Ing. Agr. Lorenzo Meza Lopez, Dean of the Faculty of Agricultural Sciences.

INTERNATIONAL SYMPOSIUM

J-FARD & JIRCAS International Symposium

The Japan Forum on International Agricultural Research for Sustainable Development (J-FARD) and JIRCAS held an international symposium entitled "Contribution of Japanese Agricultural Scientists towards the Millennium Development Goals: Recommendations for Domestic Collaboration and Human Resource Development" on September 12-13, 2007 at U Thant Conference Hall, United Nations University in Tokyo. This symposium was co-sponsored by the Japan International Cooperation Agency (JICA), the Consultative Group on International Agricultural Research (CGIAR) and the United Nations University (UNU), and was supported by the Ministry of Foreign Affairs (MOFA), the Ministry of Agriculture, Forestry and Fisheries (MAFF) and many other related organizations.

At the symposium, four keynote speeches, including "Reinforcement of science and technology diplomacy" by Dr. Taizo Yakushiji, Executive Member of the Council for Science and Technology Policy, and "Roles of agricultural research for achieving development goals" by Prof. Rudy Rabbinge, Chair of the CGIAR Science Council, were presented, followed by reports on global trends in agricultural research for development (ARD) from international research centers, as well as reports on the evaluation of Japanese and counterpart researchers engaged in previous collaborative research. Finally, a panel discussion was organized among the representatives of research institutes, universities and aid agencies under the theme of domestic collaboration and human resource development.

Symposium at UN University.

At the panel discussion, the following recommendations were agreed upon.

- It is essential for Japanese institutions to establish mechanisms to enable regular and continuous dialogues among them. Multilayered and strategic research activities which include the private sector and NGOs should be organized through the acceleration of joint participation in field development and other projects.
- To foster young researchers with the qualifications needed for overseas activities, it is essential to increase and enhance opportunities to provide real experience in the field. Support programs for young researchers and coordinating functions must be extended further.
- To increase opportunities for competent human resources in domestic research institutes and universities to work abroad, it is highly recommended that the institutes and universities adopt an evaluation system which regards these overseas field experiences as a valuable addition to their career path. There is also a need to establish and enhance human resource exchanges at JIRCAS, universities, etc., to support the movement of human resources and temporary suspensions of work.

The Fourth Biomass-Asia Workshop

JIRCAS held the Fourth Biomass-Asia Workshop from November 20 to 22, 2007 at the Grand BlueWave Hotel Shah Alam, Shah Alam, Malaysia, in cooperation with the Malaysian organizers, including the Ministry of Energy, Water, and Communications (MEWC), the Ministry of Science, Technology, and Innovation (MOSTI), the Ministry of Natural Resources and Environment (NRE), and the Ministry of Plantation Industries and Commodities Malaysia (MPIC); and Japanese organizers, including the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Ministry of Agriculture, Forestry and Fisheries (MAFF), the Ministry of Economy, Trade and Industry (METI), and the Biomass-Asia Research Consortium member institutes of the National Institute of Advanced Industrial Science and Technology

(AIST), the National Agriculture and Food Research Organization (NARO), the Forestry and Forest Products Research Institute (FFPRI), the University of Tokyo, and Hiroshima University.

Following opening remarks by Dr. Tatsuo Katsura, the then Senior Vice-President of AIST, and Mr. Kunio Oguri, Deputy Director General of MAFF, Dr. Kenji Iiyama, President of JIRCAS, gave a special lecture, entitled "Lignocellulose refinery system must be realized for global environment and economy."

After the morning sessions, a keynote speech was delivered by Mr. Lim Keng Yaik, Minister of MEWC. In the technical sessions, based on the technologies discussed and views exchanged at the past three workshops, there were active discussions on regionally adaptable models of sustainable biomass utilization technology in Asia. In the final session, a direction was charted for the research and development of industrial and agricultural technologies in three region-based models, including the ASEAN continental model, the ASEAN island model, and the China model. A total of over 250 scientists, administrators, and technical experts in both the public and private sectors from 11 countries and the Food and Agriculture Organization (FAO) participated in the symposium and exchanged views and information on the issues addressed by the 14 plenary speakers, 12 panelists representing different Asian countries, and 18 oral and 36 poster presenters.

After the cabinet decision on "Biomass Nippon (Japan) Strategy" that had been executed in 2002 and revised in 2006, the following tasks have become urgently necessary, from both the global and Asian regional perspective: (1) prevention of global warming, (2) the formation of a circulation-type economy, (3) the nurturing of new competitive and strategic industries and (4) activation of farming and fishing villages. To achieve these goals, JIRCAS and the other collaborating institutions organized the "Biomass-Asia Workshop" to bring together government officials and researchers active in the field of biomass in countries throughout Asia.

Forum: Agriculture and environment in Africa from the perspective of rural development

On March 22, the "Agriculture and environment in Africa from the perspective of rural development" forum was held at JICA's Institute for International Cooperation, organized by the former Japan Green Resources Corporation and co-organized by JIRCAS and the FAO liaison office in Japan. It was supported by the Ministry of Agriculture, Forestry and Fisheries, the Ministry of Foreign Affairs, and the Japan International Cooperation Agency. About 200 people participated in the forum from embassies of African countries in Japan, related government agencies and organizations, private companies, and universities.

African countries suffer from problems of poverty, shortages and increasing food prices, and in addition, environmental problems such as desertification are worsening. For sustainable development in Africa, it is necessary to develop the agricultural sector, the foundation of most of its national economies, and to maintain stability in rural areas, where most of the population makes its living. Therefore, continuously

supporting agricultural activities based on rural communities is an effective countermeasure to Africa's problems.

With this view in mind, the forum was held in advance of TICADIV (May 2008) and the Toyako Summit (July 2008), focusing on agriculture and the environment from the perspective of rural development and its support by related organizations.

The keynote address, "Water resources and rural development in Africa" was made by Mr. Pasquale Steduto, Chief of the FAO's Water, Development and Management Unit. Several other specific topics were presented by specialized agencies, including the "Current status of New Rice Varieties in Africa and Research on Rice in Africa at JIRCAS" by Dr. Takashi Kumashiro, Director of Biological Resources Division, JIRCAS.

In the following panel discussion, "What can Japan do for rural development in Africa?," animated discussions took place with various opinions offered, such as "Cooperation should be implemented at farm level," "Japan can support the field of rice productivity improvement in which Japan has a comparative advantage," "It is important for research activities to be carried out in cooperation with research institutes in Africa and other countries and with international research institutes that are able to engage in technology transfer."

Program:

Host's Opening Remarks

Mr. Haruyuki MACHIDA (President, J-Green)

Keynote Address

Water resources and rural development in Africa, Mr Steduto (Chief of the FAO's Water, Development and Management Unit)

Presentation of Specific Topics

Japan's cooperation in Africa in rural development: Mr. Kohara (Director General of the Rural Development Department, JICA)

Current status of New Rice Varieties in Africa and Research on Rice in Africa at JIRCAS: Dr. Kumashiro (Director of Biological Resources Division, JIRCAS)

A participatory approach to rural development and the prevention of desertification in Sub-Saharan Africa: Mr. Shimizu (Director of Planning Division, J-Green)

Panel Discussion

What can Japan do for rural development in Africa?

Moderator

Mr. Kondo (Senior Writer, the Yomiuri Shimbun)

Panelists

Mr. Steduto (Chief of the FAO's Water, Development and Management Unit)

Mr. Saito (Director General of the Rural Area Policy Planning Department, Rural Development Bureau, MAFF)

Mr. Kohara (Director General of the Rural Development Department, JICA)

Dr. Kumashiro (Director of Biological Resources Division, JIRCAS)

Mr. Shimizu (Director of Planning Division, J-Green)

NEW RESEARCH COLLABORATION

New MOUs initiated in Fiscal Year 2007

JIRCAS has signed MOUs with the National University of Laos (NUOL), Lao PDR, and Royal University of Agriculture (RUA), Cambodia, and a JRA with the Faculty of Agriculture, Ubon Ratchathani University (UBU), Thailand

Memorandums of Understanding between JIRCAS and the National University of Laos (NUOL), Lao PDR, and between JIRCAS and the Royal University of Agriculture (RUA), Cambodia; and a Joint Research Agreement between JIRCAS and Faculty of Agriculture, Ubon Ratchathani University (UBU), Thailand were signed in June 2007 for the accomplishment of a project entitled "Establishment of a feeding standard of beef cattle and a feed database for the Indochinese peninsula". This project was launched in 2006 on a 5-year plan to establish a feeding standard for tropical beef cattle and a local feed database in the Indochinese area. Consumption of beef and dairy products is expanding in the Indochinese peninsular nations due to lifestyle changes and is predicted to continue to grow. However, the global human population is increasing and it is believed that food supplies will eventually not meet demand. For this reason, it is important to make a precise study of the nutrient requirements of local cattle and to develop an efficient method of usage of local cattle feed resources to prevent competition with

Dr. Chan Nareth, RUA Rector, signs the MOU.

MOU-signing ceremony between JIRCAS and NUOL.

human food resources. It is essential to construct a regional research cooperation network for the efficient achievement of the targets. To this end, JIRCAS has already agreed contracts with JRA and work plans with Thai research organizations, including the Department of Livestock Development (DLD), Khon Kaen University (KKU), Mahasarakham University (MSU), Rajamangala University of Technology-Isan (RMUTI), Suranaree University of Technology (SUT), Chiang Mai University (CMU), Maejo University (MJU), and Prince of Songkla University (PSU) in 2006 as well as the above. Each research organization shares each research subject and is pushing forward their study under the same general work plan.

MOU with the Institut National de la Recherche Agronomique du Niger (INRAN)

Since 2003, JIRCAS has been implementing a development-focused research project entitled "Improvement of the Fertility of Sandy Soils in the Semi-Arid Zone of West Africa through Organic Matter Management" in collaboration with ICRISAT, West & Central Africa (formerly the Sahelian Center) based in Niger. The project aims to develop technologies/options for affordable and sustainable soil fertility management systems targeting the sandy soils of the Sahel by elucidation of the functions of the different kinds of indigenous organic matter in the soil and evaluation of plant genetic resources for their role in fertility maintenance/restoration. By the middle of 2007, several focal technologies had been developed and verification is now being commenced in experimental and farmers' fields at the project site (Fakara region), with soil chemical properties and staple pearl millet productivity as indicators of the effectiveness of the new technologies.

The project will then go into the output phase where the verified technologies will be transferred to the farmers. However, in the process of technology integration and dissemination, the project anticipates some difficulties arising for a number of intrinsic reasons, including undeveloped infrastructure, low capital availability, empirically-grounded risk management, and low adaptability to new technology. This situation required the establishment of a collaborative project with the Institut National de la Recherche Agronomique du Niger (INRAN), a national research organization in Niger.

INRAN had already contributed to this project by providing a socioeconomic analysis of the Fakara villages and farmers at the project site. The present collaboration will be implemented to modify the focal technologies into more practical and affordable ones, and also to identify appropriate approaches for dissemination of these technologies to the local farmers.

To formalize this collaboration, Dr. Kenji Iiyama, President of JIRCAS, and Dr. Hassane Moussa, Director General of INRAN, signed a comprehensive MOU between their two organizations in March 2008, under which the 3-year Work Plan was also confirmed by the scientists involved in the current project.

New MOUs and JRAs initiated in Fiscal Year 2007

	Category	Institution	Country	Date
1	Joint Research Agreement	Suranaree University of Technology (SUT)	Thailand	Apr. 8, 2007
2	Memorandum of understanding	Royal University of Agriculture (RUA)	Cambodia	May 21, 2007
3	Joint Research Agreement	Ubon Ratchathani University (UBU)	Thailand	June 7, 2007
4	Memorandum of understanding	National University of Laos	Lao PDR	June 21, 2007
5	Joint Research Agreement	Forest Research Institute Malaysia (FRIM)	Malaysia	July 10, 2007
6	Joint Research Agreement	Universiti Sains Malaysia (USM)	Malaysia	July 10, 2007
7	Memorandum of understanding	Chiang Mai University (CMU)	Thailand	July 31, 2007
8	Memorandum of understanding	Cantho University (CTU)	Vietnam	Sept. 4, 2007
9	Memorandum of understanding	The Indonesian Agency for Agricultural Research and Development of the Ministry of Agriculture of the Republic of Indonesia (IAARD)	Indonesia	Oct. 1, 2007
10	Memorandum of understanding	Brazilian Agricultural Research Corporation (Embrapa)	Brazil	Nov. 13, 2007
11	Joint Research Agreement	National Biological Control Research Center (NBCRC)	Thailand	Jan. 1, 2008
12	Memorandum of understanding	Institut National de la Recherche Agronomique du Niger (INRAN)	Niger	Feb. 15, 2008
13	Memorandum of understanding	Zhejiang Forestry University (ZJFU)	China	Mar. 7, 2008

CGIAR Focal Point Institution

The Consultative Group on International Agricultural Research (CGIAR) nominated JIRCAS as the CGIAR's Focal Point Institution in Japan. JIRCAS will assist the CGIAR's activities in Japan and raise its profile through the following activities.

1. Dispatch JIRCAS researchers to CGIAR Centers and work towards research exchange between Japan and CGIAR
2. Support or cosponsor CGIAR symposiums, etc., held in Japan
3. Support the publicizing of the CGIAR's activities at occasions such as symposium and festivals in Japan
4. Assist CGIAR executives to exchange views with Japanese stakeholders during their stays in Japan
5. Provide information to both the CGIAR and Japanese institutions to strengthen the partnership

The latest CGIAR annual report (Focus on Partnerships) featured the CGIAR-JIRCAS partnership. (http://www.cgiar.org/pdf/ar_2006_section2.pdf)

The CGIAR held its Annual General Meeting (AGM) in Beijing, China from December 3-7, 2007. Dr. Iiyama, the President of JIRCAS, held discussions with Ms. Katherine Sierra, Chair of the CGIAR, and Dr. Ren Wang, Director of the CGIAR

Secretariat. The CGIAR expressed its gratitude for JIRCAS' strong support for collaborative research projects and other CGIAR projects in Japan. The CGIAR and JIRCAS also affirmed their mutual intentions to strengthen their partnership.

JIRCAS publicized its activities using posters and handouts at a partner booth in the Exhibition Area during the AGM. Information on the 2008 Program for the Japan International Award for Young Agricultural Researchers was also provided at the JIRCAS booth.

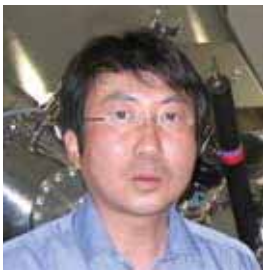
Dr. Kenji Iiyama meeting with Ms. Katherine Sierra, Chair of the CGIAR, at the CGIAR AGM.

ACADEMIC PRIZES AND AWARDS

Dr. Tamao HATTA, Head of the Public Relations Section, Research Planning and Coordination Division, received the "Best Paper Award" from the Journal of the Clay Science Society of Japan in September 2007.

This award was given for the best paper in the 2007 Edition (Vol. 46), entitled "Co-Precipitation Synthesis of Schwertmannite and its Analogues with Different Anion Species, Focusing on Understanding the Role of Anions in the Formation of FeOOH Minerals." The co-authors were Atsuyuki Inoue and Tamao Hatta.

In the paper, the role of dissolved anions on the structural formation of FeOOH minerals was rationalized by taking into consideration the electron-donor characteristics of anions, such as their average electronegativity and bonding strength.



Dr. Tamao Hatta

Dr. Jun FURUYA, Project Leader of the Development Research Division, and Dr. Seth D. Meyer, Market Policy Research Analyst at the Food and Agricultural Policy Research Institute at the University of Missouri-Columbia (MU-FAPRI) and Assistant Professor at MU, received the Agricultural Economics Society of Japan's Best Journal Prize on March 27, 2008.

This prize was given for the best paper to appear in the 2007 edition of the Journal of Rural Economics Vol. 79, which was entitled "Impacts of Water Supply Changes on the Rice Market in Cambodia: Development of a Supply and Demand Model of Rice Considering Water Supply Changes."

For the award-winning article, a supply-and-demand model for rice in Cambodia, which includes, among other factors, evapotranspiration as a water supply variable impacting regional yields and planted areas, was developed to assist in the design of agricultural policies and planning. Impacts are determined stochastically by drawing on water cycle distributions and evaluating the resulting variation in production and price bands for local rice markets.

This is the first such econometric model of rice in Cambodia. Furthermore, this is the first ever academic paper to describe the application of a stochastic supply-and-demand model for rice markets. The original text is written in Japanese; however, the following paper is written in English and has been extended to include a risk analysis of the rice market.

Furuya, J. and Meyer, D.S. (2008). Impacts of water cycle changes on the rice market in Cambodia: Stochastic supply-and-demand model analysis. Paddy and Water Environment, 6: 139-151.

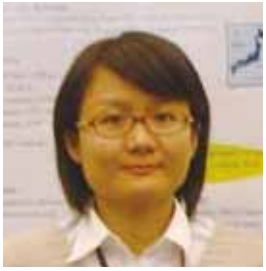
Dr. Jun Furuya

Dr. Meyer, D. S.

Dr. Yoshiko IIZUMI, Researcher at the Soil and Water Management Project Team at the Tropical Agriculture Research Front Division, received the "Encouragement Award for International Exchanges" from the Japanese Society of Limnology in September 2007.

This award is given to young researchers selected from applicants to be dispatched to the Korean Society of Limnology as part of the international exchange program between the Japanese and the Korean Societies of Limnology.

Dr. Iizumi attended the 40th anniversary congress of the Korean Society of Limnology on March 2007, in Chuncheon, Korea, and presented the results of her research with Dr. Tsuyoshi KINOUCHI and Mr. Kazuhiko FUKAMI, entitled "Calculation Program for Estimation of Nitrogen Load in Agricultural Land." She made a presentation on the created program, constructed using the macro facility of Microsoft Excel, to calculate the inflow and outflow of nitrogen load in agricultural land of individual small towns and villages. This program can prepare input data for a nitrogen cycle module of the WEP (Water and Energy Transfer Process) model which has been applied to the Cheonggyecheon basin in Korea to assess the hydrological impact of the restoration project. Dr. Iizumi has also made a significant contribution to research exchanges between Japan and Korea.



Dr. Yoshiko Iizumi

Dr. Yoshimichi Fukuta

Dr. Yoshimichi FUKUTA, at the Biological Resource Division, received the prize for "Mapping of QTLs controlling isotope discrimination in the photosynthetic system using recombinant inbred lines derived from a cross between two different rice (*Oriza sativa* L.) cultivars" by Takai *et al*, at the No. 255 Meeting of the Society at Tsukuba City in March 2007, representing both authors. The paper was published in a journal, Plant Production Science, by the Society in 2006. The paper describes a research achievement by collaboration among the Japanese International Research Center for Agricultural Sciences (JIRCAS), the International Rice Research Institute (IRRI), and Kyoto University, under Phase IV of the IRRI-Japan Collaborative Research Project from 1999 to 2004 and a JIRCAS research project entitled "Development of abiotic stress-tolerant crops from 2006 to 2010." In this paper, carbon isotope discrimination (Δ) occurring during the process of photosynthesis and the degree of leaf photosynthesis were investigated genetically using a hybrid population comprising 126 recombinant inbred lines (RILs), to identify genetic factor(s) and improve the photosynthetic ability of rice plants. A total of seven QTLs were detected on chromosomes 1, 2, 6, 7, and 11, and the roles of these QTLs were studied in relation to stomatal conductance, which in turn affects photosynthetic ability. The study was regarded as a particularly useful achievement, as a trial of genetic analysis for sours' factors with the potential to contribute to breeding for improvement of rice yields.

RESEARCH OVERVIEW

OVERVIEW OF JIRCAS'S RESEARCH STRUCTURE

1 History

JIRCAS was first established in 1970 as the Tropical Agriculture Research Center (TARC) under the Ministry of Agriculture and Forestry of Japan. TARC was reorganized into the Japan International Research Center for Agricultural Sciences (JIRCAS) in 1993. On April 1, 2001, under the Government of Japan's administrative reforms for facilitating the reorganization of government-affiliated research organizations, JIRCAS became an Incorporated Administrative Agency (IAA) under the jurisdiction of the Ministry of Agriculture, Forestry and Fisheries (MAFF).

2 Mission

Through research and development and dissemination of information related to agriculture, forestry, and fisheries in developing regions, JIRCAS contributes to the improvement of the international presence of our country and a secure and stable supply of food worldwide, including Japan.

3 The IAA System

An IAA is an organization responsible for key public services that the government is not required to provide, but which the private sector is likely to neglect for various reasons. The IAA system was introduced in 2001 as a part of central government reforms based on the idea that the planning sectors and the implementing sectors should be separated. Under the IAA system, MAFF defined JIRCAS's second medium-term goals in FY 2006, including the enhancement of research efficiency and the improvement of the quality of research programs and financial performance. Based on the second medium-term goals, JIRCAS drafted and began to implement a detailed five-year plan, the Medium-Term Plan (FY 2006-FY 2010).

4 Evaluation

The performance and budgeting management of research activities conducted by JIRCAS undergo regular evaluation by the IAA Evaluation Committee established within MAFF. As for the activities of each fiscal year, the Committee investigates and analyzes progress towards achieving the Medium-Term Plan, and the results of this evaluation are applied as necessary to modifications of the operational and financing systems for subsequent fiscal years. To meet the requirements of this rigorous evaluation, JIRCAS has modified the in-house evaluation system in the initial year of the second medium-term goals. The in-house evaluation in FY 2007 was carried out as follows.

1) Each project evaluated its own research activity and prepares reports.
2) These were evaluated at the meeting for the evaluation of sub-programs of the Medium-Term Plan by external reviewers (specialists from other universities or institutes) and internal reviewers (the President, the Vice-President, an Executive Advisor and Auditor, Directors of each section and Project Leaders) in February 2008.
3) Comprehensive evaluation of all JIRCAS activities including administration was implemented at the External Reviewers' Meeting in March 2008.

The external reviewers at both of the above meetings are listed in the Appendix. The results of the in-house evaluation and a summary of all activities were submitted to the IAA Evaluation Committee established within MAFF in June 2008.

5 Medium-Term Plan

JIRCAS is implementing four main programs for research activities under the Medium-Term Plan. Each main program has a number of sub-programs, each of which includes several projects. Major accomplishments and research highlights of the main programs in FY 2007 are described in the following sections. The contents of the Medium-Term Plan are also described in the Appendix.

Table 1. Number of programs in the second Medium-Term Plan (FY 2006-FY 2010)

Research Approach	Main Program	Sub-program (total)
A	A-1	7
	A-2	7
	A-3	3
B	B	2

Second Medium-Term Plan (FY 2006-FY 2010)

[Research Approach A] Research and development on agricultural, forestry and fisheries technology geared towards providing solutions to international food and environmental problems

Main Program A-1 Development of technologies to utilize biological resources for stable production and multi-purpose applications under adverse environments

Sub-programs

1. Elucidation of the mechanism of tolerance to abiotic stress and production of tolerant crops
2. Improvement of abiotic stress tolerance of rice in Africa
3. Identification of pathogenic races for important diseases and selection of resistant germplasm in major crops
4. Development of biomass utilization technology suited to Southeast Asia
5. Elucidation of the functionality and quality parameters of traditional food and agricultural products in Asia and development of effective utilization technology
6. Effective utilization of genetic resources in tropical and subtropical crops
7. Sustainable utilization of tropical and subtropical marine resources and development of aquaculture technology

Main Program A-2 Development of management technologies of environmental resources and production systems for sustainable agriculture, forestry and fisheries

Sub-programs

1. Development of sustainable management technologies for tropical soils
2. Integrated management system for improved water utilization aiming at increasing economic options and reducing environmental impact
3. Improvement of feeding technology for livestock in the tropics and the subtropics and establishment of sustainable agro-pastoral systems in the Asian dry areas
4. Elucidation and exploitation of biological nitrification inhibition (BNI)
5. Development of environmental management technology for sustainable crop production in tropical and subtropical islands
6. Development of nurturing techniques for beneficial indigenous tree species in Southeast Asia
7. Development of productive low-input cultivation technology for fruit trees in the tropics

Main Program A-3 Elucidation of the impact of global environmental changes on agriculture, forestry and fisheries and development of mitigating technologies

Sub-programs

1. Developing an impact assessment model and formulation of a food supply stabilization plan
2. Utilization of Geographic Information System (GIS) for the development of a land information monitoring technology in developing regions
3. Developing pest control management technology for major pests in the tropics and subtropics

[Research Approach B]

Main Program B
Collection, analyses and dissemination of information to grasp trends related to international food, agriculture, forestry and fisheries and rural areas

Sub-programs

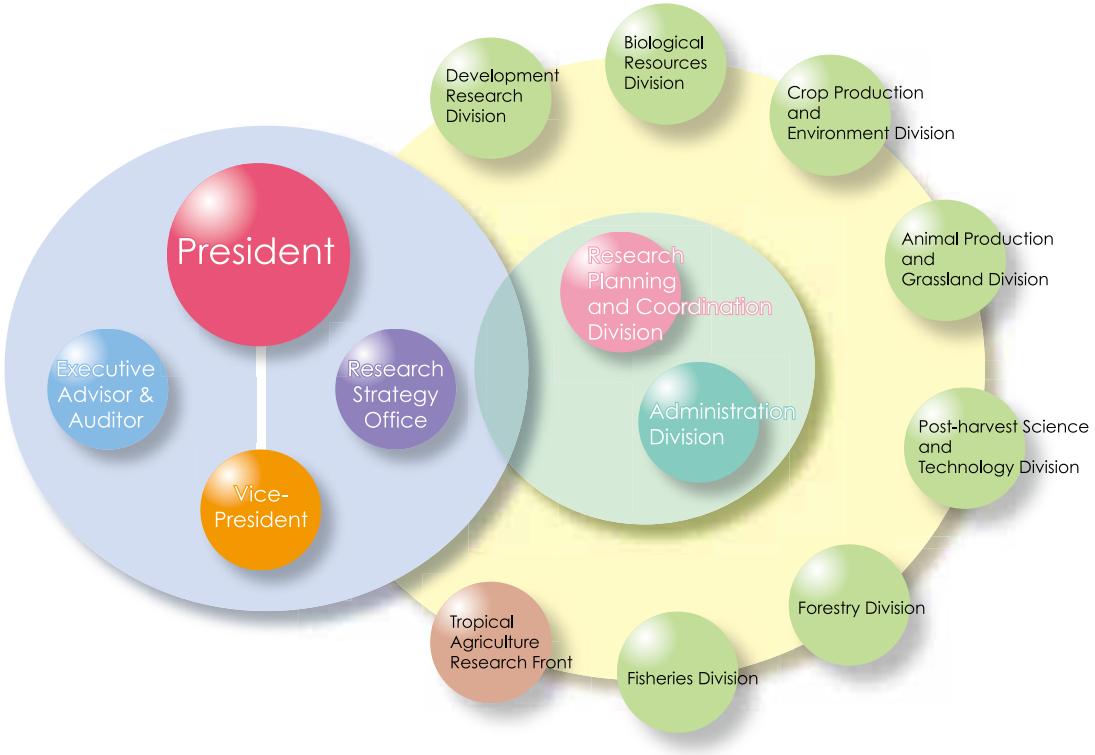
1. Collection and dissemination of information related to global food, agriculture, forestry and fisheries
2. Elucidation of the direction of technology development in developing regions and analysis of socioeconomic conditions of the development in rural areas

6 Collaborative research

JIRCAS needs to cover a wide range of research. The human resources at JIRCAS, however, are limited. This makes collaborative research with other institutes or universities important to achieve JIRCAS's project objectives. When JIRCAS and its collaborators agree on the beginning of collaborative research by exchanging ideas and opinions on research, Memorandum of Understanding (MOU) or Joint Research Agreements (JRAs) will be concluded. We developed the concept of JRAs in 2006. A JRA is a contract for collaborative research with a particular theme and with a set duration. Eighty-five MOUs or JRAs remained in force at the end of FY 2007. In 2004, JIRCAS was given a certificate of recognition by CGIAR as a key partner and a CGIAR focal point institution in Japan. JIRCAS is playing an important role in mutual understanding and collaboration between CGIAR and the Japanese government. JIRCAS has also been intensively implementing collaborative research with several CGIAR research centers. JIRCAS has been dispatching researchers and research managers to promote research in the developing regions. In FY 2007, 103 JIRCAS researchers or administrators were dispatched abroad for a total of 9,872 days. We have been also dispatching researchers from other institutes and universities to promote effective implementation of JIRCAS's projects with the cooperation of such organizations. JIRCAS has implemented several invitation programs for overseas researchers and administrators at counterpart organizations. These programs facilitate not only the promotion of international collaborative research but also related exchanges of information and opinions.

7 Organization of JIRCAS

The organization of JIRCAS in the second medium-term goal period is summarized in the Figure below. The directors of each research division, including the Research Strategy Office and the Tropical Agriculture Research Front, have responsibility for the management of individual subprograms in the Medium-Term Plan. JIRCAS's Tropical Agriculture Research Front (formerly the Okinawa Subtropical Station) focuses on agricultural, forestry, and fisheries research carried out in overseas regions with highly similar weather and geographic conditions to Okinawa, by taking full advantage of the subtropical weather and the geographical location of Ishigaki Island, in the southernmost part of Japan.



Organization of JIRCAS

For Reference

With the dissolution of the Japan Green Resources Agency on April 1, 2008, its international activities were transferred to JIRCAS. As a result, the following two new sub-programs were added to the second Medium-Term Plan.

1) Formulation of agricultural development methodologies to tackle the environmental changes of global warming and desertification (in Main Program A-3)
2) Establishment of techniques and methodologies for the reconstruction of agriculture and rural communities affected by natural disasters, etc. (in Main program B)

The newly established Rural Development Planning Division bears the responsibility for effecting the above two new sub-programs. This division deals with environmental issues such as global warming and desertification by developing technologies and methodologies that support sustainable agriculture and rural development in developing countries through on-site studies using a community-based participatory approach.

MAIN RESEARCH PROGRAMS

Theme A-1 Development of technologies to utilize biological resources for stable production and multi-purpose applications under adverse environments

In developing regions where abiotic stresses such as drought and salinity, and biotic stresses caused by pests and diseases act as major constraints on agricultural production, there is an increasingly urgent need to develop technologies that enable not only stable but also sustainable production.

Theme A-1 aims at stable production of various agricultural products encompassing agriculture, forestry and fisheries. In this theme, research projects that include the elucidation of mechanisms of stress tolerance in plants, development of abiotic stress-tolerant crops using both conventional and molecular approaches, and development of technologies to utilize various biological resources in tropical and sub-tropical regions have been conducted.

The following items can be listed as the highlights among the many outputs of this research theme in year 2007.

1. The JIRCAS molecular group has identified a unique and important gene, a histidine-kinase gene (*AHK1*) in *Arabidopsis thaliana*, that acts as a sensor of change in the osmotic pressure of plant cells. The over-expression of *AHK1* gene in *Arabidopsis* confers an elevated tolerance to drought when seedlings of the transgenic *Arabidopsis* are exposed to drought for 10 days.

2. A large number of samples of soybean (*Glycine max*) germplasm, including its wild species (*Glycine soja*) have been subjected to screening for salt tolerance under greenhouse conditions. QTL analyses of the selected tolerant cultivated soybean and the wild species have identified a single region with a significant effect. Interestingly, the QTL responsible in the cultivated soybean and in the wild species falls in the identical region of the genome.

3. As an important tool for molecular improvement of a New Rice for Africa (NERICA), an interspecific hybrid variety between *Oryza sativa* and *O. glaberrima*, a protocol for a transformation system has been developed. The transformation system involves inoculation of immature embryos of rice with *Agrobacterium*. Using this transformation system, 16 upland NERICA varieties out of 18 can be successfully transformed.

4. An important finding has been made in the field of utilization of biological resources in tropical regions. Oral administration tests with rats revealed that tree leaf vegetables carrying high anti-oxidative activity, such as the Siamese neem tree (*Azadirachta indica* var. siamensis) can suppress oxidative DNA damage and reduce the levels of neutral lipids in blood.

5. In the area of bio-fuel research, our scientists found that the sugar content in the sap of oil palm trunks increases during storage. This finding further reinforces our earlier observations that oil palm trunks are potentially a good source for the production of bio-ethanol.

6. We found that one accession of black gram (*Vigna mungo* var. *mungo*) exhibits resistance to the cowpea weevil (*Callosobruchus maculatus*) as well as to the azuki bean weevil (*C. chinensis*). This finding opens up the potential for developing cowpea weevil-resistant varieties of mung bean, one of the most important legume species in the tropics and the subtropics.

7. In our aquaculture research area, we found that the most important indigenous species of freshwater prawn in Laos is classified as *Macrobrachium yui* and elucidated its life cycle. Application of these findings should enable us to develop technologies for large-scale production and propagation of seeds of this prawn.

TOPIC 1

An *Arabidopsis* histidine kinase AHK1 functions as an osmosensor and its over-expression improves plant drought-stress tolerance

Plants are constantly exposed to environmental stresses that frequently impose constraints on their growth and productivity. But, plant cells have developed elaborate and sensitive protection systems which enable them to rapidly signal, respond and properly adapt to various stresses, including drought and high salinity. Phosphorylation, which is catalyzed by protein kinases, is a key mechanism for intracellular signal transduction in both eukaryotic and prokaryotic cells. In yeast, a histidine kinase SLN1 functions as an osmosensor that can sense and transduce a signal of external osmolarity to downstream targets. *Arabidopsis* contains eleven receptor histidine kinases and among them, *AHK1*, *AHK2* and *AHK3* were shown to be stress inducible, suggesting their roles in the regulation of plant responses to abiotic stress. Overexpression of an *Arabidopsis* histidine kinase *AHK1* in yeast *sln1* deletion mutants enables the yeast mutant to grow normally under high salinity conditions, suggesting that the histidine kinase AHK1 can function as an osmosensor. Then, we introduced the AHK2 and AHK3 cDNAs into the *sln1* mutant and found that these 2 kinases can also complement the SLN1 function, suggesting the functional importance of these histidine kinases for the efficient sensing of environmental signals.

To understand the *in planta* role of the stress-responsive histidine kinases in osmotic stress, we used both gain-of-function and loss-of-function genetic approaches. Multiple mutants of *ahk1*, *ahk2* and *ahk3* were constructed to elucidate the function of these kinases in plant growth and development. Phenotypic analyses for *ahk1* knockdown mutants suggested that these mutants are not affected in growth or morphology under normal conditions. However, under drought stress condition, fewer *ahk1* plants survived than WT plants, indicating a clear drought sensitivity for *ahk1* mutant. Moreover, the *ahk1* mutants were more sensitive to high-salinity stress than WT. Then, we compared the level of drought and salt stress tolerance of the *ahk2* and *ahk3* mutants, as well as the *ahk2 ahk3* double mutant, to WT plants. Different from the *ahk1* mutant, the results showed a strong drought and salinity tolerance for both *ahk2* and *ahk3* mutants. The *ahk2 ahk3* double mutant was even more tolerant to drought and salt stresses than the respective single ones, suggesting a combinatory function of AHK2 and AHK3 in osmotic stress signaling (Fig. 1).

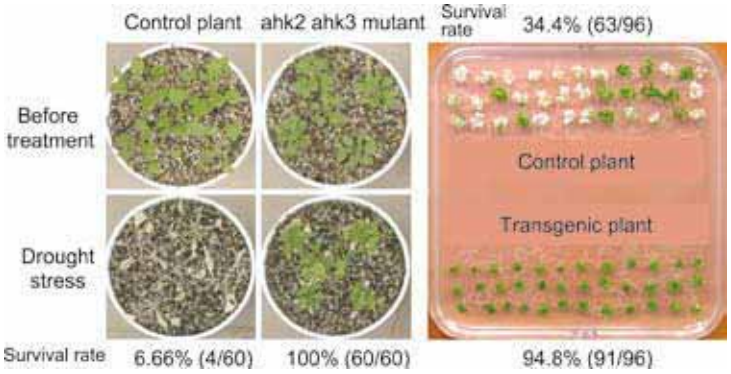


Fig. 1. Drought stress tolerance (left) and salt stress tolerance (right) of *ahk2 ahk3* double mutants. *Arabidopsis* plants lacking *AHK2* and *AHK3* showed improved tolerance to drought and high salinity, but exhibited growth retardation on the other hand.

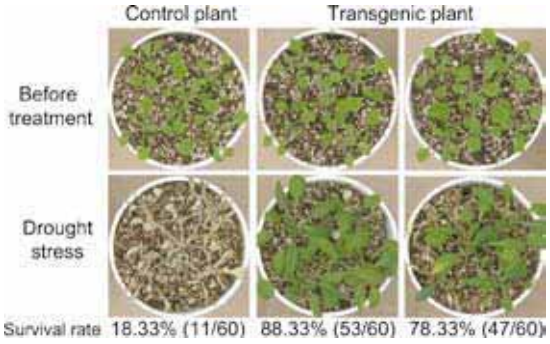


Fig. 2. Drought stress tolerance of transgenic *Arabidopsis* overexpressing *AHK1*. Transgenic *Arabidopsis* grew as well as the control plants under normal conditions, and on the other hand, showed improved tolerance to drought stress.

We performed microarray analyses to understand the diversity of these histidine kinases. Under normal conditions, many stress-responsive genes, including genes for stress-related transcription factors (TFs) *ANAC055* and *ATMYC2*, were upregulated in the *ahk2 ahk3* double mutant. Importantly, overexpression of these TF genes significantly improves drought stress tolerance in *Arabidopsis* plants. These data indicate that AHK2 and AHK3 function as negative regulators in stress signaling. In contrast, many stress-responsive genes, including AREB1, DREB2 and ANAC TFs, were downregulated in the *ahk1* mutant under dehydration stress, which indicates that AHK1 functions as a positive regulator in stress signaling. Therefore, we generated *Arabidopsis* transgenic plants, in which *AHK1* was overexpressed by using its own promoter. We obtained two stable lines showing higher dehydration-induced *AHK1* transcript. Under normal conditions, these transgenic plants (Fig. 2) displayed similar morphological phenotypes with regards to the size of rosette leaves and inflorescences. The drought tolerance of the transgenic plants was increased as compared with that of the control plants. These data suggest that the

AHK1 gene can be used to develop crops that are tolerant to drought stress.

(K. Maruyama and K. Yamaguchi-Shinozaki)

TOPIC 2

Improvement of stress tolerance of rice plants utilizing stress-responsive promoters and transcription factors of rice

Plants control a variety of stress tolerant genes and survive under stress conditions such as drought, etc. As transcription factors control many kinds of stress-inducible genes, the genes for transcription factors are thought to be useful towards improving transgenic tolerance.

In this research, we study the rice transcription factor *OsNAC6* which accumulates under environmental stresses such as drought. The *OsNAC6* gene is a member of the NAC transcription factor gene family in rice. Expression of *OsNAC6* is induced by abiotic stresses, including cold, drought and high salinity. *OsNAC6* gene expression is also induced by wounding and blast disease. A transactivation assay using a yeast system demonstrated that OsNAC6 functions as a transcriptional activator, and transient localization studies with OsNAC6-sGFP fusion protein revealed its nuclear localization.

Transgenic rice plants over-expressing *OsNAC6* constitutively exhibited growth retardation and low reproductive yields (Fig. 1). These transgenic rice plants showed an improved tolerance to dehydration and high-salt stresses, and also exhibited increased tolerance to blast disease. By utilizing stress-inducible promoters, such as the *OsNAC6* promoter, it is hoped that stress-inducible over-expression of *OsNAC6* in rice can improve stress tolerance by suppressing the negative effects of OsNAC6 on growth under normal growing conditions (Figs. 1 and 2). The results of the microarray analysis revealed that many genes which are inducible by abiotic and biotic stresses were upregulated in rice plants over-expressing *OsNAC6*. A transient transactivation assay showed that OsNAC6 activates the expression of at least two genes, including a gene-encoding peroxidase.

Collectively, these results indicate that OsNAC6 functions as a transcriptional activator in response to abiotic and biotic stresses in plants. We conclude that OsNAC6 may serve as a useful biotechnological tool for the improvement of stress tolerance in various kinds of plants.

(K. Nakashima and K. Yamaguchi-Shinozaki)

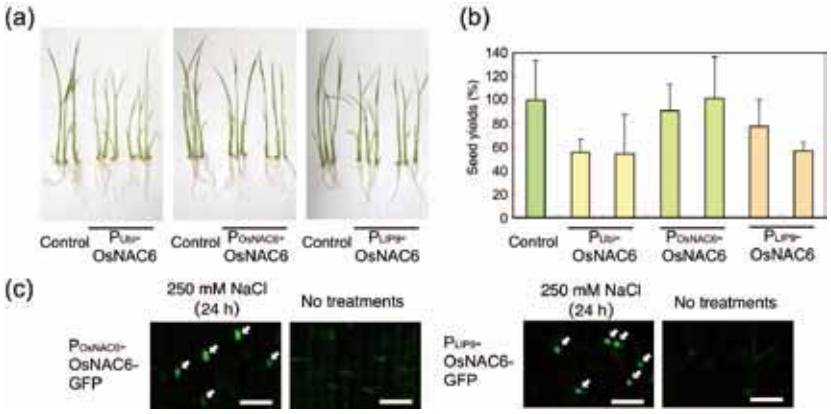


Fig. 1. Transgenic rice plants over-expressing *OsNAC6* constitutively exhibited growth retardation (a) and low reproductive yields (b). Transgenic rice plants expressing the *OsNAC6* gene controlled by stress-inducible promoters minimize the negative growth retardation effects of the OsNAC6 for better growth (a, b). We confirmed the accumulation of OsNAC6-GFP fusion protein in the nucleus (arrowheads) of roots of the transgenic rice plants expressing the *OsNAC6* gene controlled by stress-inducible promoters (c). Bar measures 50 μm.

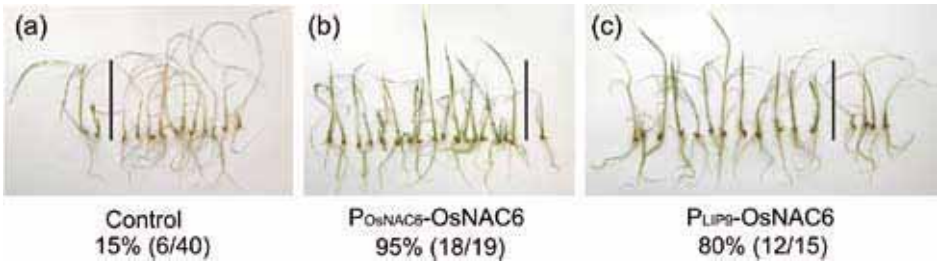


Fig. 2. Transgenic rice plants expressing the *OsNAC6* gene controlled by stress-inducible promoters showed improved stress tolerance, such as high-salt stress tolerance of the P_{OsNAC6}-OsNAC6 plants and the P_{LIP9}-OsNAC6 plants. The 14-day-old plants were soaked in 250 mm NaCl solution for 3 days and transferred to a nutrient solution for 9–12 days. Representative P_{OsNAC6}-OsNAC6 line (b), P_{LIP9}-OsNAC6 line (c) and control rice plants (a) are shown. Plants on the left of the bar survived, whereas those on the right died.

TOPIC 3

Flash flood tolerance of Asian rice, African rice and interspecific hybridization progeny, (NERICA)

In the coastal areas and river basin of Guinea in West Africa, flash floods occur frequently following heavy rain during the rainy season. And, young rice seedlings are particularly vulnerable to submergence. Flash flood tolerance is hereby defined as "survival to complete submergence within 10 days." Rice plants can supply oxygen from shoot to root through their parenchyma. However, the oxygen supply is limited due to complete submergence, which results in adverse effects on the oxygen metabolism in these rice plants. Therefore, the flash flood-tolerant ability of rice is important in flash flood-prone areas. The objective of this study is the identification of important traits to flash flood tolerance using the wide genetic resources of rice in the African environment. This study was conducted through pot and field experiments for two years in Guinea.

Fifteen day-old rice seedlings were submerged for 7 days. Flash flood tolerance was evaluated by the ratio of dry matter weight (DMW) of submerged plants to non-submerged plants at 14 days after de-submergence. Shoot elongation during submergence showed a negative correlation with flash flood tolerance (Fig. 1).

The physiological traits of flash flood-tolerant genotypes including *Sub-1* gene are short shoot elongation during submergence and high ratio of DMW of submerged plants to non-submerged plant at 14 days after de-submergence (Figs. 1 and 2).

Most of the African rice (*O. glaberrima* Steud.) genotypes showed higher shoot elongation during submergence and there was a lower ratio of DMW of submerged plants compared to non-submerged plants at 14 days after de-submergence (Figs. 1 and 2). However, Saligbeli (African rice) showed higher shoot elongation during submergence and higher ratio of DMW of submerged plants to non-submerged plants at 14 days after de-submergence.

It is necessary for flash flooded plants to adapt to environmental changes of lowered oxygen condition during submergence to aerobic condition after the water has receded. The important traits related to flash floods are shoot elongation during submergence, lodging resistance after de-submergence and increase in DMW (Fig. 3).

From the results of a principal component analysis, the first and second factors include 74% of the information of these three traits. The first factor axis shows

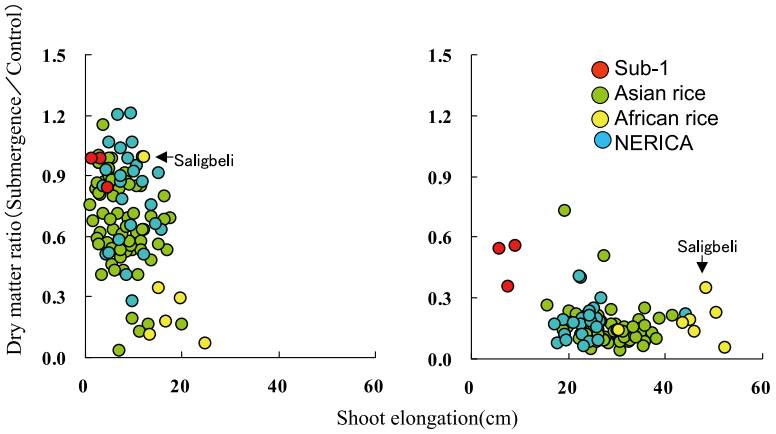


Fig. 1. Effect of shoot elongation on the ratio of dry matter weight of submerged plants to non-submerged plants at 14 days after de-submergence.

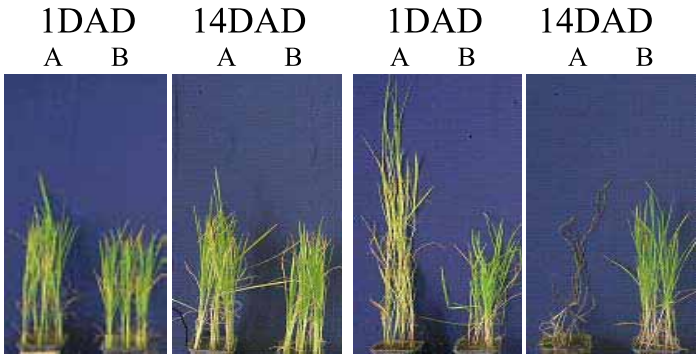


Fig. 2. Plant growth of flash flood tolerant cultivar and African rice cultivar after de-submergence.
1 and 14 DAD indicate one day and 14 days after de-submergence, respectively. A and B indicate whether the plants were in the submergence plot or in the control plot.

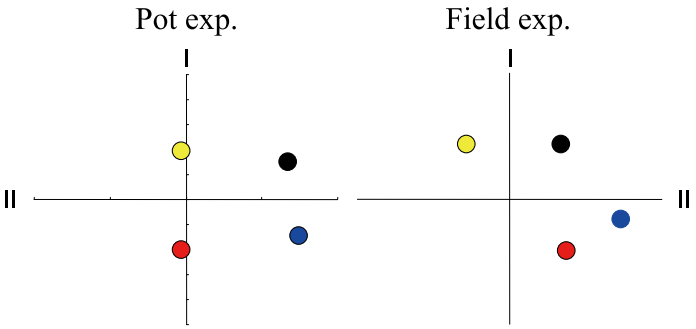


Fig. 3. Correlation patterns of characteristics projected on the plane defined by the first and second factors' axes.
● : Lodging, ● : Increased shoot DMW after de-submergence, ● : Shoot elongation during submergence, ● : Increased shoot DMW during submergence.

the traits of flash flood tolerance (Fig. 3).

The rice genotypes which include the *Sub-1* gene show flash flood tolerance, and African rice cultivars, except for Saligbeli, are shown to be sensitive to flash floods in Guinea.

The study of physiological characters which included dry matter production in flash flood-tolerant cultivars and Saligbeli is important to understand the physiological mechanisms of flash flood tolerance.

The above three indexes are applied to the simple evaluation of flash flood tolerance.

(J-I. Sakagami and N. Kawano)

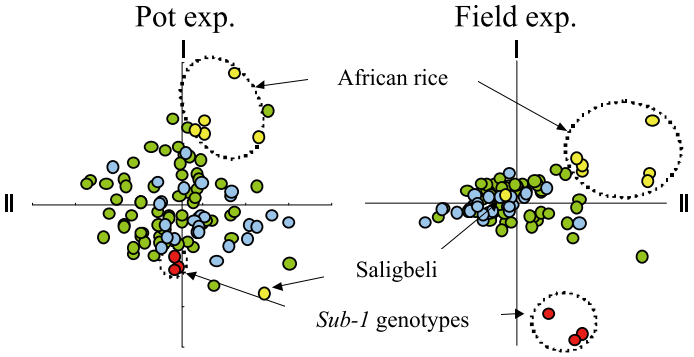


Fig. 4. Evaluation of flash flood tolerance by the principal component analysis. The symbols are the same as Fig. 1.

TOPIC 4

Genetic transformation of NERICA by *Agrobacterium* method

In 1992, the Africa Rice Center (WARDA) started work on interspecific hybridization between *Oryza sativa* L. and *O. glaberrima* Steud. in an attempt to combine the useful traits of both species. By 2005, 18 interspecific cultivars named "new rice for Africa" (NERICA), which are suitable for upland conditions, had been selected and disseminated to several African countries. These cultivars theoretically possess 12.5% of the *O. glaberrima* genome.

Genetic transformation has potential as a novel and powerful way to introduce desirable traits into target crops and to supplement traditional plant breeding techniques. Efficient protocols have been developed for transformation of *japonica*, *indica* and *javanica* cultivars. However, there had been no reports of genetic transformation of NERICA cultivars. This is the first demonstra-

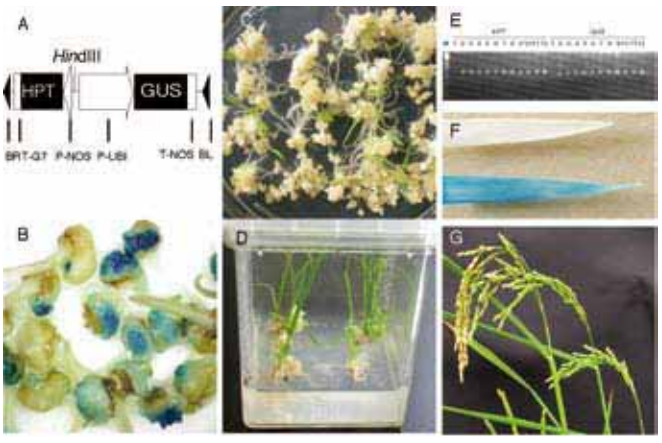


Fig. 1. Production of transgenic NERICA mediated by *Agrobacterium*. A) T-DNA region of pBIG-ubi::GUS; B) histochemical assays of GUS activity in immature embryos; C) regeneration of putatively transformed plants on regeneration medium with 20 mg/l hygromycin; D) growth of putative transformants on medium with 30 mg/l hygromycin. E) PCR analysis for the presence of the genes for HPT and GUS for putative transformants; F) GUS activity detected in the leaf of a transformed plant (lower) but no activity in a non-transformed plant (upper); G) a transformed plant grown in a greenhouse.

tion of the genetic transformation of NERICA cultivars mediated by *Agrobacterium*.

Freshly isolated immature embryos were inoculated with *A. tumefaciens* LBA4404 that harbored binary vector pBIG-ubi::GUS, which carried a hygromycin-resistance gene and a GUS (pIG121Hm) gene (Fig. 1A). GUS activity was observed in the inoculated immature embryos (Fig. 1B). Growth medium supplemented with 500 mg/l cefotaxime and 20 mg/l hygromycin was suitable for elimination of the bacteria and selection of transformed cells. Shoots regenerated from the selected cells on regeneration medium containing 250 mg/ cefotaxime and 20 mg/l hygromycin (Fig. 1C). The shoots developed roots on the hormone-free medium containing 30 mg/l hygromycin (Fig. 1D). Integration and expression of the transgenes were confirmed by PCR and histochemical GUS assay (Figs. 1E and 1F). Most of the plants were normal in terms of morphology and fertility (Fig. 1G). The transformation protocol produced stable transformants from 14 NERICA cultivars (Fig. 2). Inheritance and segregation of the transgenes were demonstrated by Southern blot analysis (Fig. 3). Now, NERICA, like other rice cultivars, can be improved by transgenic approaches.

(T. Ishizaki and T. Kumashiro)

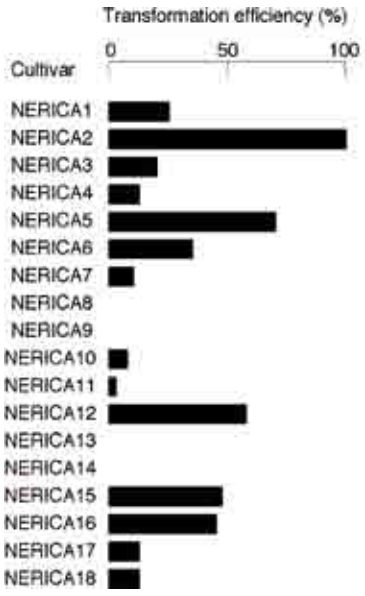


Fig. 2. Transformation efficiency of 18 NERICA cultivars (number of calli that differentiated shoots/ number of inoculated immature embryos; %).

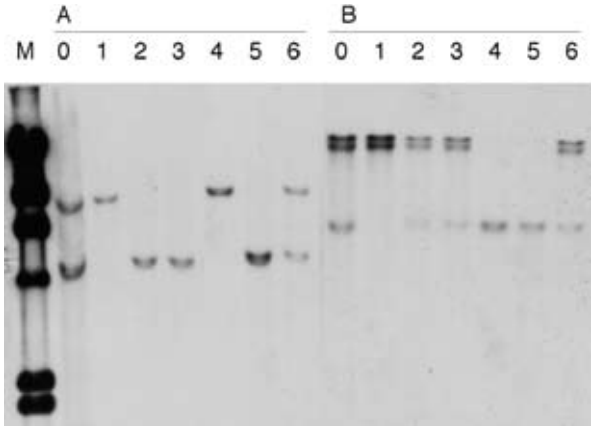


Fig. 3. Southern blot analysis of T_1 progeny produced by self-crossing of T_0 plants. DNA was digested with *HindIII*, run in 0.8% agarose gel, transferred to a nylon membrane, and probed with peroxidase-labeled fragments containing a region of the *hpt* gene and a *HindIII* digest of lambda DNA. Lane 0, T_0 plants; lanes 1-6, T_1 plants.

TOPIC 5

Genetic diversity of blast resistance in rice

A wide variation in resistance to blast disease caused by *Magnaporthe grisea* was found using 922 rice (*Oryza sativa* L.) varieties collected from Asia, Africa, and the Americas. These were classified into six varietal groups termed clusters A-F, according to Ward's hierarchical cluster analysis, based on their reaction patterns to 20 standard differential blast isolates from the Philippines. The two most susceptible clusters, B and C, dominated in varieties from the Far East (Japan). Varieties from East Asia and Southeast Asia occurred less frequently in B and C clusters than those of Japan, and more frequently in E and F

clusters, which were the most resistant of the cluster groups. Varieties from South Asia showed the widest variation, occurring in all clusters but less frequently in cluster B. American and African varieties showed similar distribution to those of East Asia. The cluster B varieties dominated in Japan and showed a high frequency of isozyme type VI, corresponding to Japonica-type. In contrast, the frequency of cluster B was low in the groups with isozyme types I, II, III, and V, which dominated in South Asia. Isozyme type I corresponds to Indica type varieties. The distribution of resistance corresponded to the geographical distribution of rice varieties and might be related to differentiation into Indica and Japonica types. These findings will provide useful information for understanding the variation in blast resistance at the global level.

(Y. Fukuta)

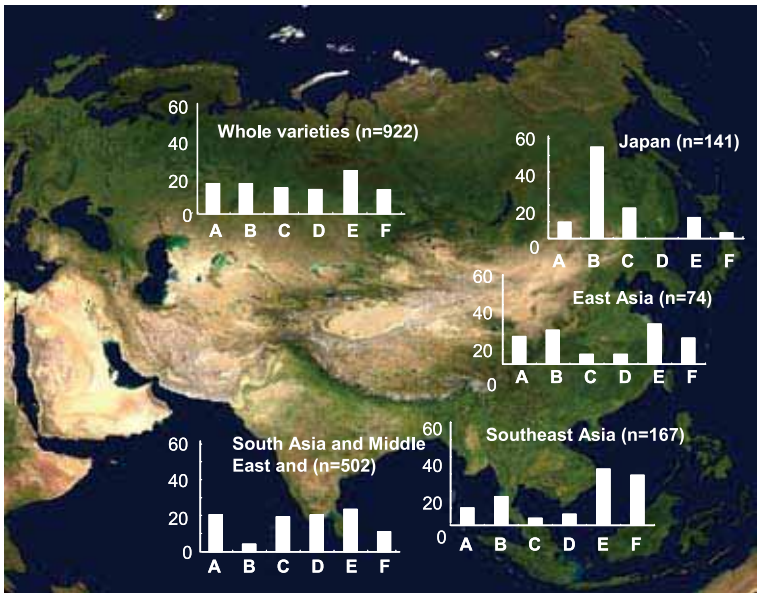


Fig. 1. Frequencies of varieties' groups, A-F, characterized by resistant patterns to standard blast isolates from the Philippines in each area.

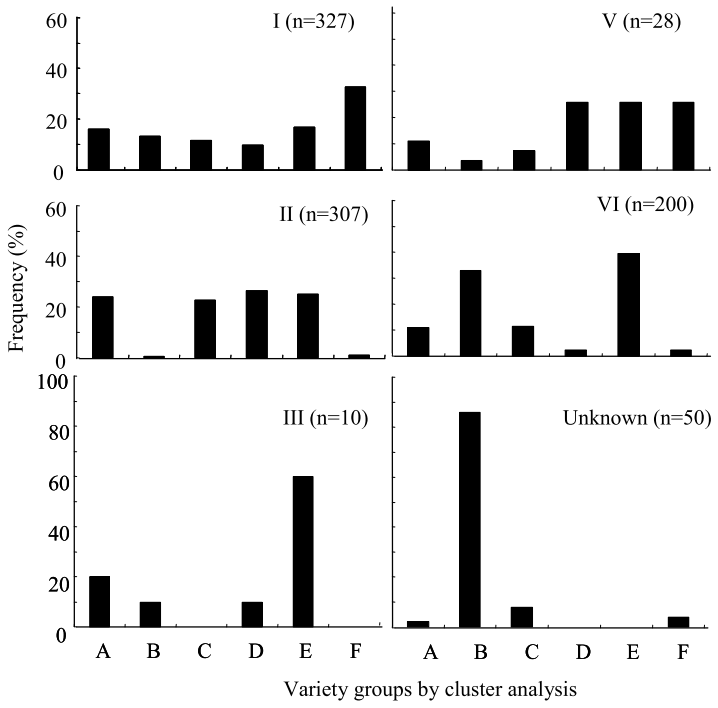


Fig. 2. Frequencies of cluster groups in each isozyme type (No. of varieties).

TOPIC 6

Designation and classification system for blast races using new international differential varieties, monogenic lines

A new systematic, expandable method that allows easy understanding of the relationships between races and resistance genes is proposed for building up an international standard designation and classification system for blast races. Blast races were characterized by their reactions to 26 LTH monogenic lines, targeting 23 resistance genes, which were divided into five groups, (1) LTH, IRBLa-A, IRBLsh-S, IRBLb-B, and IRBLt-K59, (2) 3 lines of *Pii* locus region, (3) 7 lines of *Pik* region, (4) 4 lines of *Piz* region, and (5) 7 lines of *Pita* region. Each group consists of 1 to 3 variety unit(s), which were allocated with 3 differential lines (genes) in each and applied codes, 1, 2, and 4, for compatible reactions of blast isolates, respectively. A blast race is characterized by the sum of codes in combinations of three varieties' reactions in each unit with the Gilmour method. In the case of all compatible reactions to differential lines, the race No. 73-i7-k177-z17-ta733, will be designated. This designation method will contribute to the diversity research for blast races and rice resistance, to the pathological, genetic, and breeding studies of blast disease and rice varieties, and towards building up a strong protection system against blast disease through the enhancement of communication among pathologists and breeders at the ground level. In the meantime, this system will be used for building up the international standard differential system of blast resistance under the Japan International Research Center for Agricultural Sciences (JIRCAS) research project, "Blast Research Network for Stable Rice Production," which is comprised of several research institutes from Asian countries, China, Vietnam, Laos, Philippines, Indonesia, Korea, the international organization, International Rice Research Institute (IRRI), and the National Institute of Agrobiological Sciences (NIAS) in Japan.

(Y. Fukuta)

Table 1. Infection type of LTH monogenic lines *Pik* locus genes to blast fungus isolates.

Monogenic lines and susceptible varieties	Resistance genes	Blast fungus isolates: 1804-4 (Japan, J031.1)	H05-72-1 (Japan, J1031.1)	FR2 (Guiana, J106.4)	H02-58-1 (Myanmar, J117.1)	IBOS8-2-1 (Japan, J010.0)	H05-99-1 (Japan, J014.0)	H05-100-1 (Japan, 413.0)	H05-67-1 (Japan, J0033.0)	H06-35-1 (Philippines, J000.0)
IRBLks-S	*Pik-s*	S	5S	5S	5	5S	5S	5S	5S	0
IRBLk-Ka	*Pik*	S	5S	5S	4'	4	5	5S	0	5
IRBLkp-K60	*Pik-p*	S	4'	5S	5	1	2s	2s	1	0
IRBL7-M	*Pi7(t)*	S	5	5'	5S	2s	2L-3'	2L	0	5S
IRBLkm-Ts	*Pik-m*	S	5	2s	0	1	1'	2L	0	5S
IRBL1-CL	*Pi1*	S	4'	2L	2s	2L	2s	5	0	5S
IRBLkh-K3	*Pik-h*	S	2L	2s	1	1	1	1	1	5S
LTH	+	S	5S	5S	5	5S	5S	5S	5S	5S

0-2: Resistant reaction, 3-5: Susceptible reaction

Table 2. New designation system for blast races based on the reaction of monogenic lines with LTH genetic background.

Group	I		II	III			IV		V		
Locus	-		*Pii*	*Pik*			*Piz*		*Pita*		
Target resistance genes	*Pish* *Pib* *Pit*	+ *Pia* -	*Pii* *Pi3* *Pi5(t)*	*Pik-s* - -	*Pik*-m *Pi1* *Pik-h*	*Pik* *Pik-p* *Pi7(t)*	*Pi9(t)* - -	*Piz* *Piz-5* *Piz-t*	*Pita-2* *Pita-2* *Pi12(t)*	*Pita* *Pita* -	*Pi19* *Pi20*(t) -
Monogenic lines (IRBL)	sh-S b-B t-K59	LTH a-A -	i-F5 3-CP4 5-M	ks-S - -	km-Ts 1-CL Kh-K3	k-Ka kp-K60 7-M	9-W - -	z-Fu z5-CA zt-T	ta2-Pi ta2-Re 12-M	ta-K1 ta-CP1 -	19-A 20-IR24 -
Codes	1 2 4	1 2 -	1 2 4	1 - -	1 2 4	1 2 4	1 - -	1 2 4	1 2 4	1 2 -	1 2 -
Ex. Blast isolates virulence to all genes	S S S 7	S S - 3	S S S 7	S - - 1	S S S 7	S S S 7	S - - 1	S S S 7	S S S 7	S S - 3	S S - 3
	7	3	7	1	7	7	1	7	7	3	3

Example of blast race number of isolate that shows virulence to all differential varieties (genes): No. 73-i7-k177-z17-ta733.

Ethanol and Lactic Acid Production from Oil Palm Trunks

According to the statistical data of the United States Department of Agriculture (USDA, 2005), palm oil, a major edible vegetable oil along with soybean oil, is produced at 3.5 million tons per year. Oil palm trees have an economic life span of approximately 20-25 years, after which old trees are felled and replanted. Although some portions of the old felled trunks are utilized for plywood manufacturing, almost all of them have no practical way of utilization and become troublesome wastes.

In an attempt to develop a method to utilize old oil palm trunks for fuel ethanol and usable materials production, we found that the felled oil palm trunk contains a large quantity of sap, which accounts for 75% to 80% of the whole trunk weight (Fig. 1), and abundant glucose and other fermentable sugars exist in the sap. Most especially, the amount of fermentable sugars is nearly 10% in the sap from the inner parts of the trunk (Table 1). Based on these findings, we tried to ferment the sap to produce ethanol using an industrial alcohol-producing strain, *Saccharomyces cerevisiae* Kyokai no. 7 (Fig. 2a). Ethanol was produced from the sap at a comparable rate and yield to the reference fermentation, where glucose was used as a substrate. Likewise, we tried to produce lactic acid, a promising material for polylactate, from the sap using a lactic acid bacterium, *Lactobacillus lactis* (ATCC19435), and confirmed that sugars contained in the sap were readily converted to lactic acid with almost the same efficiency as the reference fermentation with glucose as a carbon source (Fig. 2b). These results indicate that oil palm trunks are one of the most important resources for producing fuel ethanol and lactic acid in the Southeast Asian countries.

(A. Kosugi and Y. Mori)

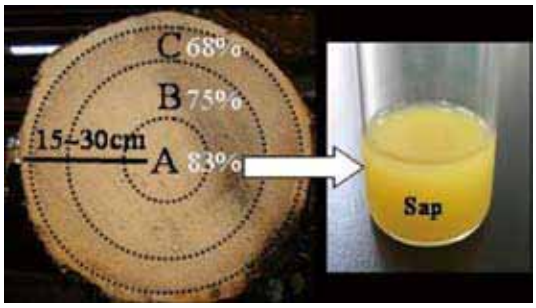


Fig. 1. Moisture contents and the sap from the felled oil palm trunk. Cross-section of felled oil palm trunk: A, central parts; B, middle parts; C, outer parts, Percentage indicates moisture contents in each area of the trunk. The sap was squeezed from the central parts of the felled oil palm trunk.

Table 1. Composition of free sugars in oil palm sap.

Free sugars	Arias		
	Center (A)	Middle (B)	Outer (c)
Aradinose	6.5	3.0	1.9
Galactose	0.9	0.8	1.0
Glucose	85.2	52.2	13.1
Xvlose	0.7	0.8	1.4
Rhamnose	0.4	0.5	0.4
Fructose	4.1	3.1	2.1
Others	0.3	0.1	0.1
Total (g/L)	98	60.5	20

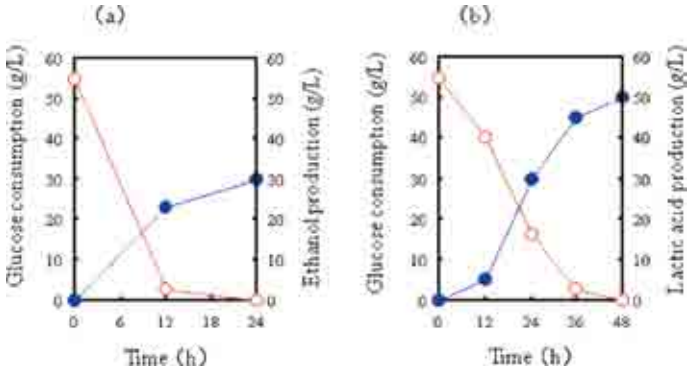


Fig. 2. Fermentation profiles of ethanol (a) and lactic acid (b) productions using the sap from felled oil palm trunk, ○, glucose concentration; ●, productions of ethanol and lactic acid, respectively.

TOPIC 8

Two-stage ohmic heating of soymilk improve tofu's physical property and yield

Tofu is a traditional soybean food. As a staple food, tofu has been playing an important role in people's daily diet in most countries of Asia. There are many types of fresh tofu and tofu derivatives. Filled tofu and soft tofu are two of the most popular tofu products, in which calcium sulfate and glucono-δ-lactone are used as coagulants.

Soymilk heating is a prerequisite for tofu gel structure formation from soybean protein. One of the purposes of soymilk heating is to denature the soybean proteins; that is, to expose the hydrophobic region and sulfhydryl groups to facilitate soymilk solidification in order to finally obtain a unique tofu texture. In the commercial tofu manufactures, soymilk is usually heated by steam injection. Since steam temperature is higher than 100 °C and steam condenses after injection, uneven heating and soymilk dilution are unavoidable. Ohmic heating, which utilizes the inherent electrical resistance of a liquid to generate heat, is becoming a promising method for food processing. With ohmic heating, not only could liquid food be heated evenly, but heating temperature and time could be accurately adjusted or controlled. Obviously, two-stage heating could be implemented with ohmic heating.

The denaturation temperatures for β-conglycinin and glycinin, which are major protein components in soybean milk, are around 70 °C and around 95 °C, respectively. Soymilk was heated by either one-stage heating (100 °C, 5 min) or two-stage heating (70 °C, 10 min and then 100 °C, 5 min). Filled tofu and soft tofu were prepared with the heated soymilk, in which glucono-δ-lactone and calcium sulfate were used as coagulants, respectively. Tofu's textural properties and syneresis rate, and soft tofu's yield and solids recovery were measured.

Table 1 shows how the two-stage heating increased the filled tofu's apparent Young's modulus by 44% and reduced the tofu's syneresis rate by 22%. In case of soft tofu manufacture, the two-stage heating increased apparent breaking strength by 12.2% and apparent Young's modulus by 16.2%, reduced the syneresis rate by 21.8% (Table 2), and increased the yield and the solid recovery by 4.5% and 5.4%, respectively (Table 3). Scanning electron microscopic observation shows that the tofu gel network prepared by two-stage heating was finer and more homogenous than that by one-stage heating. It was concluded that two-stage ohmic heating is a potential method for heating soymilk in tofu manufactures.

(E. Tatsumi)

Table 1. Effect of heating method on filled tofu's physical properties.

Heating method	Apparent breaking strength (kPa)	Apparent Young's modulus (kPa)	Syneresis rate (%)
One-stage	19.81 ± 1.57	141.21 ± 4.54	16.54 ± 0.31
Two-stage	19.67 ± 0.75	204.04 ± 5.16*	12.85 ± 0.51*

Values marked * are significantly different ($p < 0.05$).
Glucono-δ-lactone was used as a coagulant.

Table 2. Effect of heating method on soft tofu's physical properties.

Heating method	Apparent breaking strength (kPa)	Apparent Young's modulus (kPa)	Syneresis rate (%)
One-stage	3.46 ± 0.32	12.23 ± 0.81	17.15 ± 0.14
Two-stage	3.88 ± 0.26*	14.21 ± 0.29*	13.41 ± 0.30*

Values marked * are significantly different ($p < 0.05$).
Calcium sulfate was used as a coagulant.

Table 3. Effect of heating method on soft tofu's yield and solids recovery.

Heating method	Solids recovered (%)	The yield of soft tofu (g/g soybean)
One-stage	71.80 ± 1.96	3.95 ± 0.09
Two-stage	75.66 ± 1.19*	4.13 ± 0.09*

Values marked * are significantly different ($p < 0.05$).
Calcium sulfate was used as a coagulant.

TOPIC 9

Simple and rapid quantification method for gamma (γ)-aminobutyric acid in foods

Gamma (γ)-aminobutyric acid (GABA) is one of the non-protein amino acids which are widely present in nature. Since the physiological functionality of GABA such as its hypotensive effects and stabilizing effect towards mental stresses or illnesses are well recognized in Japan, various foods with GABA addition or enhancement are being produced and their physiological functionality is emphasized. The quantification of GABA is conventionally performed with chromatographic method, High Performance Liquid Chromatography (HPLC), or amino acid analyzer. These methods require high initial investment for equipment, and due to their nature, it is necessary to analyze the

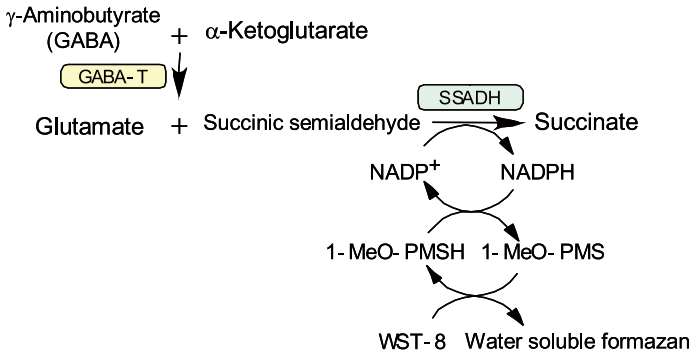


Fig. 1. Principle of GABA quantification.
The conversion of GABA to formazan was carried out through the conjugated action of GABA aminotransferase (GABA-T) and succinate semialdehyde dehydrogenase (SSADH), with the latter converting $NADP^+$ to NADPH. The resulting NADPH was formed with the reduction of tetrazolium salt (red) to water soluble formazan (yellow) coupled with an electron carrier, 1-MeO-PMSH. Therefore, GABA was converted stoichiometrically with the formation of formazan.

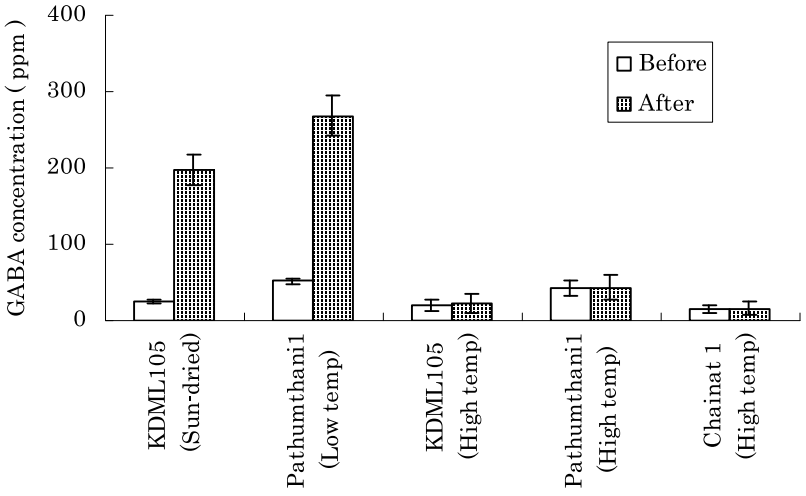


Fig. 2. Effect of thermal treatment on GABA formation among Thai rice varieties.
The formation of GABA was observed only in sun-dried or low temperature- dried rice samples. Even with the same varieties, high temperature drying inactivated GABA formation activity during germination.

samples sequentially, not simultaneously. These constraints prompted us to develop a new simple and rapid method which is based on enzymatic and colorimetric scheme.

The new method involves the conjugated action of two specific enzymes, GABA aminotransferase and succinate semialdehyde dehydrogenase. This conjugated action resulted in high specificity and sensitivity against GABA present in the sample. Using this method GABA could be quantified with the following procedure. The two enzymes, GABA aminotransferase and succinate semialdehyde dehydrogenase from *Pseudomonas fluorescens*, α-ketoglutarate and β-nicotinamide adenine dinucleotide phosphate ($NADP^+$) were placed in a 96-well microplate. Diluted GABA samples were dispensed into each well, and then were warmed at 30 °C for 15 min. The reaction was halted by the addition of acid, and the absorbance at 470 nm of the resulting water-soluble formazan was measured after color development with an electron carrier, 1-methoxyphenazinemethosulfate (1-MeO-PMSH) and tetrazolium salt, WST-8 (Fig. 1). The method showed a linearity in the results for up to a GABA concentration of 50 ppm, and was not affected by the presence of other amino acids such as glutamate, serine, glycine or histidine. Furthermore, the results obtained correlated with those from the HPLC method in milled, brown and germinated rice samples. These results demonstrated the applicability of this new method to the measurement of GABA in the food matrix, which usually consists of various compounds. Additionally, the GABA content can be estimated even without a microplate reader, that is, by just comparing with the GABA standard.

The GABA concentration in brown rice is enhanced by inherent enzymatic activities during germination. However, the germination ratio is decreased when the rice is treated or dried under high temperature. Since rice harvested in Southeast Asia are sometimes dried under high temperature to avoid further deterioration by inherent enzymatic activities, this method was applied to elucidate the effect of such thermal treatment on GABA formation in brown rice. As shown in Fig. 2, the enhancement of GABA was observed only in sun-dried or low temperature-dried brown rice. High temperature-treated samples did not exhibit any enhancement.

The efficiency, speed and the dispensability of expensive instruments in this method make it an attractive alternative to conventional methods for GABA quantification in foods. Most especially, it can be used not only in laboratories but also in food factories to give assurance of the GABA content of their products.

(T. Yoshihashi)

Germplasm evaluation of *Bacillus subtilis* strains in Thua nao, a traditional fermented soybean food in northern Thailand

Thua nao is a traditional fermented soybean food in northern Thailand. Its fermentation is mainly carried out using *Bacillus subtilis* (natto) in a process that is very similar to that of Japanese Natto. However, since Thua nao is usually produced under traditional home manufacturing conditions, its fermentation occurs with more diverse selection of *Bacillus subtilis* strains as compared with that of the Japanese Natto, which is made in modern factories with a few selected strains. Because of the diversity of *Bacillus subtilis* strains used in Thua nao fermentation, it could be expected to contain more superior *Bacillus subtilis* strains than those found in Natto.

In this study, 45 strains of *Bacillus subtilis* (natto) were isolated from nine Thua nao samples from eight markets in Chiang Rai and Payao prefectures in northern Thailand, and their characteristics were compared with "Miyagino," one of the typical Natto-producing strains. Their molecular diversity was analyzed via randomly amplified polymorphic DNA-PCR (RAPD) fingerprinting. Based on the results, the strains were divided into 19 types, including one with the same RAPD pattern as that of "Miyagino" (Fig. 1). The production of amylase, protease, subtilisin NAT (Natto kinase) and gamma-polyglutamic acid (PGA) by the strains was measured. Protease productivity of the strains was almost the same as that of "Miyagino", but their productivity for amylase, subtilisin NAT and PAG was higher than that of "Miyagino." Figure 2 shows the subtilisin NAT activity of the strains isolated from Thua Nao.

These results clearly demonstrated the value of Thua nao as a potential resource of food-processing enzymes and health-promoting compounds. Traditional fermented foods such as Thua nao contain valuable bioresources, but they are rapidly being lost in developing countries. Hence, we have to warn these countries about it before they miss the opportunity to preserve these valuable resources.

(T. Fushimi)

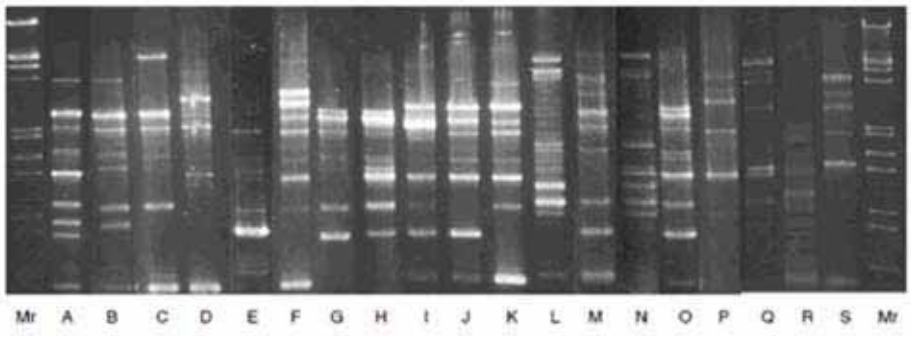


Fig. 1. Lanes A to S indicate the different RAPD patterns of the strains isolated from Thua nao. (Natto-producing strain "Miyagino" gave a pattern similar to the one shown in Lane A.)

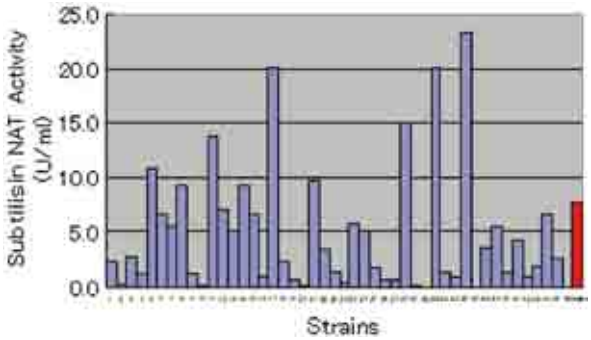


Fig. 2. Subtilisin NAT activity of the strains isolated from Thua Nao. (The red bar indicates the Natto-producing strain "Miyagino.")

Ecological characteristics of mangrove hyperbenthos in the northwest coast of Peninsular Malaysia

Mangroves contribute substantially to coastal fishes as their nursery grounds by providing foods. Hyperbenthic crustaceans, in particular *Acetes* and mysid (opossum) shrimps, are the food items frequently found in the stomach contents of various mangrove fishes of Peninsular Malaysia, indicating that these crustaceans play an important role in the estuarine food web by transferring the energy from lower producers towards higher consumers. However, the ecological traits of hyperbenthic crustaceans in mangrove estuaries of Southeast Asia have been poorly understood to date.

A year-round sledge net survey was conducted in the Matang and Merbok mangrove estuaries of the northwest coast of Peninsular Malaysia (Fig. 1) in order to clarify the species composition, biomass, and spatio-temporal variations. In addition, the reproductive biology and ecology of a dominant mysid, *Mesopodopsis orientalis*, were examined.

Fig. 1. Study sites (Merbok and Matang mangrove estuaries, Peninsular Malaysia).

The biomass of infralittoral crustaceans in the Matang mangrove was about five times higher than that found in Merbok ($p < 0.05$). Although the crustacean biomass in the littoral zone of the Matang mangrove was underestimated due to the difficulty in accessing the sampling sites, coupled with a comparatively large amount of net avoidance by larger-sized crustaceans in the mangrove areas, the quantity of biomass in the surveyed mangroves was noticeably higher as compared with that found in the adjacent coastal waters without mangroves at southern Penang Island ($p < 0.05$) (Table 1).

Three species of *Acetes* shrimp and six species of mysids, representing the genera *Rhopalophthalmus, Acanthomysis, Notoacanthomysis*, and *Mesopodopsis*, constituted a substantial portion of hyperbenthic crustaceans. The spatial distribution pattern of these crustaceans was common in both the Merbok and Matang mangroves, and they have been shown to have species-specific habitats in the estuarine system (Fig. 2). Juveniles of *Acetes sibogae, Fenneropenaeus merguiensis*, and *Mesopodopsis orientalis* (covering all developmental stages) were collected exclusively along the water edge of the estuarine river close to the mangrove forest (intertidal zone). In the infralittoral zone, *Acanthomysis* s. l, *Rhopalophthalmus* sp. 3, and *Acetes japonicus* predominated in the mouth of the estuarine river, while *A. sibogae* tended to increase in number towards the upper reaches, and *Rhopalophthalmus* sp. 2 occurred primarily in the middle reaches.

Mesopodopsis orientalis is actually one of the most important mysids in the coastal waters of Southeast Asia, and this was true in the surveyed estuaries. The recorded

Table 1. Biomass of hyperbenthic crustaceans in the Merbok and Matang mangrove estuaries and the adjacent coastal waters without mangroves.

	Merbok Mangrove		Matang Mangrove		Teluk Kumbar*	
Taxa	Littoral	Infralittoral	Littora	Infralittoral	Littoral	Infralittoal
Mysidacea	832.1	33.4	41.8	91.3	95.8	no data
Acetes	837.6	99.5	22.0	247.3	15.1	
Penaidae	76.9	4.3	306.2	354.6	1.0	
Other Shrimps	1.8	2.0	47.5	42.7	0	
Annual mean (mg/m^2)	1789.4	139.2	417.3*	735.9	111.9	

*Jun-Sept 06+Mar 07 (underestimated)
** coastal area without mangrove

density in the Merbok mangrove (700 ind./m^{-2} in annual mean) was the highest among those observed in the estuarine mysids worldwide. And again, the abundance in this estuary was more than ten times higher than that found in the related coastal waters, indicating high productivity in the Malaysian mangrove estuary.

The reproduction of the Malaysian shallow-water mysid, unlike temperate and subarctic mysids, was year-round, and the abundance and reproductive activity appeared to be unaffected by seasonality, or if present, very much reduced or only at a minimum. Relatively stable environmental condition, particularly water temperature, was assumed to contribute significantly to a less pronounced population dynamics of the crustaceans of this region. Interestingly, the mangrove population of *M. orientalis* was less fecund as compared with its coastal counterpart but was bigger in size during its entire life cycle stages (Fig. 3). A similar phenomenon has been observed in Japanese euryhaline prawns, and subsequent analyses have detected genetic differences among local populations with different life history characteristics. Hence, our finding strongly suggests that differences in the life history traits among the local populations of a mysid observed worldwide should be reassessed in terms of not only ecophysiological parameters but also genetic backgrounds.

(Y. Hanamura)

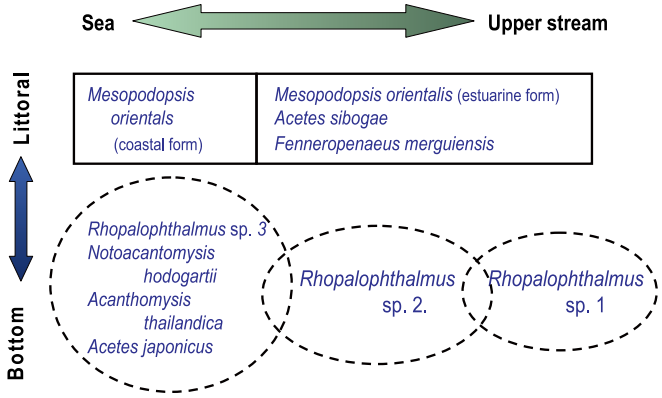


Fig. 2. Schematic representation of the spatial distribution of hyperbenthic crustaceans in mangrove estuaries.

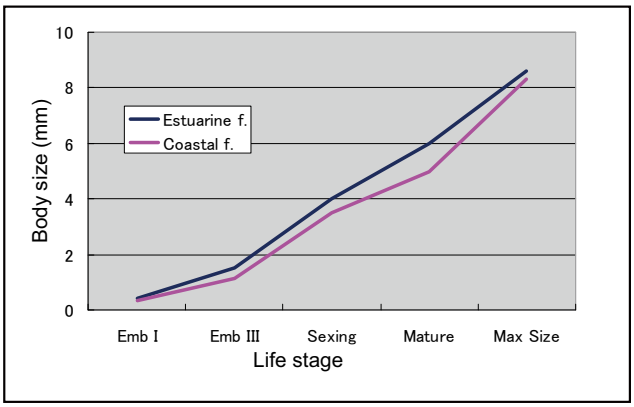


Fig. 3. Growth curves of the estuarine (blue line) and coastal (red line) populations of *Mesopodopsis orientalis* in Peninsular Malaysia: Emb:stage I egg; Sexing: sexual differentiation in pleopods; Mature: sexual maturation; Max size:maximum body size).

TOPIC 12

A newly developed co-culture system between the giant tiger prawn and two species of algae

Japan ranks as the second largest shrimp importer in the world, next to the United States (US). It imports about 90% of its total demand and most of the imported shrimps come from Southeast Asian countries. However, these countries have some problems with regards to their intensive shrimp cultures, such as eutrophication and outbreak of diseases. Hence, the current production of the giant tiger prawn (*Penaeus monodon*) which is an indigenous species in Southeast Asia is decreasing remarkably.

Our intent is to research and develop a *P. monodon* co-culture system which is simple, low cost, has minimum negative environmental impact and able to produce safe and high quality shrimps, in collaboration with Kasetsart University in Thailand. We are attempting to use algae to develop a new co-culture system for shrimp farms in Southeast Asia, where the majority of enterprises are small-scale. In our co-culture system for *P. monodon*, we selected *Rhizoclonium tortuosum*, a green filamentous alga which is commonly discarded by shrimp farmers due to their belief that it suppresses shrimp growth, and *Caulerpa lentillifera* which is a commercial alga in Japan and Philippines. *R. tortuosum* can grow in salinities ranging from 10-50 ppt. and temperatures of 20-30 ºC. *C. lentillifera* can adapt to salinities of 18-38 ppt.

Even when fed to satiation with artificial feeds, shrimps continued to graze on R. *tortuosum* (Fig. 1). And *C. lentillifera* serves as an effective protective shelter for the grown shrimps (Fig. 2). The water tempera-

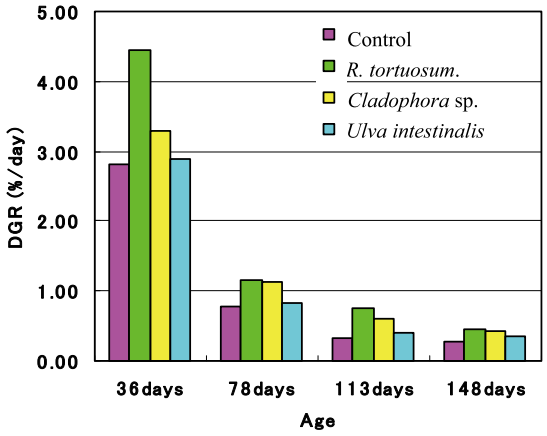


Fig.1. Daily growth rate of shrimps supplied with the different algae.

Fig.2. A giant tiger prawn in a co-culture pond with the algae.

ture inside the algae is stable and usually ranges at 1 ºC less than the water surrounding them in the shrimp pond. Moreover, these algae have high abilities for the uptake of nitrogen existing as ammonia in the culture water. Shrimp growth is actually promoted by these algae.

After the outbreak of the yellow-head virus (YHV) disease which usually assures a 100% mortality rate, 10% of the shrimps survived in co-cultivation with these algae. It is thought that the stable environment and enhanced immunity offered by these algae for *P. monodon* allowed them to survive. The remaining shrimps grew to approximately 50 g. after two months of the YHV disease outbreak. In addition, production efficiency was improved by co-cultivation with the two algae.

Our data suggests that these algae are useful in shrimp cultures. It is concluded that the co-culture system incorporating these algae is a feasible method for maintaining the sustainability and high productivity of shrimp aquaculture in Southeast Asia.

(K. Hamano)

Theme A-2 Development of management technologies of environmental resources and production systems for sustainable agriculture, forestry and fisheries

The natural resources that are the foundation of agriculture and forestry have begun to show signs of deterioration worldwide due to inadequate management and excessive use of agricultural inputs. We therefore need to develop systems for production management that focus more on social and economic conditions, which would enable the systems to be adopted and utilized in the target countries; systems for controlling soil nutrients and water conditions to make them suitable for sustainable production in tropical, subtropical, arid, or semiarid regions; and systems for production management by combining agriculture and animal industry in various ways and by improving individual production methods. To accomplish the effective use of natural resources and development of systems for sustainable production management by combining various practices in agriculture, animal husbandry and forestry, we have launched studies on the optimization of soil, water, and crop management for agricultural, grazing, and forested lands as well as islands.

Major outcomes accomplished in 2007 include:

- In semi-arid regions of Africa with sandy soils, basic research for technology development using experimental fields is almost complete, and the project has moved to the stage of focusing more on demonstrations at the project site of the developed technology. In intensive agricultural areas in Southeast Asia, significant progress was made on simulation of yield and soil carbon using cumulative data from long-term field experiments.
- In water-saving rice cultivation, development of breeding materials and their genetic analysis using near-isogenic lines has further progressed, and the relationship between water and soil management under water-saving conditions has been evaluated. In rainfed agriculture, a simple tool that can be easily operated by local farmers has been developed to make an annual plan for utilization of water in a small pond for a variety of farm operations. This tool is anticipated to make a significant contribution to the project

goal, which is diversification of cropping options through effective use of water resources.

- In a study on the development of a sustainable agropastoral system in dry areas of Northeast Asia, grazing experiments with ruminants were started in Mongolia, and investigations of livestock farming policies, economic conditions of herders' households, and the state of grassland usage, etc., were carried out in China and Mongolia. The metabolizable energy (ME) requirement of Brahman steers for maintenance in Thailand was estimated to be 456.8 kJ/kgBW0.75. This value is similar to that of Japanese black steers raised according to Japanese feeding standards.
- In research on biological nitrification inhibition (BNI), two BNI compounds excreted from sorghum roots were identified and genotypic differences in BNI activity in rice were further confirmed through improvement of analytical accuracy. It was also shown that BNI compounds from *Brachiaria humidicola* have little effect on the population of major microbes in soils.
- It was discovered that non-tilling cultivation reduced soil erosion on sloping fields in the Philippines, the same as on Ishigaki Island. We also found that the mangrove swamps surrounding the mouth of the Miyara River on Ishigaki Island retain 90% of the nitrogen and phosphate carried in the river water.
- Experimental results showed that the self-fertilization rates of the mother trees of *Shorea curtisii* were considerably higher in selective logged forest than those in natural forest. This evidence indicates that reduction of adult tree density by selective logging was the main factor in the increased self-fertilization rates of mother trees in the selective logged forest.
- We established that cut-back pruning and thinning of primary scaffold limbs in durian brings forward the fruit-bearing age, and girdling the trunks of mangosteen speeds flower bud emergence.

As a whole, the projects under this theme have progressed steadily as planned. Progress with the themes can be summarized by noting that installation of a monitoring system to measure the various items needed for the projects has been completed and accumulation of data has started. The most notable research highlights have been produced by projects related to soil and livestock management: specifically, the development of a method to estimate the available forms of soil organic nitrogen, a mega-database for the project site, a tool to capture soil blown in by wind erosion, and estimation of the metabolizable energy requirements of Brahman steers.

TOPIC 1

A new sediment catcher to evaluate the effect of wind erosion on soil fertility

Wind erosion causes enormous negative effects on the soil fertility through soil loss and associated soil nutrient loss in the Sahel or the semi-arid zone of West Africa, one of the most major desertification front lines in the world. Although coarse organic matter (COM), which is defined as free organic debris larger than 0.2 mm, plays a prominent role in soil nutrient dynamics in the semi-arid agro-ecosystems, we have not been able to quantify the flux of COM by wind erosion. The Big Spring Number Eight (BSNE) sampler, the most used sediment catcher, can trap COM blown higher than 50 mm above the ground but cannot estimate the COM flux accurately because most of the COM moves below 50 mm. Therefore, we aimed to develop a new sediment catcher, named as the Aeolian Materials Sampler (AMS), which can trap with better efficiency both the COM and soil particles moving below 50 mm during wind erosion events like frequent sand storms.

As shown in Fig. 1, the AMS has been designed to have three special features for the improvement of its trapping efficiency, 1) wedge-shaped with two mouths which draw the air and blown materials into the sampler by the Venturi effect, 2) an apron in front of the mouth which prevents scouring effects at the inlet, and 3) a collection pan which is long enough to ensure that the entering materials settle into it.

Wind-tunnel experiments showed that the trapping efficiency of the AMS for COM, TE_{com} (%), was constant at the range of wind velocities used, and is well described by the following equation (Fig. 2, $r^2 = 0.94$ when TE_{com} was averaged for each angle):

$$TE_{com} = 61.0 + 18.0 \exp(-0.06x)$$

where x stands for the angle of AMS to the wind direction (°). It was also revealed that the AMS does not selectively trap COM, so that the particle size distribution of the original COM is preserved in the trapped COM.

The performance of the AMS was verified in the field of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT-Niamey), Niger. The amount of remaining COM on the soil surface was calculated by subtracting the loss of COM measured using the AMS and the BSNE sampler from the initial amount of COM, which corresponded with the actual amount (Fig. 3). Thus, we can estimate how much nitrogen (N) or carbon (C) moves along with the COM blown in wind erosion events, when measuring the N or C content of the trapped COM.

Since the AMS is a buried type sampler and is unable to rotate (Fig. 1), it is effective in limited wind direction ranged ±45° against the set AMS. Therefore, it is necessary to use at least four AMS to cover all wind direction.

(K. Ikazaki, H. Shinjo, U. Tanaka, and S. Tobita)

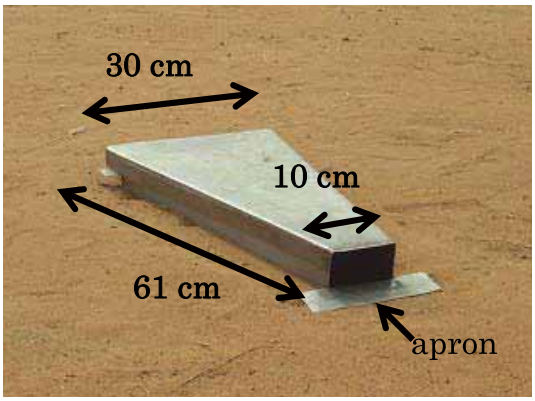


Fig. 1. Appearance of the AMS equipment at the study site.

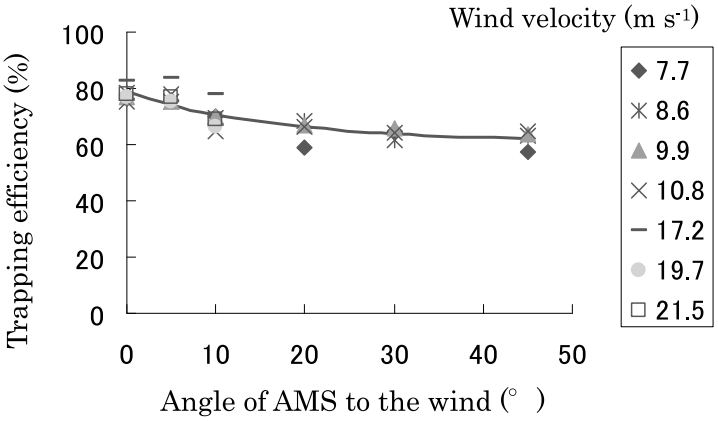


Fig. 2. Trapping efficiency of the AMS for COM as a function of its angle to the wind.

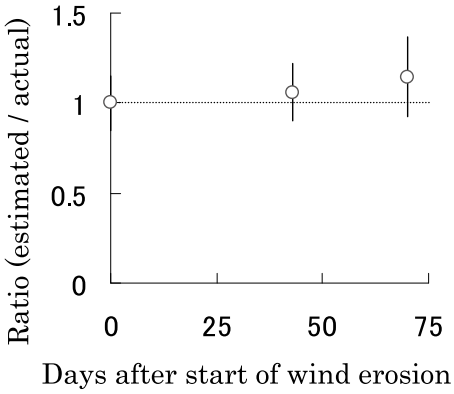


Fig. 3. Changes in the actual amount of remaining COM on the soil surface as compared with the estimated amount by using the AMS and BSNE samplers (ralative value). The bars represent standard error.

TOPIC 2

Development and publication of metadata in research information for the Fakara area in the Sahel, West Africa

Since 1991, various researches have been actively conducted in the Fakara area of Niger by different international organizations like the International Livestock Research Institute (ILRI) and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) based on the consensus of this area as a typical zone of the Sahel for mixed crops-livestock (agro-pastoral) system. JIRCAS has also joined in on this area since 2003 and started research activities through its overseas project on soil fertility management in sandy soils. Despite various researches conducted in the same area, the information obtained was not oriented towards the convenient access of others and this hampered the utilization of valuable sources of past information for the present or next research activities. In view of this situation, the information obtained by JIRCAS, ICRISAT and ILRI were compiled

in metadata (MD) and opened to the public in order to improve accessibility to information and contribute towards future researches in the Sahel.

A workshop was organized initially at ICRISAT Niger with focal scientists and Geographic Information System (GIS) experts in order to decide the necessary procedures for an MD which comply with international standards. Three steps were taken for the procedure of the MD development, i.e. Definition phase (a variety of formats, sources, topics and disciplines), Main iterative loop (Data encoding and its verification), packaging and delivery (DVD-ROM media, online services).

Priority was given to encoding tools that helped simplify interactions with participating scientists (free, customizable and network-based) which met the widespread Content Standard for Digital Geospatial Metadata (CSDGM): M3Cat v. 1.5. For higher-level editing, ArcCatalog v. 9.0 was used.

Past researches carried out in the Fakara area were compiled in this MD using the same format with sequential number, title, definition of information sources, origin of information, responsible scientist, contact address, a variety of format, data volume, etc. A dataset for geographical information contains satellite images with georeferences. A total of 73 datasets, including a dataset for geography, were stored in this MD, which contains an inventory of biophysical characterization collected by JIRCAS, satellite images and rainfall distribution data by ICRISAT, and land use information from 1950 collected by ILRI. The developed MD was saved on DVD-ROM and uploaded on the JIRCAS homepage for public uses: (http://www.jircas.affrc.go.jp/project/africa_dojo/Metadata/index.html).

(K. Hayashi and S. Tobita)

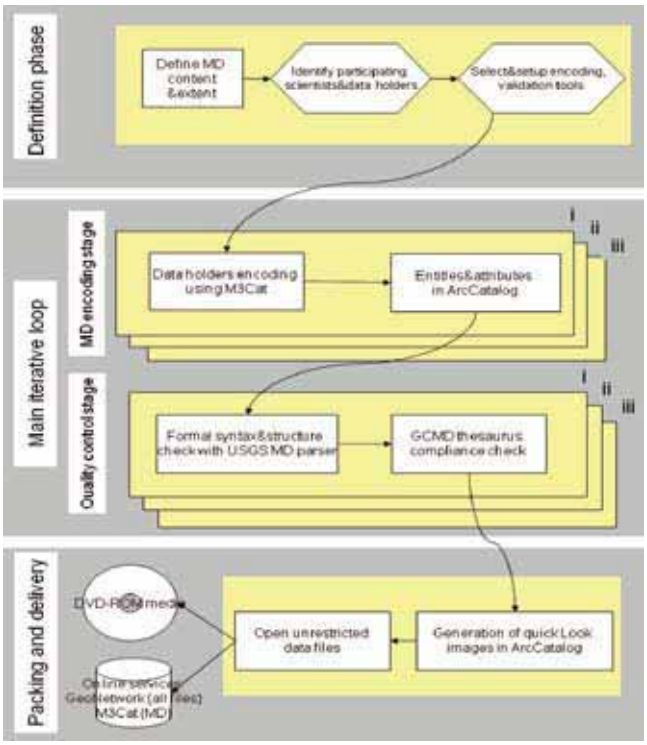


Fig. 1. Flowchart for the documentation process of the Fakara MD.

Table 1. An example of the datasets in Fakara MD (JIRCAS; Japan International Research Center for Agricultural Sciences, ICRISAT; International Crops Research Institute for the Semi-Arid Tropics, INRAN; Institute National de la Recherche Agronomique du Niger).

Participating Institutes	Research Fields	Inventory
JIRCAS	Leguminous crops	Answers of interviewed individual farmers to selections of survey questions, etc
JIRCAS	Traditional farming	Actual situation of land use for Jerma households, etc
INRAN	Socioeconomic	Household characteristics in Fakara re household economics, expenses, etc
Kyoto University	Agropastoral system	Area cropped by sedentary Fulani (HS), etc
Kyoto University	Risk management	Household risk management in Fakara
ICRISAT	GIS	Daily rainfall measurements at landscape scale with a network of rain gauges in 2004, etc
ICRISAT	Agroclimate	Katanga AWS weather data 2000 Daily Output, etc
ILRI	GIS	Fakara Geomorphology map, etc
ILRI	Ethnobotany	Ethnobotanical survey

Estimation of nitrogen availability in infertile sandy soils in the tropical areas using UV absorbance of soil extracts

Nitrogen availability in soils is normally determined by the incubation method which measures inorganic nitrogen produced under the conditions that promote nitrogen mineralization from organic sources. This incubation method, however, requires several weeks to complete, and therefore, simpler chemical extraction methods have been developed for rapid determination.

One of the chemical extraction methods, which is proven in Japan, involves the extraction of soils with phosphate buffer solution and then determining the organic nitrogen content of the resulting soil extracts by measuring its UV absorbance at 280 nm. We applied this UV absorption method in the infertile sandy soils of West Africa, and examined the relationship between the UV absorbance of the soil extract and the dry matter of pearl millet, the main food of the people in the Sahelian region, grown in that soil.

Soil samples were collected from the soil surface layer (0-15 cm) in pearl millet fields in three villages in the Fakara region of Niger under various soil fertility managements such as no-input, corralling (confining livestock in the field), manure application, fallowing for 1 to 10 years, and reserved fallowing in which livestock are held off. The air-dried soil samples were treated with 0.067 M phosphate buffer (pH 7.0), and the absorbance of the soil extracts was measured at 280 nm with a spectrophotometer. To examine the nitrogen availability for crop growth, pearl millet was cultivated in pots containing 1 kg of the soil sample which was added with an adequate supply of water and nutrients, except nitrogen. The dry weight of the aboveground plant parts of pearl millet was measured at 28 days after sowing.

Our results show that there is a positive correlation (r = 0.77, P < 0.01) between inorganic nitrogen mineralized under incubation (nitrogen availability determined by the incubation method) and the absorbance of phosphate buffer soil extracts at 280 nm (Fig. 1). Nitrogen availability of the soils in this region can be estimated by the measurement of the UV absorbance of soil extract

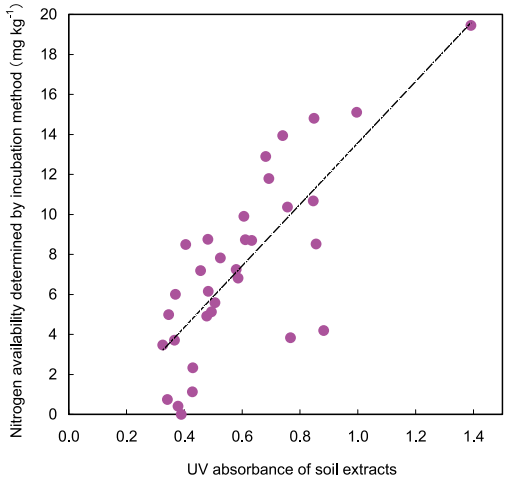


Fig. 1. Relationship between the nitrogen availability determined by incubation method and the UV absorbance of phosphate buffer soil extracts at 280 nm.

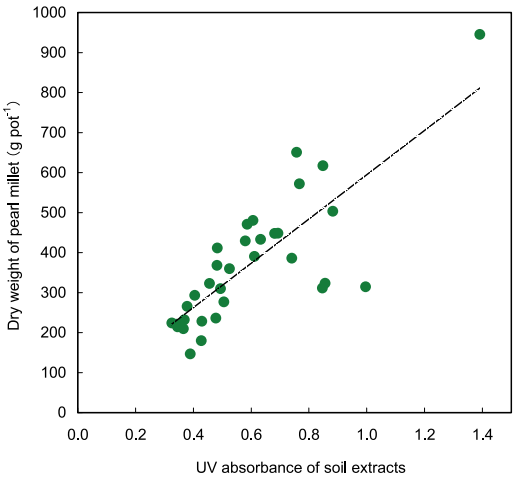


Fig. 2. Relationship between the dry weight of pearl millet at 28 days after sowing and the UV absorbance of phosphate buffer soil extracts at 280 nm.

using this regression formula, which can be applied to the infertile soils with a total nitrogen content ranging from 0.07 to 0.61 g kg^{-1}. Likewise, the UV absorbance of the soil extracts at 280 nm showed a positive correlation (r = 0.79, P < 0.01) with the dry weight of pearl millet at 28 days after sowing (Fig. 2). These results demonstrate that the UV absorbance of soil extracts can be used to estimate the nitrogen fertility of the soils.

(K. Suzuki, K. Okada, K. Hayashi, R. Matsunaga, N. Matsumoto and S. Tobita)

TOPIC4

Pond water use planning tool for integrated farming

It is necessary for the carrying on of integrated farming that farmers plan water use for several months in advance. This study has developed a water use planning tool for farmers who have no prior experience of integrated farming. The tool is a disk which is made of paper. Through this, the farmers can instantly get information about their pond capacity, water loss during the dry season due to evaporation, water consumption of each agricultural product such as vegetables, cattle, etc.

The Thai government recommends integrated farming to small farmers using farm ponds in order to increase their income in Northeast Thailand. In fact, many ponds, with sizes of approximately 20 m×30 m have been constructed. However, most of the farmers use their ponds only for fish culture and not jointly for vegetables, fruits or cattle, etc. One of the reasons is the difficulty of water use planning for farmers who have no prior experience in integrated farming. Therefore, we tried to support the farmers' water use planning and generate more utilization of integrated farming management by developing this water use planning tool for farmers.

Farmers can read their pond capacity and water consumption level from the disk tool, write down the values into the planning sheet, and evaluate the plan as follows.

Step 1: Estimation of usable water volume

① [Water resource] Use Side 1 of the disk. Select soil type (Clay, Sandy) of outer lane by matching the red line. Set 'depth of pond' in the 2nd lane, 'length' and 'breadth' in the 3rd and 4th lane, respectively. Read 'pond area' in the 5th lane, and read 'water volume' under 6th lane up to the depth of water.

② [Reserve water volume] Read the reserve water volume under the 6th lane up to the depth of water.

③ [Evaporation volume] Use Side 2 of the disk. Match blue line. Set 3rd lane to the month during the planning and read the evaporation under 4th lane up to the pond area respectively, and sum up all the values.

④ [Usable water volume] = ① - ② - ③

Step 2: Water use planning

⑤ Use Side 2 of the disk. Match green line. Set 'crop' in the 3rd lane, and read the water consumption under the 4th lane up to the cropping area. Match red line. Set 'cattle' in the 3rd lane, and read the water consumption under the 4th lane up to the stage of

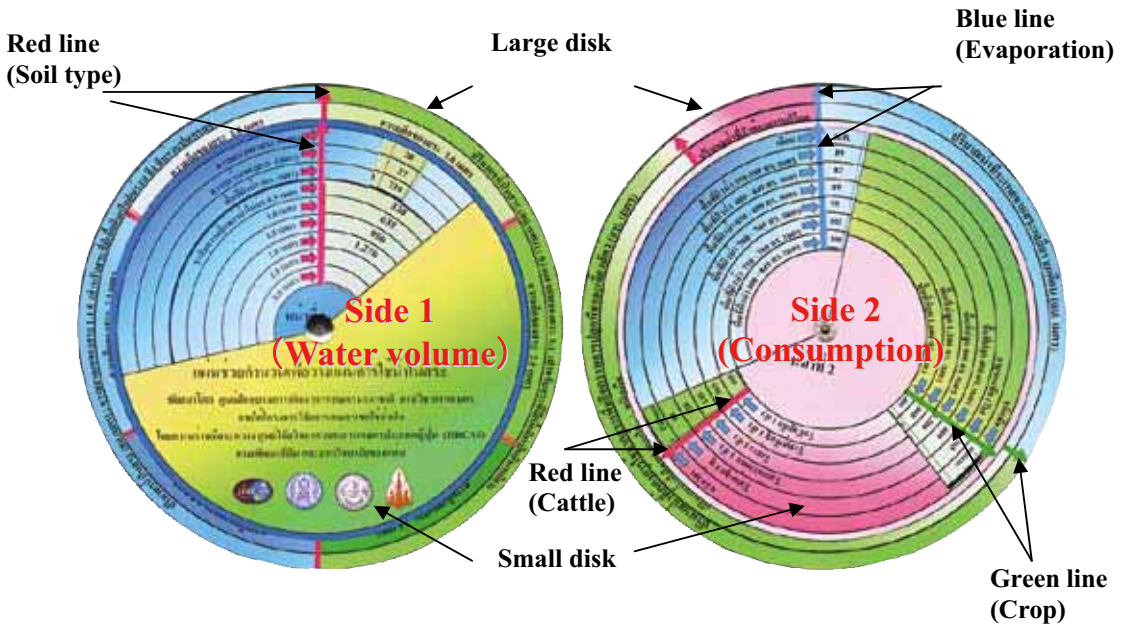


Fig. 1. Disk tool.
(Match the line color of objective)
(Rotate small disk and read the value)

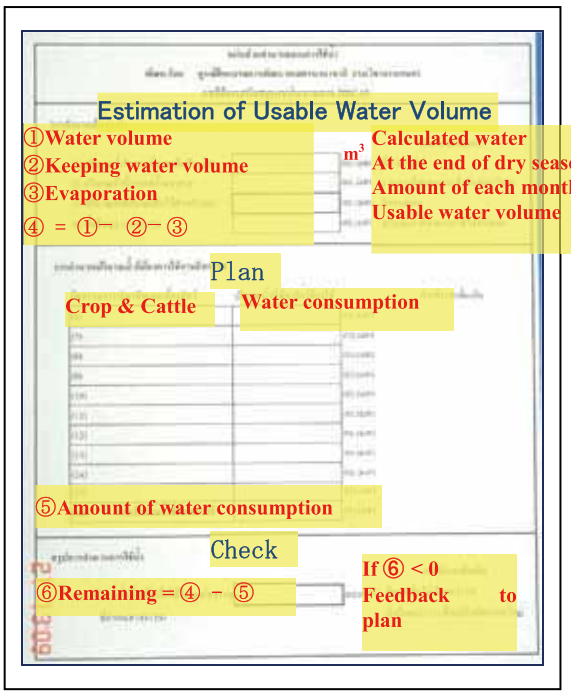


Fig. 2. Planning Sheet.

Table 1. Evaluation by farmers.

Category	Good	Middle	Bad
1. Shape	91(%)	9	0
2. Coloring	93	7	0
3. Font size	72	28	0
4. Usability	64	36	0
5. Clarity	40	60	0
6. Practicality	84	16	0

By 14 farmers in the project site (Nong Saeng Village). Average of each category (Water volume, Evaporation, Crop, Cattle).

the cattle, and multiply the number of cattle. Sum up all the water consumption volume.

Step 3: Check the plan
⑥ Remaining water volume = ④ - ⑤
If the remaining water volume shows negative value, go back to Step 2 and start again.

1. The results of the farmers' evaluation of the tool are as follows. Clarity; Good: 40%, Middle: 60%, Practicality; Good: 84%, Middle: 16%, etc. (Table 1).
2. Basic data shown on the disk are as follows: Shape of ponds, according to the standards of the Land Development Department (Thai); Evaporation, Khon Kaen Meteorological Station, Necessary Irrigation water volume for crops (Custard apple, Mango, Asparagus, Rice nursery, Maize, Tomato, Chili pepper, Eggplant, Coriander, Shallot, Long bean, Radish, Kale, Cauliflower, Cucumber, Water spinach), determined by FAO; Cattle drinking water requirements based on the JIRCAS experiment in the project site.

(M. Oda)

TOPIC 5

Metabolizable energy requirements for the maintenance of Brahman steers in Northeast Thailand

In Thailand, the nutrient requirements of the cattle are based on information gathered from countries located in the temperate zones. Since the breed of cattle, climatic conditions, and available feed resources in Thailand differ from those in the temperate zones, the nutrient requirements of the cattle in Thailand may not be the same as those recommended. However, the energy balance in cattle has been measured to a limited extent. In order to study the energy metabolism in cattle, we have developed a respiration trial system with a ventilated hood at Khon Kaen Animal Nutrition Research and Development Center, Khon Kaen, Thailand. In Thailand, native and Brahman cattle are very popular for beef. We have already measured the metabolizable energy (ME) requirements for maintenance of native steers. Therefore, we conducted two digestion and respiration trials in order to estimate the ME requirements for the maintenance of Brahman steers.

Experiment 1: Twenty energy balance trials were conducted with 4 mature Brahman steers (Table 1). Their average body weight (BW) was 385 kg. Steers were fed at 1.5% of BW as dry matter (DM) basis twice a day. The crude protein content in experimental diet was 12% on DM basis. Diets consisted of 100% of Cavalcade hay (Feed 1), 23.41% of Pangola grass hay with 76.59% of Cavalcade hay (Feed 2), 63.59% of Pangola grass hay with 36.41% of coconut meal (Feed 3) and 47.65% of

Pangola grass hay with 52.35% of palm kernel cake (Feed 4). ME requirement for maintenance was estimated as 458 kJ/kgBW$^{0.75}$ from this experiment.

Experiment 2: Twenty energy balance trials were conducted with 4 mature Brahman steers (Table 1). Their average BW was 349 kg. Steers were fed at maintenance, 1.4 × maintenance, 1.8 × maintenance, and *ad libitum* levels. Crude protein content in experimental diet was 12% on DM basis. Diets consisted of Pangola grass hay, dried cassava, rice bran, brewer's waste and palm meal. ME requirement for maintenance was estimated as 454 kJ/kgBW$^{0.75}$ from this experiment.

ME requirement for maintenance was estimated as 456.8 kJ/kgBW$^{0.75}$ from all the data of ME intake and balance by Brahman steers (Fig. 1). This value is the same as Japanese black steers under the Japanese feeding standard (470.3 kJ/kgBW$^{0.75}$). Furthermore, that estimated value is within several kinds of standards for beef cattle in Europe and the United States (from 401.7 to 543.9 kJ/kgBW$^{0.75}$) as shown in the feeding standards by the US National Research Council. Estimated efficiency of ME utilization for growth was 57.4% (Fig. 1).

The ME requirement for maintenance in Brahman steers is a useful information to calculate daily amounts of feeds and must be utilized as basic data for feeding standard in Indochinese peninsula. It is necessary not only for the energy requirement of animals but also in determining the nutrient contents in feeds in order to promote more efficient use of local feed resources.

(T. Nishida)

Table 1. Feed formulation and results of energy balance trials with Brahman steers (kJ/BWkg$^{0.75}$).

Experiment 1	Feed 1	Feed 2	Feed 3	Feed 4	Fasting
Metabolizable energy intake	471	484	571	601	
Heat production	477	481	499	504	259
Energy balance	-7	2	71	97	-259
Experiment 2	**M***	**M×1.4**	**M×1.8**	**ad lib****	**Fasting**
Metabolizable energy intake	454	637	789	943	
Heat production	436	537	601	665	265
Energy balance	18	99	188	278	-265

*M: maintenance level, **ad lib: *ad libitum* intake.

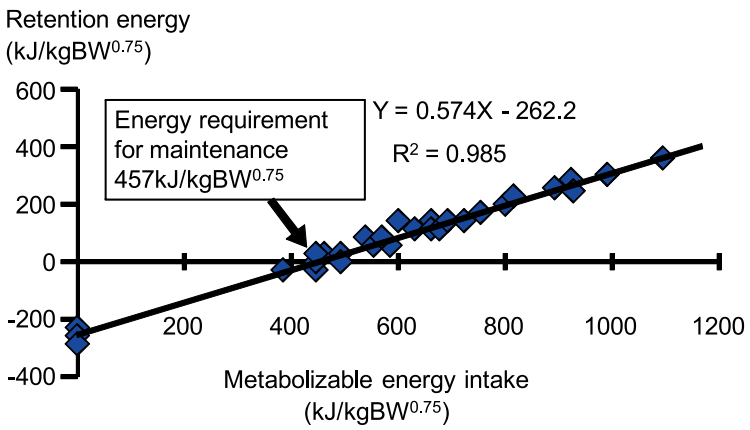


Fig. 1. The relationship between metabolizable energy intake and energy balance in Brahman steers.

Theme A-3 Elucidation of the impact of global environmental changes on agriculture, forestry and fisheries and development of mitigating technologies

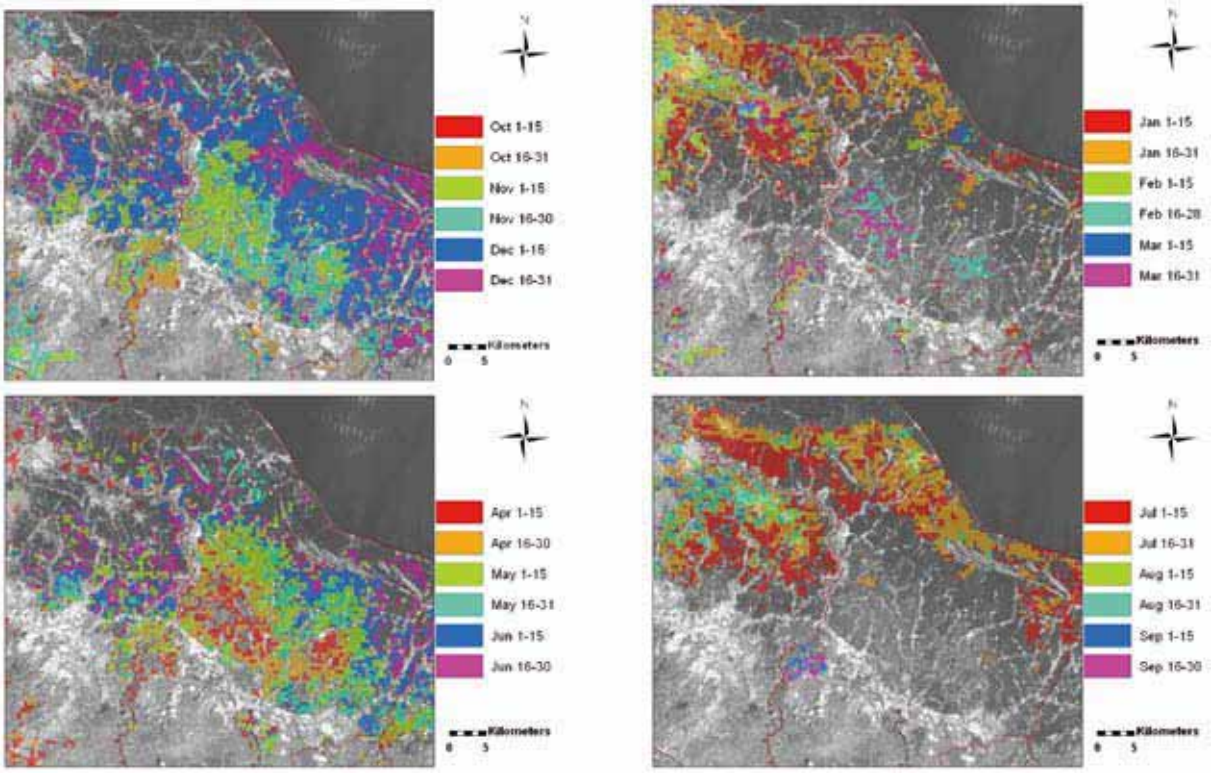
Global warming is predicted to cause disasters due to climate change and the spread of insect pests; there is also the risk of undermining the stability of agricultural production and shifting of suitable agricultural areas. This theme aims to clarify the phenomena of interdependence between global environmental changes such as water cycle changes and agricultural production activities, and to enhance the methodologies for estimating their influences on agriculture, as well as to clarify the damage caused to agriculture and forestry products by insect pests resulting from global warming, and to develop technologies to prevent them. In FY 2006, five projects were launched to study the interdependent influences of environmental changes with agricultural production, to develop GIS methodologies and supply and demand models of foods, and to develop institutional and technological measures for alleviating the detrimental effects on agriculture of climate change and harmful insects.

The main results are as follows.

■ **Enhancement of GIS applications for agricultural land information on local to regional scales:** We launched a research project on monitoring technology to capture changes in agricultural land use on a quasireal-time basis in collaboration with an agricultural land resources research institute in Indonesia. These technologies can be applied to assess the productivity of economically significant crops and also to estimate the spatial and temporal characteristics of hazardous conditions caused by agricultural disasters (See satellite imagery below).

■ **Stable food supply systems for mitigating the fluctuations in production and markets in China:** We established early warning systems on climatic natural disasters, incorporating mesh data on temperature and precipitation, in Heilongjiang Province, and developed a technology for ensuring that field servers operate reliably. In addition, a farm management model which incorporates risk factors was developed, and institutional approaches toward risk reduction were launched.

■ **Water supply fluctuations in Indochina:** We completed the construction of a supply



Monitoring Transplanting Time in Rice Production around Karawang District in the West Java Province of Indonesia, using MODIS data.

and demand model of rice which incorporates water supply fluctuation as one of the factors affecting changes in rice production in Vietnam, Thailand, Laos, and Cambodia, allowing simulations to be based on various scenarios in natural environments and social conditions.

■ **Development of management techniques for citrus greening disease in severely affected areas:** Citrus greening disease (CG) is spreading worldwide, partly due to global warming. We launched an on-farm experiment in integrated pest management (IPM) of CG in Vietnam to establish techniques for managing the disease in severely infested areas. We also started field experiments to prove the efficacy of *Feronia limonia and Feroniella oblata* as rootstocks resistant to CG. To reproduce the transmission process of CG by adult psyllids in a closed environment, we successfully grew adult psyllids which were carrying CG bacteria from eggs on infected citrus trees in a greenhouse environment.

■ **Development of biological control of invasive insect pests on coconut trees:** We completed a distribution map of *Brontispa longissima*, an insect pest of coconut trees spreading in Southeast Asia and the Pacific region, based on field surveys and information provided by overseas research institutes. This project also aims to develop a biological control method against the insect. We have embarked on the development of an artificial feeding method and are analyzing the insect's basic ecological behavior.

TOPIC 1

Impacts of water cycle changes on the rice market in Cambodia

Water is an indispensable input for agricultural production and the supply is highly influenced by hydrological cycle changes. Climatic changes caused by global warming leads to the activation of the water cycle and these probably expand water supply fluctuations. The changes will affect the supply and demand of crops. Therefore, econometric analyses related to the cycle changes are important to aid in the design of agricultural policies and plans.

Farmers, who are in developing countries where the unit share of irrigated fields is low, are at risk of severe damage by global hydrological changes. Simulation results of the supply and demand model considering water cycle changes for each region will provide important information for formulating policies to offset or mitigate the negative consequences. Cambodia is one of the world's poorest countries, and the percentage of the population with below US$1 purchasing power parity was 34% in 2003. Rice consists of 68.5% of the food consumption; hence the industry related to the supply of rice is quite important for the economic development of this country.

This study tries to clarify the impacts of water supply changes on producers and consumers of rice in Cambodia using a supply and demand model of rice which takes into consideration the hydrological cycle changes. The developed model is

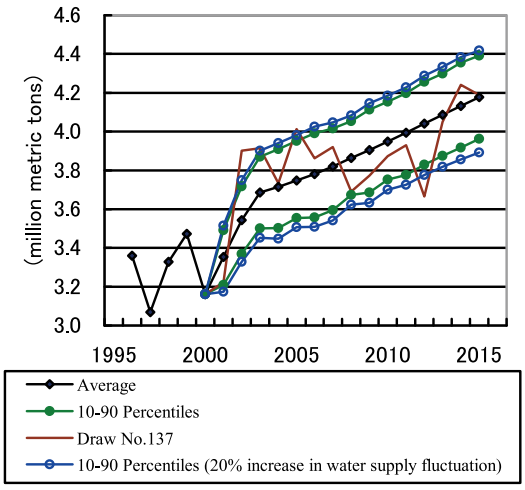


Fig. 1. Fluctuation in the production of wet season rice for the whole country.

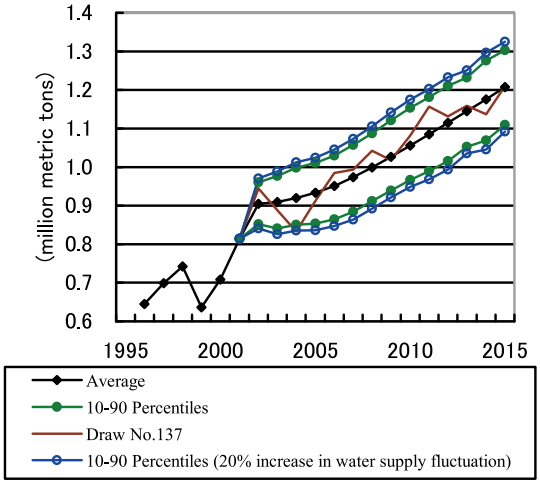
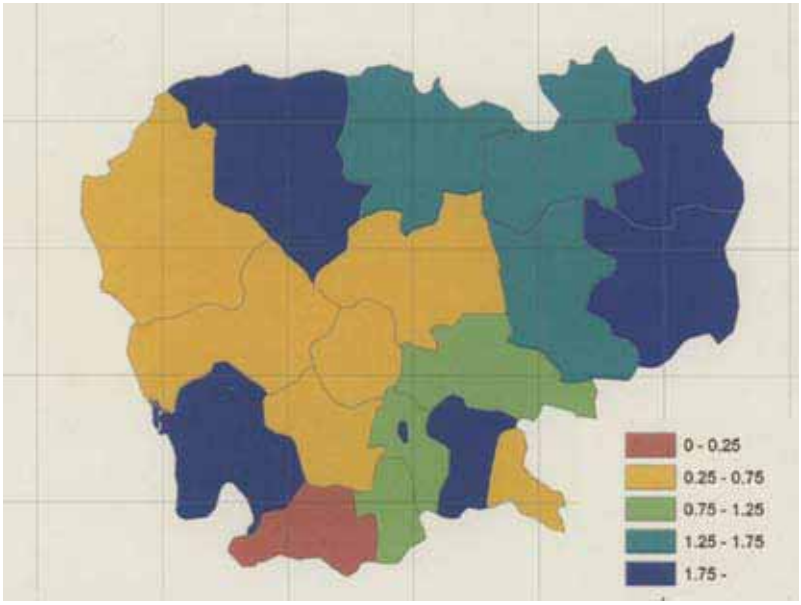


Fig. 2. Fluctuation in the production of dry season rice for the whole country.



Note: Numbers are coefficients of variations in the case of a 20% increase in water supply fluctuations from the baselines.

Fig. 3. Fluctuations of planted areas during wet season.

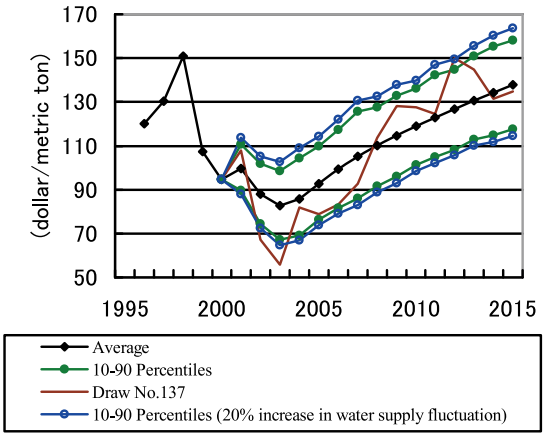


Fig. 4. Fluctuation of farm prices.

extended to a stochastic model and fluctuations of water supplies are analyzed.

The difference between the 90th and 10th percentiles for wet season rice production is about 400 thousand metric tons, which is about 10% of the average seasonal production (Fig. 1). On the other hand, that for dry season rice production is about 180 thousand metric tons, which is about 17% of the average production (Fig. 2). Therefore, the variation in production during the dry season is relatively greater than that in the wet season.

To investigate the expanding water supply variability, a simulation in the case of increasing 20% of the random water supply was conducted. The difference between the 90th and 10th percentiles for wet season rice expanded into 500 thousand metric tons (Fig. 1) and that for dry season rice expanded into 220 thousand metric tons (Fig. 2). The percentage increases of these changes, relative to the productions in the base year are 2.5% and 3.8% respectively, indicating that rice production during the dry season is more affected by water supply changes than during the wet season.

Impacts of water supply changes on the planted areas during the wet season were investigated. Planted areas in regions where elevations are high, such as Rottana Kiri, Mondol Kiri, and Koh Kong, and the lands vulnerable to flooding, such as Phnom Penh and Prey Veng, are sensitive to increased fluctuations in water supplies (Fig. 3).

Finally, the variations in the farm prices were investigated. The distribution of prices is slightly negatively skewed; the width between 90th percentile and the mean is $19.27 per metric ton and that of between 10th percentile and the mean is $18.71 per metric ton for the baseline (Fig. 4) (Farm prices are calculated using the exchange rate in 2002: US$1=3912.1 Riels). The asymmetry of the distribution is based on the logarithmic ET variables of yield and planted area functions, and it corresponds to the diminishing planted area in the case of water supply scarcity. If the water supply expands 20%, the average width between the 10th and 90th percentiles of simulated outcomes for farm prices will increase from $38.09 to $45.50 (Fig. 4). The upper price band is larger than the lower band suggesting that the situation of low income consumers could grow worse under an unstable environment with relatively larger upward price spikes.

(J. Furuya)

B. Collection, analysis and dissemination of information to grasp trends related to international food, agriculture, forestry and fisheries and rural areas

Information relating to the middle- to long-term trends in global food supply and demand were collected and examined at meetings organized by international organizations. To formulate future plans for collaborative research in African regions, a strategic survey on key technologies for innovation in African agriculture was completed and a report published.

Recommendations for domestic collaboration and human resource development were compiled and issued to enhance agricultural research for international development in Japan, by organizing an international symposium entitled "Contribution of Japanese Agricultural Scientists towards the Millennium Development Goals."

Regarding socioeconomic analyses of technology development and rural development, two projects—a study on the factors determining the adoption of new water management technologies in Southeast Asia, and a study on the impacts of regional and economic integration on agricultural structure and farm income—were continued. Meaningful results were presented as several case studies such as on corrective activities for irrigation systems in the Philippines and the role of foreign investment in cassava production in Indonesia.

A publication on key technologies for innovation in African agriculture.

TOPIC 1

The relationship between the cassava farmers-processors partnership and farmers' productivity: A case study in Lampung Province, Indonesia.

This study tries to identify the relationship between the partnership of farmers and processing companies, and the profits (income) of the small-scale cassava farmers in Lampung Province of Indonesia. A total of 80 cassava farmers in Sukadana District, East Lampung Regency, and Lampung Province were interviewed from February to March 2007. The respondents were classified into three groups; namely, Group I (without any contracts with the cassava processors), Group II (has a partnership with local cassava processors) and Group III (has a partnership with a Japanese food company which is implementing technical collaboration as a Corporate Social Responsibility/ CSR Project). The characteristics of each group are shown in Table 1.

The revenue of Group III is significantly higher than the other two groups (Table 2). The results indicate that partnership with the CSR Project positively affected the revenues of the farmers, because the yield and price of cassava increased. The latter (pricing) seems to work more critically because the yield differences among the three groups are not statistically significant. The cassava price of Group III is significantly higher than the other two groups.

The better quality of cassava and the freedom to select the market for the cassava are the major factors that influenced the increasing price of cassava in Group III. It is appropriate to assume that the quality (starch content) of cassava is determined by the harvesting age. This assumption is supported by the fact that there is a significant correlation between the cassava price and the harvesting age of cassava. The cassava harvesting ages Group II and III are significantly longer than that of Group I. This suggests that the technical support by the processors optimized the harvesting age and more farmers succeeded in harvesting cassava within an appropriate timetable. Though there is no significant difference in the har-

vesting ages between those of Group II and III, the cassava price of Group III is better than Group II. This suggests that the freedom to select the market for cassava in Group III contributed to the higher cassava price.

Various companies have shown interest in producing biofuel from cassava in Indonesia. It can be concluded that the increasing demand for cassava will attract more companies to enter the processing business, and the emergence of the newcomers and the success of the CSR Project by the Japanese company in the study area will motivate the local cassava processors to invest more to attract cassava farmers, that in turn will contribute to the farmers' welfare through improved profits from cassava production.

(T. Sugino)

Table 1. The characteristics of farmers-processors partnerships.

	Group I (No-contract)	Group II (Partnership with processor)	Group III (CSR)
Cassava price determination	Defined by market price. Floor price not assured.	Defined by market price. Floor price assured.	Defined by market price. Floor price not assured.
Access to credit	Not available	Available with interest	Available with no interest
Source of input	No restriction	Compulsory purchase from the processors	No restriction
Channels of sales	No restriction	Compulsory sales to the processors	No restriction
Others survices	Not available	Technical support (not all the pocessors)	Technical support. Tractor servise with lower price.

Source: Interview Survey, 2007

Table 2. Cassava production costs and returns.

(Rp. 1,000/ha)

	Group I	Group II	Group III	All respondents
Sample sizes	39	24	17	80
Yield (t/ha)	21.9	20.6	23.3	21.8
Harvesting ages (months) [ac]	8.9	9.4	10.0	9.30
Cassava prices (Rp/kg) [bc]	289	296	345	303
Output (1) [bc]	6,314	6,017	8,082	6,601
Current inputs:				
Seedlings [bc]	228	241	123	210
Fertilizers [b]	728	626	842	721
Pesticides	95	108	100	100
Sub-total (2)	1,051	974	1,065	1,031
Labor costs:				
Hired [a]	1,261	1,720	1,394	1,427
Family [bc]	236	406	712	388
Sub-total (3) [ac]	1,497	2,126	2,106	1,815
Others (4)	501	654	859	623
Total costs (5)=(2)+(3)+(4) [ac]	3,049	3,754	4,030	3,469
Operator's surplus (6)=(1)-(5) [ab]	3,266	2,263	4,052	3,132

Source: Interview Survey, 2007

a: $p<0.05$(t-test) between Group I and Group II
b: $p<0.05$(t-test) between Group II and Group III
c: $p<0.05$(t-test) between Group I and Group III

TRAINING AND INVITATION PROGRAMS

AND INFORMATION EVENTS

INVITATION PROGRAMS AT JIRCAS

In keeping with its role as an international research center, JIRCAS has implemented several invitation programs for foreign researchers and administrators at counterpart organizations. These programs facilitate the exchange of information and opinions on agriculture, forestry, and fisheries research, their implementation and administration, while at the same time strengthening international research ties among scientists and administrators in other countries, mostly in the developing regions. Current programs are described in greater detail below.

Administrative Invitation Program

Under the Administrative Invitation Program, JIRCAS invites administrators from counterpart organizations to its Tsukuba premises to engage in discussions and reviews of ongoing research to ensure that collaborative projects run smoothly. In addition, the program exposes administrators to the current activities at JIRCAS and other MAFF-affiliated Incorporated Administrative Agencies (IAAs). Finally, the program provides opportunities for the exchange of information and opinions concerning policy-making and project design at the administrative level, thereby contributing to deeper mutual understanding and international collaboration. Thirty-four individual visits to JIRCAS were made during FY 2007 under the Administrative Invitation Program. Invited administrators and their home institutions are listed below.

Administrative Invitations, FY 2007

Cesar Martinez	International Center for Tropical Agriculture (CIAT), Colombia	July 8-11, 2007
Manabu Ishitani	International Center for Tropical Agriculture (CIAT), Colombia	July 8-11, 2007
Zaida Lentini	International Center for Tropical Agriculture (CIAT), Colombia	July 8-11, 2007
Huixia Wu	International Maize and Wheat Improvement Center (CIMMYT), Mexico	July 8-11, 2007
Matthew Reynolds	International Maize and Wheat Improvement Center (CIMMYT), Mexico	July 8-11, 2007
Rachid Serraj	International Rice Research Center (IRRI), Phillipines	July 8-11, 2007
Philippe Herve	International Rice Research Center (IRRI), Phillipines	July 8-11, 2007
Maricris Zaidem	International Rice Research Center (IRRI), Phillipines	July 8-11, 2007
Wan Razali	Forest Research Institute, Malaysia	Sep. 11-14, 2007
Masaru Iwanaga	International Maize and Wheat Improvement Center (CIMMYT), Mexico	Sep. 11-14, 2007
Mohan Chandra Saxena	International Center for Agricultural Research in Dry Areas (ICARDA), Syrian Arab Republic	Sep. 11-17, 2007
Jacques Van Outryve	The International Federation of Agricultural Journalists (IFAJ), Belgium	Sep. 12-14, 2007
Pramuk Tichakorn	Royal Forest Department, Thailand	Sep. 2-8, 2007
Somchai Choochuai	Royal Forest Department, Thailand	Sep. 2-8, 2007

Somnuk Topoang	Royal Forest Department, Thailand	Sep. 2-8, 2007
Sumet Sirilak	Royal Forest Department, Thailand	Sep. 2-8, 2007
Thongchai Prathumsuwan	Royal Forest Department, Thailand	Sep. 2-8, 2007
Wichai Lamwilai	Royal Forest Department, Thailand	Sep. 2-8, 2007
Malee Sermvongtrakul	Royal Forest Department, Thailand	Sep. 2-8, 2007
Nawarat Anomasiri	Royal Forest Department, Thailand	Sep. 2-8, 2007
Papa Abdoulaye Seck	AFRICA RICE CENTER (WARDA), Benin	Sep. 9-13, 2007
Inoussa Akintayo	AFRICA RICE CENTER (WARDA), Benin	Sep. 9-15, 2007
Moussa Sie	AFRICA RICE CENTER (WARDA), Benin	Sep. 9-15, 2007
Chee Phaik Ean	Fisheries Research Institute (FRI), Malaysia	Sep. 30-Oct. 6, 2007
Suriyan Tunkijjanukij	Faculty of Fisheries, Kasetsart University, Thailand	Oct. 9-16, 2007
Jagadish Rane	International Center for Tropical Agriculture (CIAT), Colombia	Jan. 15-18, 2008
Carolina Saint Pierre	International Maize and Wheat Improvement Center (CIMMYT), Mexico	Jan. 15-18, 2008
Matthew Reynolds	International Maize and Wheat Improvement Center (CIMMYT), Mexico	Jan. 15-18, 2008
Nina Rosa F. Castillo	International Rice Research Center (IRRI), Phillipines	Jan. 15-18, 2008
Suwannee Vitayaudom	Bureau of Policy and Planning, Office of the Vocational Education Commission, Ministry of Education, Thailand	Feb. 17-23, 2008
Songsak Vitayaudom	Royal Forest Department, Thailand	Feb. 17-23, 2008
Visoot Somnuk	Royal Forest Department, Thailand	Feb. 17-23, 2008
Raja Mohammad Noordin bin Raja Omar	Fisheries Research Institute (FRI), Malaysia	Mar. 17-25, 2008
Mahamadou Gandah	Institute National de la Recherche Agronomique du Niger (INRAN), Niger	Mar. 17-27, 2008

Counterpart Researcher Invitation Program

The Counterpart Researcher Invitation Program provides invitations for periods of up to six months to researchers engaged in collaborative work with JIRCAS research staff. Counterparts conduct in-depth research at JIRCAS, at other MAFF-affiliated IAAs, at prefectural research institutes, or at national universities. This invitation program aims both to enhance the quality of research conducted overseas and to facilitate exchanges of individual research staff between JIRCAS and the counterpart institutions. Thirteen researchers were invited under this program during FY 2007. Invited researchers, their affiliated research organizations, and their research activities are summarized below.

Counterpart Researcher Invitations, FY 2007

Alias bin Man	Fishery Resources Section, Fisheries Research Institute, Malaysia	Studies of ecology and stock mangement of fishery resources	Nov. 4-23, 2007
Tan He	Cultivation and Planting Institute, Heilongjiang Academy of Agricultural Sciences, P.R. China	Application and evaluation of early warning technologies	Nov. 1-30, 2007
Siwaret Arikit	Rice Science Center of Excellence, Kasetsart University, Thailand	Functional analysis of Os2AP and BADH in several aromatic and non-aromatic rice	July 3-Aug. 11, 2007
Tan He	Cultivation and Planting Institute, Heilongjiang Academy of Agricultural Sciences, P.R. China	Application and evaluation of early warning technologies	Aug. 16-31, 2007
Wanna Angthong	Khon Kaen Animal Nutrition Research and Development Center, Thailand	Establishment of rapid estimation method for the metabolizable energy value and the potential of methane production in feed by comparing in vitro incubation and in vivo gas exchange measurement	Sep. 17-Oct. 26, 2007
Krailert Taweekul	Dept. of Agricultural Extension, Faculty of Agriculture, Khon Kaen University, Thailand	Expansion of technology development through farmer exchange	Sep. 25-Oct. 24, 2007
Xu Yinlong	Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, P.R. China	Composition and application of mesh climate dataset for analyzing natural disasters for analyzing natural disasters	Sep. 9-16, 2007
Nguyen Loc Hien	College of Agriculture and Applied Biology, Can Tho University, Vietnam	Analysis of Os2AP and BADH in several Vietnamese aromatic and non-aromatic rice varieties	Jan. 6-Feb. 1, 2008
Nguyen Loc Hien	College of Agriculture and Applied Biology, Can Tho University, Vietnam	Analysis of Os2AP and BADH in several Vietnamese aromatic and non-aromatic rice varieties	Jan. 9-Feb. 6, 2008
Liyuan Li	Agricultural Policy Division, Institute of Agricultural Economics and Development, Chinese Acadeny of Agricultural Sciences, P.R. China	Evaluation of the benefits of early warning systems by farm planning model	Jan. 10-Feb. 15, 2008
Samuel M. Contreras	Bureau of soil and water management, Water resources Management Division, Phillipines	Effects of plow pan destruction on soil water dynamics	Jan. 28-Feb. 26, 2008
Ronald Allan A. Dimaano	Bureau of soil and water management, Soil Conservation and Management Division, Phillipines	Effects of no till farming on soil erosion	Jan. 28-Mar. 9, 2008

Project Site Invitation Program

In FY 2007, JIRCAS launched this invitation program to invite researchers from developing countries to the project sites in developing countries, where JIRCAS researchers are engaged in JIRCAS-funded collaborative research activities on various research themes relevant to the projects on site, and other countries where workshops or planning meetings are held. Under this program, thirty-two researchers were invited and implemented their programs listed below.

Project Site Invitations, FY 2007			
Bounthong Bouaham	National Agriculture Forestry Research Institute, Lao PDR	Upland agriculture in transition from traditional to intensification in Laos	Apr. 30-May 12, 2007
Linkham Douangsavanh	National Agriculture Forestry Research Institute, Lao PDR	Food Security of Shifting Cultivation Systems	Apr. 30-May 12, 2007
Koichi Futakuchi	Africa Rice Center (WARDA), Benin	Invited Speaker of Workshop	Jun. 4-6, 2007
Marie-Josee Sogbossi	Africa Rice Center (WARDA), Benin	Invited Speaker of Workshop	Jun. 4-6, 2007
Moussa Sie	Africa Rice Center (WARDA), Benin	Invited Speaker of Workshop	Jun. 4-6, 2007
Ngo Ngoc Hung	College of Agriculture, Can Tho University, Vietnam	Good Soil Care Planning Meeting	Jul. 1-4, 2007
Luu Hong Man	Cuu Long Delta Rice Research Insitute, Vietnam	Good Soil Care Planning Meeting	Jul. 1-4, 2007
Attachai Jintrawet	Faculty of Agricultute, Chiang Mai University, Thailand	Good Soil Care Planning Meeting	Jul. 1-4, 2007
Prapit Sangtong	Soil Chemistry Research Group, Department of Agriculture, Thailand	Good Soil Care Planning Meeting	Jul. 1-4, 2007
Suphakarn Luanmanee	Soil Chemistry Research Group, Department of Agriculture, Thailand	Good Soil Care Planning Meeting	Jul. 1-4, 2007
Fe A. Dela Pena	Crop Protection Division, Philippine Rice Research Institute (PhilRice), Phillipines	Development of differential system in Philippines	Oct. 9-14, 2007
Santoso, MSi	Fitopathology Division, Indonesian Institute for Rice Research (BALITPA), Indonesia	Development of differential system in Indonesia	Oct. 9-14, 2007
Suwarno	Indonesian Institute for Rice Research (IIRR), Indonesia	Development of differential system in Indonesia	Oct. 9-14, 2007
Cailin Lei	Institute of Crop Sciences, Chinese Academy of Agricultural Sciences, P.R. China	Development of differential system in China	Oct. 9-14, 2007
Sobrizal	National Nuclear Energy Agency, Center for Application of Isotop and Radiation Technology, Indonesia	Development of differential system in Indonesia	Oct. 9-14, 2007
Loida M. Perez	Plant Breeding and Biotech Div., Philippine Rice Research Institute, Phillipines	Development of differential system in Philippines	Oct. 9-14, 2007
Le Cam Loan	Plant Pathology Department, Cuu Long Delta Rice Research Institute, Vietnam	Development of differential system in Vietnam	Oct. 9-14, 2007
Pham Van Du	Plant Pathology Department, Cuu Long Delta Rice Research Institute, Vietnam	Development of differential system in Vietnam	Oct. 9-14, 2007

Jian-li Wu	The China National Rice Research Institute, P.R. China	Development of differential system in China	Oct. 9-14, 2007
Wilfrido Morel Paiva	Centro Regional de Investigacion Agricola (CRIA), MAG, Paraguay	Development of evaluation method for soybean rust (at INTA EEA Pergamino)	Nov. 19-27, 2007
Rafael Moreira Soares	Empresa Brasileira de Pesquisa Agropecuaria, Centro Nacional de Pesquisa de Soja, (Embrapa Soja), Brazil	Development of evaluation method for soybean rust (at INTA EEA Pergamino)	Nov. 19-28, 2007
Diah Setyorini	Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Indonesia	Intensive Progran on DSSAT 4.5 & CropDSS tool	Nov. 25-Dec. 7, 2007
Nguyen Van Qui	Soil Science Department, College of Agriculture & Applied Biology, Can Tho University, Vietnam	GSC Intensive Progran on DSSAT 4.5 & CropDSS tool	Nov. 25-Dec. 7, 2007
Thongly Xayachack	Department of Livestock and Fisheries, Faculty of Agriculture, National University of Laos, Lao PDR	Results and Planning Meeting of Research Project for Establishment of Feeding Standard of Beef Cattle and Feedstuff Database in Indochina	Nov. 27-28, 2007
Viengsakoun Napasirth	Department of Livestock and Fisheries, Faculty of Agriculture, National University of Laos, Lao PDR	Results and Planning Meeting of Research Project for Establishment of Feeding Standard of Beef Cattle and Feedstuff Database in Indochina	Nov. 27-28, 2007
Ek Makara	Royal University of Agriculture, Faculty of Animal Science and Veterinary Medicine, Cambodia	Results and Planning Meeting of Research Project for Establishment of Feeding Standard of Beef Cattle and Feedstuff Database in Indochina	Nov. 27-28, 2007
Kimsan Sophorn	Royal University of Agriculture, Faculty of Animal Science and Veterinary Medicine, Cambodia	Results and Planning Meeting of Research Project for Establishment of Feeding Standard of Beef Cattle and Feedstuff Database in Indochina	Nov. 27-28, 2007
Kongkeo Phachomphon	National Agriculture Forestry Research Institute, Lao PDR	Development of water resources and efficient use of water in rural area in Laos	Dec. 5-9, 2007
Na-Nakorn Uthairat	Faculty of Fishries, Kasetsart University, Thailand	Development of Integrated Shrimp Culture System for Sustainable Production	Jan. 7-9, 2008
Prapansak Srisapoome	Faculty of Fishries, Kasetsart University, Thailand	Development of Integrated Shrimp Culture System for Sustainable Production	Jan. 7-9, 2008
Suriyan Tunkijjanukij	Faculty of Fishries, Kasetsart University, Thailand	Development of Integrated Shrimp Culture System for Sustainable Production	Jan. 7-9, 2008
Dusit Aueumneoy	King Mongkut's Institute of Technology Ladkrabang (Rayong Campus), Thailand	Development of Integrated Shrimp Culture System for Sustainable Production	Jan. 7-9, 2008

FELLOWSHIP PROGRAMS AT JIRCAS

JIRCAS Visiting Research Fellowship Program at Tsukuba

A program similar to the Okinawa Visiting Research Fellowship Program has been implemented at JIRCAS' Tsukuba premises since October 1995. The Tsukuba Visiting Research Fellowship Program aims to promote collaborative research to address various problems confronting countries in the developing regions. Under this program, eleven researchers are invited to conduct research at JIRCAS HQ in Tsukuba for a period of one year from May 2007 to April 2008. The fellows and their research topics are listed below.

JIRCAS Visiting Research Fellowships at Tsukuba (May 2007 to April 2008)

Aladdin Hamwieh	International Center for Agricultural Research in the Dry Areas (ICARDA), Syria	Development DNA markers associated with tolerance to environmental stresses in soybean
Chunhua Fu	College of Life Science and Technology, Huazhong University of Science and Technology, P.R. China	Identification of genes that function in environmental stress tolerence and useful promoters in crops
Nguyen Thi Minh Nguyet	Department of Science and International Cooperation, Agricultural Genetics Institute, Vietnam	Marker-aided breeding for blast resistance gene in rice
Chakrit Tachaapaikoon	Pilot Plant Development and Training Institute (PDTI), King Mongkut's University of Technology Thonburi, Thailand	Efficient degradation of crop residues using microbial enzymes
Waraporn Apiwatanapiwat	Nanotechnology and Biotechnology, Kasetsart Agricultural and Agro-Industrial Improvement Institute, Thailand	Ethanol production from crop residues using genetically engineered microorganisms
Natchaya Khetkratok	Groundwater Research Center, Faculty of Technology, Khon Kaen University, Thailand	Surface water analysis in rainfed paddy fields using hydrologic model and GIS
A.K.M. Zakir Hossain	Department of Crop Botany, Faculty of Agriculture, Bangladesh Agricultural University, Bangladesh	Induction mechanism of nitrification inhibition in plants
Rotimi Rufus Ipinmoroti	Soils and Plant Nutrition Group, Cocoa Research Institute of Nigeria, Nigeria	Effects of nitrification inhibition by plants on nitrogen dynamics in soils
Soni Darmawan	Center for Remote Sensing Institute Teknologi Sensing, Indonesia	Development of a spatiotemporal agricultural land use monitoring system in Southeast Asia using remote sensing technology
Dang Thi Dung	Department of Entomology, Faculty of Agronomy, Hanoi Agricultural University, Vietnam	Ecological studies on parasitoids for biological control
Heguang Liu	Institute of Agricultural Economics and Development (IEA), Chinese Academy of Agricultural Sciences (CAAS), P.R. China	Analysis of changing patterns in comparative advantage for major agricultural commodities and processed foods in East Asia

JIRCAS Visiting Research Fellowship Program at Okinawa

The Okinawa Visiting Research Fellowship Program was initiated in FY 1992. The program invites researchers to conduct research on topics relating to tropical agriculture for a period of one year at the Tropical Agriculture Research Front (TARF) (formerly Okinawa Subtropical Station). In FY 2007, two researchers were invited and worked on the research subjects listed below.

JIRCAS Visiting Research Fellowships at Okinawa (May 2007 to April 2008)

Payungsak Rauyaree	Biotechnology Research and Development Office, Department of Agriculture, Thailand	Cloning and expression analysis of proline-accumulation related genes in Vigna (cowpea)
Muhammad Fiaz Joyia	Pakistan Agricultural Research Council (PARC), RRP Institute of Natural Resources & Environmental Sciences (INRES)National Agricultural Research Center (NARC), Pakistan	Development of water-saving techniques by increasing subsoil-stored water use

JIRCAS Visiting Research Fellowship Program at Project Sites

This fellowship program has been implemented since May 2006 at collaborating research institutions located in developing countries where collaborative research is being carried out by JIRCAS researchers. It aims to promote the effective implementation of ongoing collaborative research at the project sites through the participation of local research staff. Furthermore, through this fellowship program, JIRCAS intends to contribute to capacity-building at the collaborating research institutions. In FY2007, three researchers were invited to Thailand and Pakistan. The fellows and their research subjects are listed below.

For more information on the JIRCAS Visiting Research Fellowship Program, please contact the International Relations Section, Japan International Research Center for Agricultural Sciences, 1-1 Ohwashi, Tsukuba, Ibaraki 305-8686. (Tel. +81-29-838-6335; Fax +81-29-838-6337; e-mail: irs-jircas@ml.affrc.go.jp)

JIRCAS Visiting Research Fellowships at the Project Site (May 2007 to April 2008)

Poonmanee Kanjanaworakul	Department of Aquaculture, Faculty of Fisheries, Kasetsart University, Thailand	Application of Rhizoclonium species (Cladophoraceae) to shrimp feeds: Towards the development of a low cost zero-discharge intensive shrimp culture system with discarded seaweeds
Muhammad Farooq	Department of Agronomy, University of Agriculture, Pakistan	Phenotypic and genotypic evaluation of rice breeding lines suitable for water-saving cultivation
Jutamas Sitthiwong	Department of Animal Science, Faculty of Agriculture, Ubonratchathani University, Thailand	Comparison between in vitro and in vivo nutritive value in tropical feed

Other fellowships for visiting scientists

The Government of Japan sponsors a postdoctoral fellowship program for both Japanese and foreign scientists through the Japan Society for the Promotion of Science (JSPS). The program places post-doctoral and sabbatical fellows in national research institutes throughout Japan according to research theme and prior arrangement with host scientists, for terms of generally one month to three years. Fellowships can be undertaken in any of the ministries, and many fellows are currently working at various IAAs affiliated with MAFF. The visiting scientists that resided at JIRCAS in 2007 are listed below.

JSPS Postdoctoral Fellowships for Foreign Researchers (October 2005 to November 2009)

Humnath Bhandari	Visiting Research Fellow, Social Sciences Divisioin, IRRI, Phillipines	Impact of social capital on water management in different rice ecosystem in Southeast Asia	October 3, 2005-October 2, 2007
Subramaniam Gopalakrishnan	India	Biochemical, Physiological and molecular characterization of nutrification inhibitor from root ecudates of *Brachiaria Humidicola*	November 30, 2005-November 29, 2007
Syeda Shahnaz Parvez	Bangradesh	Bioavailability of antioxidative phenolics from selected edible plants consumed in Southeast Asia	September 1, 2006-August 31, 2008
Yiyong Zhu	Nanjing Agricultural University, P.R.China	Role of plasma membrane H-ATPase in regulating the NI activity release from *B. Humidicola*	October 1, 2006-September 30, 2008
Asad Jan	Assistant Professor, Institute of Biotechnology and Genetic Engineering, NWFP Agricultural University, Pakistan	Analysis of plant grouth regulation under abiotic stress conditions	November 1, 2006-October 31, 2008
Hoi Xuan Pham	National Institute of Agricultural Genetics, Vietnam	Promoter analysis of abiotic stress-inducibe genes in rice	October 22, 2007-December 20, 2007
Feng Qin	P.R. China	Functional analysis of DREB2 transcription factors involved in drought and salt stress in plants	Novermber 30, 2007- Novermber 29, 2009

WORKSHOPS

Workshop on rainfed rice improvement to environmental stress in Africa

The Workshop's Opening ceremony.

The workshop was held under the joint sponsorship of JIRCAS and the Institut de Recherche Agronomique de Guinée (IRAG) from June 5-6, 2007 at Conakry in Guinea. The workshop was organized to show the direction of rice research under conditions of environmental stress in Africa and to announce the results of joint research into improvement of water-stress-resistance of rainfed rice between JIRCAS and IRAG over the three years since 2004. Participants discussed questions of sociology and natural science on the first day of the workshop and the development of rice on the second. All the presentations were in French. About fifty researchers, engineers and extension workers from the National Service of Rural Promotion and Agricultural Extension (SNPRV), the Agricultural Study and Planning Office (BCEPA), the Confederation of National Organizations of Farmers (CNOP), the Africa Rice Center (WARDA), the International Research Center for Agricultural Development (CIRAD), the Japan International Cooperation Agency (JICA), IRAG and JIRCAS were invited to the workshop. A clear consensus emerged on the importance of development in the lowlands through the planting of higher-performance cultivars and useful technology such as water management to improve rice production in Africa, in particular Guinea.

Presentations on the workshop's first day

Session 1: Improvement of rice varieties. Chaired by Dr. Jun-Ichi Sakagami of JIRCAS

- Genetic diversity of rice in Guinea: Dr Mamadou Billo Barry, IRAG
- Success story of CK cultivar in rice breeding in Guinea: Mr. Malick Soumah, Killisi, IRAG
- Development of lowland NERICA for West and Central Africa: Dr. Sie Moussa, WARDA
- Genotypic adaptability of selected cultivars in Guinea through three years of field experiments: Lamine Djarakoro Doumbouya, JIRCAS/ IRAG

Session 2: Crop improvement on resistant mechanism of inadequate environment in rainfed rice. Chaired by Dr Mamadou Billo Barry, IRAG

- Rice ecology and cultivation in Guinea: Mr. Pendessa Alhassane, SNPRV
- Rice cultivation in inundated areas of coastal regions in Guinea: Mr. Camara Abdoul Karim, Koba, IRAG
- Evaluation of water stress resistance in rainfed rice: Dr. Jun-Ichi Sakagami, JIRCAS/ IRAG
- African rice (*Oryza glaberrima* Steud.)—exploitation of its assets in rice breeding: Dr. Koichi Futakuchi, WARDA

Session 3: Socioeconomic issues in rice cultivation. Chaired by Dr. Takashi Nanya, JICA

- NERICA adoption and impact in Guinea: Dr Marie-Josee Sogbossi, WARDA
- The economics of intensive rainfed lowlands: Mr. Sekou Diawara, Director, IRAG
- Experience of community-based seed multiplication systems in Guinea: Ali Conde, ARI
- Future strategies for rice development and research through IRAG and international relations in Guinea: Sékou Béavogui, Director, IRAG

Session 4: General Discussion. Chaired by Mr. Sékou Béavogui and Dr. Jun-Ichi Sakagami

NIAES/JIRCAS/NARO-NARC/FFTC/ESAFS International Symposium Eighth Conference of the East and Southeast Asia Federation of Soil Science Societies (ESAFS8)

This symposium, entitled "New Challenges for Agricultural Science – Harmonizing Food Production with the Environment" was held at Tsukuba International Congress Center on October 22–23, 2007 with 305 participants: 188 from Japan and 117 from abroad, including delegates from all 12 member societies from Bangladesh, China, India, Indonesia, Japan, Korea, Malaysia, Philippines, Sri Lanka, Taiwan, Thailand, and Vietnam.

Three topics were discussed in the keynote sessions with three speakers in each session. They were 1. Water management for sustainable production; 2. Crop production under environmental stress, and 3. New solutions to soil pollution. Discussion points can be summarized as follows: 1. More intensive studies are needed on the effect of land management changes such as water saving management and upland-lowland rotation of paddy fields on soil carbon and nitrogen status as well as greenhouse gas emissions; 2. Public acceptance of stress-tolerant genetically modified crops is important in utilizing those crops; 3. Arsenic pollution should be studied more intensively in Asia, since a lot of research has been already done on cadmium pollution.

Oral sessions consisted of 30 presentations. Among them, 12 reports from member societies, 18 reports from contributed papers for three categories: Distribution, Bioavailability and Management of Heavy Metals; Soil Genesis, Classification and Soil Management; and Plant Nutrition, Fertilizer Application, Microorganisms, and the Environment. Poster sessions consisted of 195 presentations, comprising 50 on soil, 40 on plant nutrition and fertilizer application methods, 31 on heavy metal pollution, 19 on environmental pollution other than heavy metals, 16 on greenhouse gas and carbon budgeting, 10 on information systems, and 9 on water management and salinization.

JIRCAS contributed to this symposium in the form of planning (1 person), conveners (2 persons), invited speakers for keynote sessions (2 persons), oral presentations (1 person), and poster presentations (4 persons). The abstracts of this symposium contain the latest soil and plant nutrition research now being carried out in the target Asian area.

Program:

Keynote Session 1: Water management for sustainable production

- "Coping with water shortage in irrigated rice: Implications for nutrient management and sustainability" To Phuc Tuong, Chiba University, IRRI
- "Whether water saving reduces the global warming potential of irrigated paddies" Yasukazu Hosen, IRRI, JIRCAS
- "Paddy-upland rotation induces deterioration of soil fertility" Misuhiko Nishida, the National Agricultural Research Center for Tohoku Region

Keynote Session 2: Crop production under environmental stress

- "Use of alkali tolerant plant for the improvement of high saline-alkali soil in northeast China" Zhengwei Liang, CAS
- "P and Zn deficiency in rice: Tolerance mechanisms and underlying genetic factors" Matthias Wissuwa, JIRCAS
- "Enhancing tolerance in rice to low iron availability in calcareous soils" Naoko K. Nishizawa, the university of Tokyo

Keynote Session 3: New solution to soil pollution

- "New aspect of collaborative research on the soil pollution, food safety and soil remediation technique in Asia" Zueng-Sang Chen, National Taiwan University
- "Heavy metal pollution, risk assessment and remediation paddy soil environment: Research experiences and perspectives in Korea" Jae E. Yang, Kangwon National University
- "Heavy metal pollution of soil and a new approach to its remediation: Research experiences in Japan" Tomoyuki Makino, NIAES

Oral Sessions

Closing Program

Workshop: Improvement of Plant Performance for Sustainable Agricultural Development in Wetlands

Wetlands are now in an important position in the context of global climate change, human population pressure and expected economic development. Although there might appear to be an urgent need for agricultural utilization of wetlands to meet demand from ever-increasing populations, especially in Africa, any future development of wetlands should retain a balance between development and conservation. This workshop was organized to identify promising options for the agricultural development of wetlands by keeping human impact to a minimum and conserving their natural environment as much as possible through improvement of crop performance under wetland conditions. The workshop was held as a session financially supported by the Organization for Economic Co-operation and Development (OECD) at the 9th Conference of the International Society for Plant Anaerobiosis (ISPA), from November 18 to 23, 2007 in Matsushima, Japan. The ISPA's membership consists of scientists interested in plant responses to impeded aeration caused by various reasons, including waterlogging, submergence, natural tissue impedance, storage conditions and packaging of produce. Waterlogging and submergence, typical environmental stresses that can be seen in the wetlands, were two major themes at the ISPA conference, attracting many specialists in this field.

Program:

- OECD activities worldwide
  J.S. Scheperes

General information on the current state of wetlands

- Intensification of Rainfed Lowland Rice Production in West Africa
  Takeshi Sakurai
- Agricultural use of different types of wetlands: opportunities and limitations.
  Jos T.A. Verhoeven
- Learning from traditional agricultural systems: hidden functions and behavior of rhizobacteria in local plants and crops.
  Yasuyuki Hashidoko
- Large diversity of species and survival strategies in trees of Amazonian floodplain forests, and sustainable management options.
  Pia Parolin and Wolfgang J. Junk

Crop production on physio-agronomical issues

- Review of wheat improvement for waterlogging tolerance in Australia and India: the importance of anaerobiosis and element/microelement toxicities associated with different soils.
  T.L. Setter, K.N Singh, N. Kulshreshtha, S.K. Sharma, N.P.S. Yaduvanshi, P.C. Ram, B.N. Singh, J. Rane, G. McDonald, H. Khabaz-Saberi, B. Biddulph, R. Wilson, I. Barclay, R. McLean, M. Cakir, F. Drake-Brockman and I. Waters
- The morphological and physiological responses of rice seedlings to flash floods.
  Naoyoshi Kawano, Osamu Ito and Jun-Ichi Sakagami
- The root-soil interface in wetlands
  Guy Kirk

Crop improvement via genetic issues

- Development of flooding tolerance adaptations in natural wetland plants and their determination of inter-specific differences in survival, performance and distribution.
  Brian Sorrell
- Tolerance of Soybean Crops to Soil Waterlogging.
  Tran Thi Cuc Hoa, Tara VanToai, Nguyen Thi Ngoc Hue, Henry Nguyen, Grover Shannon, and Bert Bishop
- *Submergence-1* genes regulate ethylene and gibberellic acid-mediated acclimation responses to submergence in lowland rice (*Oryza sativa*).
  Takeshi Fukao, Tristan Harris and Julia Bailey-Serres

International Workshop: Assessment of Changes in Water Cycles on Food Production and Alternative Scenarios: Implications for Policy Making

Water problems such as droughts, floods, and deterioration of water quality have become of increasing concern around the world. Population growth increases demand for food and piped water. As food consumption increases, demand for water and land for agricultural production will correspondingly increase. The expansion of agricultural land may lead to deforestation that reduces the water storage capacity of the ecosystem. It is anticipated that the surge in water demand will change the hydrological cycle. Alternatively, climatic changes caused by global warming lead to the acceleration of the water cycle and will probably increase water supply instability. Water is a crucial input for agricultural production, and the supply is highly influenced by hydrological cycle changes.

To solve problems caused by changes in water accounting, researchers in hydrology and climatology have analyzed changes in the global water cycle. This project has undertaken research to propose scenarios for optimum water resource distribution, to develop social guidelines and to aid the design of agricultural policies and plans. Models developed in this project are integrated into a food supply and demand model that takes water cycle changes into account. The integrated model is used for evaluating efficient water use and technologies for agricultural production.

At this workshop, features of the

project, outcomes, and policy implications were presented. Furthermore, several leading researchers were invited from overseas to discuss views on possible scenarios.

The symposium was held on November 22, 2007 at Epochal Tsukuba, Japan, organized by the Agriculture, Forestry and Fisheries Research Council Secretariat (AFFRC) of MAFF, the Forestry and Forest Products Research Institute (FFPRI), the National Institute for Agro-Environmental Sciences (NIAES), the National Institute for Rural Engineering (NIRE), and the Japan International Research Institute for Agricultural Sciences (JIRCAS).

Program

Opening Address

Mr. Masahiro SUGA, Agriculture Forestry and Fishery Research Council, MAFF

Outline of Workshop Agenda

Dr. Takao MASUMOTO, NIRE (Project Leader)

Keynote Address

An integrated economic-hydrologic model and alternative water policy analysis of the Mekong River Basin: Prof. Ximing CAI, University of Illinois at Urbana-Champaign, USA

Morning Session

Monitoring the water cycle dynamic in forested areas: Dr. Yoshio TSUBOYAMA, FFPRI, Japan

Use of a water balance model for improving the productivity of rainfed lowland rice ecosystems: A case study in Laos: Dr. Shu FUKAI, University of Queensland, Australia

Simulating the regional grain yields of rain-fed lowland rice in northeast Thailand as affected by variable water and nitrogen supply conditions: Dr. Toshihiro HASEGAWA, NIAES, Japan

Afternoon Session

Identification of irrigation by pumping groundwater in Cambodia: Dr. Seng VANG, CARDI, Cambodia

Development of a distributed hydrologic model for assessing human interaction in agricultural water use: Dr. Naoki HORIKAWA, NIRE, Japan

Water for food modeling: Lessons from the comprehensive assessment of water management in agriculture, with examples from the Mekong watershed: Dr. Charlotte de Fraiture, IWMI, Sri Lanka

Impacts of water cycle changes on the rice market in lower Mekong countries: Dr. Jun FURUYA, JIRCAS, Japan

Poster presentation

Panel session and general discussion

Closing address

Dr. Takami KOMAE, Director General, NIRE

JIRCAS-United Nations University Joint Workshop on "Current Situation and Future Development of Mongolian Animal Husbandry under Changing Social and Environmental Conditions"

The Mongolian economy largely depends on its livestock sector. However, since its transition to a market economy, the sector faces the challenges of desertification due to overgrazing and frequent occurrence of natural disasters. While coping with these setbacks that threaten the traditional nomadic way of grazing, new developments such as a transition to settled or semi-settled style of animal husbandry and the allotment of grazing rights to pastoralists are being seen.

Two experts from the Ministry of Food and Agriculture of Mongolia were invited to Japan by JIRCAS. Together with United Nations University (UNU), we set up an international workshop to discuss current policies on animal husbandry and legal and institutional frameworks for grazing lands in Mongolia. The workshop was held at Elizabeth Rose Conference Hall, UNU in Tokyo on March 13, 2008. Eighty-six people from universities, research institutes, private companies, NPOs, etc., participated in the

workshop.

At the workshop, Mr. Ivirai Khanimkhan (Director General of the National Agricultural Extension Center) and Dr. Bataa Bynie (Head of the Strategic Planning Division) at the Ministry of Food and Agriculture, Mongolia, gave keynote lectures on the "Current Situation of Animal Husbandry Policy in Mongolia" and "Land Use System and Laws Related to Animal Husbandry in Mongolia," respectively.

Following the lectures, a presentation regarding the research outline of the project, "Development of a sustainable agro-pastoral system in dry areas of Northeast Asia project" was delivered by Dr. Kazunobu Toriyama (Project Leader, JIRCAS). Presentations regarding the research outputs of the project, namely, "Current Situation and Problems of Dairy Farming in Mongolia" by Dr. Hiroshi Komiyama (Senior Researcher, JIRCAS) and "Pastoral Economy and Market Access in Mongolia" by Dr. Shunji Oniki (Senior Researcher, JIRCAS) were also provided.

Lastly, presentations on relevant research projects focusing on climate change and meteorological disasters, namely, "Early Monitoring Network for Climate Change Impacts in East Asia and Climate Change Impacts in Mongolia" from Dr. Qinxue Wang (Chief Researcher, Asian Water Environment Section, Asian Environment Research Group, National Institute for Environmental Studies [NIES]) and "Developing a Nationwide Early Warning System of Meteorological Disasters for the Mongolian Mobile Pastoralism" by Prof. Masato Shinoda (Arid Land Research Center, Tottori University) were presented.

Hot topics at the workshop were the promotion of intensive animal husbandry around cities and the allotment of grazing rights to pastoralists. From the floor, many kinds of questions and opinions were exchanged during the presentations. There was ample opportunity to discuss from various viewpoints the future direction of Mongolian animal husbandry, with the participants generally concurring.

Dr.Kenji Iiyama,President of JIRCAS, gave the Opening Remarks at the workshop.

The 2007 JIRCAS Open Lecture Series

The Tropical Agriculture Research Front (TARF) aims to become a more open research organization to help it to promote its research activities backed by stronger support and understanding of the people of Okinawa. To this end, JIRCAS is being introduced to the public through various events, such as an Open House once a year and the establishment of a permanent exhibition room.

In this financial year, the first ever JIRCAS Open Lecture Series was held to promote mutual exchange between the public and JIRCAS. The lectures gave an account of TARF's ongoing research, including results and its staffs' research experiences in foreign countries, to the general public.

2007 JIRCAS Open Lecture Series — April 12

Lecture	1st	2nd	3rd	4th	5th
Theme	**Grafting tropical fruit trees**	**What is a genetically modified plant?**	**An interesting story about sugarcane**	**Growing crops without cultivating the soil: conservation agriculture worldwide**	**Life and research on citrus greening disease control in Vietnam: Vietnam seen from the viewpoint of an orange**
Date	May 22, 2007	July 30, 2007	October 10, 2007	December 11, 2007	January 21, 2008
Place	Ohama Community Center	Ishigaki City Health and Welfare Center	Ishigaki City Health and Welfare Center	Ishigaki City Health and Welfare Center	Ishigaki City Health and Welfare Center
Speaker	Yoshimi Yonemoto	Mariko Shono	Mitsunori Sato	Fujio Nagumo	Katsuya Ichinose
Content	• Tree grafting demonstration	• Genes and DNA—what's the difference?	• Where does table sugar come from?	• Soil erosion worldwide	• Research projects at TARF: Problems with citrus greening disease
	• Four conditions for a successful tree grafting	• Improvement of varieties and genes of crops	• The untold story of the origin of sugarcane and its characteristics	• What is conservation agriculture?	• Possible solution to the problem
	• What is good about grafted trees?	• Method for producing blue rose through genetic modification	• Sugarcane production situation around the world	• Non-tillage farming	• Realities in Vietnam concerning citrus greening disease
	• Caring for grafted trees	• Examples of genetically modified crops	• How to increase sugarcane production in Ishigaki	• Farming techniques in different parts of the world	• Life as a researcher in Vietnam
					• Understanding Vietnam through research
Number of participants	154	37	34	68	48

JIRCAS RETURN SEMINARS

At JIRCS, researchers returning from overseas dispatches or research projects give an oral presentation accompanied by a written summary of their activities that is distributed to JIRCAS staff. These sessions are termed “JIRCAS Return Seminars” and are held during the interim or upon the completion of research projects and dispatch assignments. These seminars are ordinarily held twice per month, and each year 21 scientists give presentation.

APPENDIX

PUBLISHING AT JIRCAS

OFFICIAL JIRCAS PUBLICATIONS

In English

1) JARQ (Japan Agricultural Research Quarterly)
   Vol. 41 No. 2, No. 3, No. 4
   Vol. 42 No. 1
2) Annual Report 2006
3) JIRCAS Newsletter — No. 50, No. 51, No. 52, No. 53
4) JIRCAS Working Report Series
   - No.55 Development of Technologies and Sustainable Farming Systems in the Mekong Delta of Vietnam
   - No. 56 Sustainable Production Systems of Aquatic Animals in Brackish Mangrove Areas (2005)
   - No. 57 Forefront of rice cultivation in Africa
   - No. 58 Facing the Challenge of Soybean Rust in South America

In Japanese

1) JIRCAS News — No. 50, No. 51, No. 52, No. 53
2) JIRCAS International Agriculture Series
   - No. 16 Diagnosis, design and evaluation of diversified farming in the Mekong Delta of Vietnam: Based on the farming systems research approach
4) JIRCAS Research Highlights — No. 14

RESEARCH STAFF ACTIVITY 2007-2008

Journal articles, book chapters, and monographs

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(J) Denotes articles written in Japanese; (C) Denotes articles written in Chinese: bold lettering indicates staff member at JIRCAS during FY2007.

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Medium-Term Plan of the Japan International Research Center for Agricultural Sciences

The Japan International Research Center for Agricultural Sciences (JIRCAS) was established in April 2001 as an Independent Administrative Agency (IAA) of the Ministry of Agriculture, Forestry and Fisheries, for the purpose of contributing to the improvement of technologies related to agriculture, forestry, and fisheries in tropical and subtropical areas as well as other overseas developing regions (hereinafter referred to as "developing regions") by conducting research and development in these areas.

During the first medium-term goal period, JIRCAS worked on R&D for the sustainable development of agriculture, forestry, and fisheries as well as on the expansion of international research exchanges and networks by taking both domestic and overseas situations into account, such as the adoption of the U.N. Millennium Development Goals and the announcement of the Policy for the Promotion of International Agricultural Research (decided by the Agriculture, Forestry and Fisheries Research Council in September 2003). In managing its operations, JIRCAS took advantage of its new status as an IAA and embarked on making flexible changes in its organization and system, and promoted the improvement of the quality of research and support work and their efficiency.

During the second medium-term goal period, JIRCAS plans to contribute to improving technologies for agriculture, forestry, and fisheries in the developing regions through "Research and development on agricultural, forestry, and fisheries technology geared towards providing solutions to international food and environmental problems" and "Collection, analysis and dissemination of information to grasp trends related to international food, agriculture, forestry, fisheries, and rural areas." To make these global contributions smooth and stable, JIRCAS further promotes operations such as the creation of a multilateral collaborative research system, promotion of collaborative research with world-class research organizations led by the Consultative Group on International Agricultural Research (CGIAR), establishment of a dynamic research system, strategic development of human resources, and enhancement of public relations.

Optimized allocation of research resources and improvement of various systems are implemented to carry out these activities efficiently and effectively, and to return high-quality achievements to the international community. Major research at JIRCAS is implemented as projects, and all the necessary budgets for achieving results are allocated on a project basis. Efforts will also be made to improve the system for overseas activities and to simplify administrative procedures.

For efficient and effective promotion of these operations, exchange activities are enhanced by utilizing the Japan Forum for International Agricultural Research for Sustainable Development (J-FARD), which was initiated by JIRCAS and others in 2004 to build a new partnership between Japan's international researchers and organizations in agriculture, forestry and fisheries, and to promote cross-organizational cooperation and collaboration nationwide. JIRCAS also aims to build flexible personnel and business management systems.

Through this series of activities, JIRCAS is committed to making international contributions and promoting national interests by fulfilling its responsibilities as Japan's only research institution to carry out comprehensive research in agriculture, forestry, and fisheries.

I. Measures to be taken to achieve our goal of efficient business management

As for operations implemented by operational grants for administration, operations are reviewed and efficiency is further promoted. General and administrative expenditures are cut by at least 3% from the previous year and research expenditures by at least 1% from the previous year during the medium-term goal period each year.

In line with the key policy of administrative reform (decided at the Cabinet meeting on December 24, 2005), personnel expenditures will be cut by more than 5% over the next five years (except for retirement allowances and welfare expenditures (but not applying to legal and non-legal welfare expenditures) and part of salaries revised in accordance with the recommendation by the National Personnel Authority). Necessary reviews of salaries of personnel in managerial positions are also made by taking into account the structural reform of salaries of government officials.

1. Implementation and feedback from evaluations and checks

(1) JIRCAS will use external specialists and experts to ensure its objectivity and reliability; and operations and research are evaluated and reviewed by JIRCAS itself prior to releasing its annual report to the IAA Evaluation Committee established within the Ministry of Agriculture, Forestry and Fisheries (MAFF).

(2) Numerical goals and indicators for major research projects are set as concretely as possible, and input of research resources and obtained results are analyzed from the viewpoint of ensuring contributions to the improvement of technologies concerning agriculture, forestry, and fisheries in the developing regions. JIRCAS will also make efforts to diffuse its research achievements and monitor the status of their utilization.

(3) JIRCAS will endeavor to streamline and upgrade its evaluation methods by ensuring the mutual utilization of data needed for a multiple evaluation system. It will also improve this evaluation system when necessary.

(4) To allocate research resources on a priority basis, JIRCAS will clarify basic ideas and concrete methods of feeding evaluation and feed the results of in-house evaluation back to the administrative management along with the evaluation results from the IAA Evaluation Committee.

(5) JIRCAS will make comprehensive performance evaluations of its research personnel, all the while ensuring the fairness and transparency of the evaluation items and standards. The results will be appropriately fed into the priority allocation of research resources and the treatment of research personnel.

(6) A new evaluation system will be introduced to assess the performance of general officials in light of the need to revitalize the organization and achieve better results.

2. Effective use of research resources and their improvement and upgrading

(1) Research funds
  1) Evaluation results are appropriately fed through to budget allocations, and the effective use of operational grants for administration is promoted.
  2) The planning system for acquiring competitive funds is enhanced. Efforts will be made to increase research funds and accelerate research activities by positively applying for external funds useful for achieving our medium-term goals.

(2) Research facilities and equipment
  1) Research facilities and equipment will be shared to ensure their efficient utilization. Information on machinery available for joint use and open laboratories will be widely disclosed via the Internet.
  2) Planned renovation and upgrading of old facilities essential for research promotion laid out in the Medium-Term Plan will be implemented in line with JIRCAS's research prioritization.

(3) Organization
  1) JIRCAS will be reorganized as necessary to gain optimal insight into problems in the developing regions.
  2) A leader will be assigned to each research project. Responsibility and authority is given to the leader concerning the management of the progress of the research and the allocation of research resources in the project.
  3) The functions of the local offices are strengthened in regions such as Southeast Asia where research activities are concentrated.

(4) Improvement of staff qualifications and development of human resources
  1) We will create a program aimed at developing human resources, including young researchers, to enable us to nurture personnel and improve their qualifications in a well-planned manner.
  2) Efforts will be made to improve the qualifications of researchers who play a key role in international collaborative research through their dispatch abroad or by collaborative studies with invited overseas researchers.
  3) We will create a competitive and cooperative environment for research personnel, provide them with effective incentives, develop their career path by utilizing a range of employment systems, and conduct smooth personnel exchanges with research organizations, including other IAAs.
  4) We will make efforts to improve our personnel's qualifications by having the adminis-

trative and technical staff actively participate in various training sessions needed for the pursuit of their duties and helping them to acquire qualifications useful for their jobs. Efforts will also be made to improve the system that allows technical staff to engage positively in research support.

5) The management ability and leadership of research project leaders will be improved by utilizing various training systems.

3. Promotion of efficiency, improvement, and upgrading of research support sector

(1) Maintenance of facilities and machinery will be outsourced depending on the type of job.

(2) Details of work at the General Affairs Section will be reviewed to ensure an efficient implementation system and to promote the efficiency of clerical management work by speeding up and simplifying clerical procedures.

(3) JIRCAS will provide efficient local support to researchers dispatched abroad for their experimental and accounting work.

(4) Efforts will be made to streamline, upgrade, and enhance research support by reviewing and focusing the jobs of the technical personnel onto areas that require highly specialized technology and knowledge to meet needs for advanced experimental and research work.

(5) Efforts will also be made to rationalize staffing for research support by reviewing overall support work and promoting outsourcing as much as possible.

(6) The Ministry of Agriculture, Forestry and Fisheries Research Network (MAFFIN) will be utilized to streamline, upgrade, and enhance work on the collection and provision of research information along with efforts to promote information-sharing across JIRCAS and streamline operations by utilizing groupware.

4. Promotion and enhancement of collaboration and cooperation between industry, academia, and government

(1) While taking into account our sharing of roles with other IAAs, we will positively pursue collaborative research and alliances, including personnel exchanges and cooperation between other IAAs and JIRCAS.

(2) To promote collaborative research and researcher exchange more actively, efforts will be made by utilizing J-FARD to improve information exchange and alliances with national and public research organizations, universities, the private sector, overseas organizations, international organizations, and the Japan International Cooperation Agency (JICA).

(3) Opinions will be exchanged with related IAAs, the government departments concerned, and national and public research institutes concerning the forms that alliances and cooperation should ideally take in carrying out research projects undertaken by JIRCAS.

(4) To move ahead with research projects efficiently, we will seek alliances with the government.

(5) Cooperation will be provided to the National Agriculture and Food Research Organization (NARO) as necessary in implementing comprehensive research that features a fusion of expert knowledge in diversified fields.

II. Measures to achieve the goals of improving the quality of services and other duties provided to the public

1. Research and investigations

(1) Promotion of international collaborative research and international contributions

1) To promote collaborative research and researcher exchange more actively, efforts will be made by utilizing J-FARD to improve information exchange and alliances with national and public research organizations, universities, the private sector, overseas organizations, international organizations, and JICA.

2) To contribute to problem-solving in developing regions and the improvement of technologies for agriculture, forestry, and fisheries, more than 1,000 researchers and research managers, mainly from JIRCAS but including those from other IAAs and universities, will be dispatched to research organizations in the developing and developed countries and international research organizations affiliated with the CGIAR during the second medium-term goal period to promote smooth international collaborative research and to actively participate in international contributions.

3) Research managers will be invited from research organizations in the developing regions to enhance collaboration and cooperation through consultation on the course of collaborative research promotion.
4) More than 500 collaborative researchers and research managers will be invited from agriculture, forestry, and fisheries research organizations in the developing regions during the second medium-term goal period to conduct collaborative research or improve the ability of the researchers concerned.
5) At least 80 effective Memoranda of Understanding (MOUs) and other similar contracts on research implementation between JIRCAS and overseas research organizations will be constantly maintained during the second medium-term goal period.
6) In an effort to contribute to the promotion of international collaborative research in agriculture, forestry, and fisheries, a project will be launched through tie-ups with the government sector to provide financial incentives to researchers at agriculture, forestry, and fisheries research organizations in the developing regions.

(2) Course of research promotion

In line with the course of research indicated in "the promotion policy of international agricultural research" and the "Basic Plan for Agriculture, Forestry and Fisheries Research" (decided at the meeting of the Agriculture, Forestry and Fisheries Research Council on March 30, 2005), JIRCAS will carry out the following priority research projects by utilizing J-FARD and taking into account the "Strategy for international collaborative research [JIRCAS's role]" summarizing the results of JIRCAS international symposia and investigations into overseas research organizations, and the opinions of external experts.

1) Research projects targeting the developing regions will be launched to help reduce by half the world's hungry population, as indicated in the U.N. Millennium Development Goals. For this purpose, crops tolerant to unfavorable environmental conditions that make crop production unstable, such as drought, salinity, and disease, will be jointly developed by research organizations affiliated with CGIAR.
2) Many problem-solving research projects will be enhanced, with a focus on the utilization of biological resources, environmental resources management, and measures to address environmental and food problems in Asia, designated as an area in which the strategic alliance in science and technology needs to be strengthened according to a new "Science and Technology Basic Plan."
3) JIRCAS will support international contributions to Africa as indicated in the Progress Report by the G8 Africa Personal Representatives on implementation of the Africa Action Plan at the Gleneagles G8 summit (held in July 2005) in the field of research and development. Technologies related to crops and the soil will be developed to increase crop production in Africa.
4) To contribute to achieving the target of CO2 reductions imposed by the Kyoto Protocol, research into biomass will be undertaken by JIRCAS in Southeast Asia as a research institute capable of developing a technology for biomass utilization on site.
5) There are many large and small islands in the Asia-Pacific area. They are vulnerable to environmental changes, and production activities tend to affect their surrounding environment. Concerning the protection and sustainable utilization of environmental resources on the islands, JIRCAS will also tackle problems with the production environment on such islands by making the most of the geographical advantages of the Tropical Agriculture Research Front and by working in line with the collaborative action plan adopted at the 3rd Pacific Islands Leaders' Meeting (PALM) (held in May 2003).

A. Research and development on agricultural, forestry and fisheries technology geared towards providing solutions to international food and environmental problems

(1) Development of technologies to utilize biological resources for stable production and multi-purpose applications under adverse environments

1) Elucidation of the mechanism of tolerance to abiotic stress and production of tolerant crops

This project aims at developing an evaluation method for tolerance to abiotic stress such as drought, screening of a wide range of germplasms of rice, wheat, and soybean to identify tolerant germplasms, and acquiring DNA markers linked to this tolerance

that can be efficiently used in breeding programs. In parallel with these conventional approaches, we will search for new genes through elucidation of the molecular mechanisms of stress tolerance, and will introduce these candidate genes into crops. The resultant transformants will be evaluated for their adaptability to adverse environments and their agronomic performance.

2) Improvement of drought and submergence tolerance of rice in Africa, including NERICA
   To improve the drought and submergence tolerance of rice varieties in Africa such as NERICA (a new rice for Africa), a wide range of rice germplasms will be evaluated for such tolerances to select tolerant types, and then from them, DNA markers linked to the tolerance will be acquired. The selected tolerant germplasm and the DNA markers can be used in breeding programs to improve their tolerance. As a molecular approach to drought tolerance, genes which confer abiotic stress tolerance, such as DREB, will be introduced into a NERICA variety.
3) Identification of pathogenic races of important diseases and selection of resistant germplasm in major crops
   To deal with rice blast, which is extensive in tropical Asia; Fusarium head blight of wheat; and soybean rust, currently spreading in South America, a system to identify the predominant races of each pathogen and sources of resistance in the host crops will be built, novel resistant germplasm will be identified, and breeding materials will be developed.
4) Development of biomass utilization technology suited to Southeast Asia
   We will develop a system to efficiently produce ethanol fuel from unutilized biomass, such as cassava residue and the waste of oil palm trees mass grown in East Asia, and a technology for producing useful material such as biodegradable composites.
5) Elucidation of the functionality and quality parameters of traditional food and agricultural products in Asia and development of effective utilization technology
   We will clarify the functionality of the antioxidization and antimutagenicity characteristics of traditional Asian foods and tropical farm products such as vegetables and their quality factors, including texture. We will also develop a process technology that allows the improvement and effective utilization of such functionality and quality.
6) Effective utilization of genetic resources in tropical and subtropical crops
   To improve the productivity of crops in tropical and subtropical areas such as sugarcane and beans, and to promote their diverse utilization, we will evaluate the characteristics of extensive crop genetic resources, including wild relatives, and develop a technology to utilize valuable genetic resources and produce breeding materials. We will also cooperate with the project of the National Institute of Agrobiological Sciences Genebank, which has been set up as the central national gene bank.
7) Sustainable utilization of tropical and subtropical marine resources and development of aquaculture technology
   In Southeast Asian waters, we will make a trophodynamic analysis, clarify the biological characteristics of target fish species such as their maturity and growth, as well as their interaction with other living organisms; estimate stock abundance of commercially important fish; and propose stock management policies suited to the region. We will also develop aquaculture technologies for fish, crustaceans, and algae suitable for current conditions in the developing regions.

(2) Development of management technologies of environmental resources and production systems for sustainable agriculture, forestry and fisheries

1) Development of sustainable management technologies for tropical soils
   We will analyze the main materials applied to soils such as organic matter and fertilizer in the agropastoral areas in the Sahel region of West Africa, where production of organic matter is low, and clarify the dynamics of key elements such as nitrogen in the soil-plant ecosystem. In Southeast Asia, which has a high production of organic matter, we will also clarify soil nutrient dynamics, physical properties, and changes in the biota of soil in response to the input of organic material. Based on the results of this analysis and clarification, we will develop a technology for improving the fertility of tropical soils through proper management of organic matter.
2) Integrated management system for improved water utilization aiming at increasing

economic options for farmers' incomes
In the rain-fed farming areas of Indochina, we will develop a management technology for catchment and drainage that can be adopted efficiently and widely in existing cultivation systems for cash crops through a farmer-participatory approach. We will also propose technical guidelines for increasing farmers' incomes by diversifying and combining farming business operations through the efficient utilization of water resources and effective utilization of local resources. In addition, we will develop rice-breeding materials suitable for water-saving cultivation in the irrigated paddy fields that stretch across Asia, and propose an environmentally sound technology for soil and crop management under conditions of reduced water availability.

3) Improvement of feeding technology for livestock in the tropics and the subtropics and the establishment of sustainable agro-pastoral systems in Asian dry areas
We will identify the nutrient demand of beef cattle in tropical and subtropical areas and develop rational management technologies for feeding aimed at the effective utilization of local feed resources. We will also shed light on land degradation and the actual conditions of farming to prevent the advance of desertification due to excessive cultivation and overgrazing in the arid and semi-arid regions from Northeast Asia to West Asia, and create a sustainable agro-pastoral production system. We will also develop technologies for sustainable management of farmland and grassland, effective utilization of water resources, and advanced utilization of little-used feed resources. A model of sustainable farming will be produced by combining all these efforts to raise farmers' incomes.
4) Elucidation and exploitation of biological nitrification inhibition (BNI)
Biological nitrification inhibition (BNI) is a natural phenomenon in which certain plant species have the capability to control nitrification in soils by releasing inhibitory compounds from their roots. The development of next-generation crop/pasture varieties that have a built-in ability to self-regulate nitrification through inhibition will have a dramatic impact on minimizing nitrogen losses that are associated with nitrification. We aim to (a) develop the genetic and physiological tools necessary for genetically exploiting the BNI attribute in crops and pastures and assess inter- and intra-specific variability of BNI, (b) characterize the physiological and biochemical mechanisms of BNI and isolate BNI compounds followed by elucidation of their biosynthetic pathways, and (c) clarify their interaction with environmental factors, particularly soil conditions, and its effect on modulating the functionality of BNI.
5) Development of environmental management technology for sustainable crop production in tropical and subtropical islands
We will develop a technology for effective utilization of water resources and fertilizer and an environmental management technology for reducing soil loss. These technologies are essential for sustainable crop production in the context of the environmental systems on tropical and subtropical islands. We will also produce prediction models of environmental pollution such as those of river soil loss and nutrient salt loss, and then evaluate the effectiveness of the environmental management technology scheduled for development.
6) Development of nurturing techniques for beneficial indigenous tree species in Southeast Asia
We will propose combined management of agriculture and forestry operations based on the utilization of useful indigenous tree species, while at the same time developing a technology for tree cultivation needed to promote the production of timber from useful indigenous trees in the tropical monsoon regions of Southeast Asia where forests have decreased sharply. We will also propose a method for selective logging while maintaining the genetic diversity of useful indigenous tree species in natural dipterocarp forests on tropical hills.
7) Development of productive low-input cultivation technology for fruit trees in the tropics
We will develop a cultivation technology for low-tree-height cultivation aimed at low input and effective prevention of diseases such as rot disease in the production of tropical fruits, including durian, in Southeast Asia. We will also develop a technology for high-quality, high-yield production, including improved pollination efficiency and

fertilizer management.

(3) Elucidation of the impact of global environmental changes on agriculture, forestry, and fisheries and development of mitigating technologies

1) Developing an impact assessment model and formulation of a food supply stabilization plan

To conduct medium- and long-term evaluations of how environmental changes, such as changes in water supply and global warming, affect the supply and demand of major agricultural products in East and Southeast Asia, we will improve the world food supply and demand model, and create a scenario of measures for food production such as rice aimed at minimizing the impact of such environmental changes. We will also develop early warning systems to mitigate damage to agriculture from meteorological disasters and clarify specific measures to stabilize food supply.

2) Utilization of Geographic Information System (GIS) for the development of a land information monitoring technology in developing regions

We will obtain past history data on land utilization, cropping, and growth patterns of agricultural products, land degradation, and the occurrence of disasters to gain an understanding of spatial environmental changes in the developing regions and to quantitatively clarify the relationship between such changes and agricultural production. We will also develop technologies to monitor the phenomena of various spatial scales using geographic information such as satellite data to gain a better understanding of environmental changes in quasi-real time.

3) Development of management technology for major pests of tropical and subtropical crops

We will develop management techniques for major pests to stabilize crop production in the tropics and subtropics. We will focus our efforts on the development of a control technology to prevent citrus greening disease, which hampers sustainable production of citrus fruits in Southeast Asia and other regions.

B. Collection, analyses and dissemination of information to grasp trends related to international food, agriculture, forestry and fisheries and rural areas

(1) Collection and dissemination of information related to global food, agriculture, forestry, and fisheries

By strengthening ties with related organizations at home and abroad and through on-site investigations, we will collect extensive information on supply and demand trends in food and agriculture, forestry, and fisheries products worldwide, including the developing regions; and on research and development, institutions, and policies, as well as industrial structures, relating to agriculture, forestry, fisheries, and their associated industries. The information collected will be provided to the public through the expansion of databases, symposia, and other means.

(2) Elucidation of the direction of technological development in developing regions and analysis of socioeconomic conditions influencing development in rural areas

We will clarify the direction of technology development necessary for developing regions through managerial and social evaluation of the selection, introduction, and establishment of technologies such as those for rice cultivation in Asia. We will also make clear the socioeconomic conditions and development methods that will encourage effective rural development in Asian countries where rapid changes are taking place in trade and distribution.

2. Promotion of the release and dissemination of research results

(1) Securing interactive communication with the public

1) We will wherever possible open seminars and workshops on international collaborative research projects, disclose research results collected and analyzed through information media, publish the results of research evaluations, engage in interactive communication with the public regarding collaboration on international research projects implemented by JIRCAS, and ensure the public understanding and transparency of JIRCAS' s activities.

2) The research staff will work positively on outreach activities via open lectures for citizens. Their efforts will be conscientiously evaluated.

3) We will establish a system for receiving and answering questions from the public on our Web site.
4) We will conduct questionnaire-based surveys of our collaborative research partners to identify research needs and exchange information.
5) We will adopt a participatory approach in international collaborative research projects to incorporate the needs of local residents and seek their understanding of and cooperation with our research activities.

(2) Promotion of utilization of research results
1) To ensure the prompt and practical application of research results, we will make efforts to encourage the beneficiaries of technologies and research results to participate in research projects from the planning stages, and to conduct such research activities by focusing on the utilization, diffusion, and commercialization of research results.
2) To promote the dissemination of our research achievements, we will hold symposia concerned with research projects on site.
3) Of the research results concerned with international research on agriculture, forestry, and fisheries, we will select at least 20 research results that can be transferred to the developing regions for diffusion based on external evaluations during the period covered by the medium-term goals.

(3) Public relations and the release of research results
1) Research results will be released at academic meetings and symposia in Japan and overseas. At least 560 refereed papers will also be published in academic journals and bulletins during the period covered by the medium-term goals. At least 30 international symposiums and workshops will also be held during that period, and research results will be widely released in Japan and overseas.
2) Details of research results will be released on Web sites and through exhibitions. To publicize the roles of JIRCAS in solving problems facing world food and agriculture, we will also actively take advantage of the mass media by making more than 30 press releases of major research results during the period covered by the medium term goals.
3) We will prepare various manuals and brochures for research results, and conduct public relations on such research achievements in the developing regions through international collaborative research activities.

(4) Acquisition of intellectual property rights and promotion of their utilization
1) In our efforts to acquire intellectual property rights, we will file at least 20 patent applications in Japan and abroad during the period covered by the medium-term goals, and will aim to win patent rights in consideration of the potential for patent licensing. We will also endeavor to widen the scope of patent licensing, stressing the practicality and utility of intellectual property such as patents.
2) We will review registered patents as needed in the light of licensing revenue, and the development and invention of alternative technologies. If necessary, we will waive the patent rights.
3) Breeding research results which are applicable in Japan will be positively applied to the registration of varieties based on the Seed and Seedling Law to promote their dissemination and utilization.
4) We will provide information on the intellectual property rights of JIRCAS through the Internet, and promote their utilization through the Technology Licensing Organization (TLO) certified by the Ministry of Agriculture, Forestry and Fisheries.

3. Other social contributions in specialized fields

(1) Analysis and appraisal
1) On request from the government, various organizations, and universities, JIRCAS will perform analyses and appraisals that require the highly specialized knowledge it possesses and which are difficult for other organizations to carry out.

(2) Training sessions and seminars
1) We will hold training sessions and seminars as often as possible, and actively cooperate in events sponsored by the government and other organizations.
2) We will actively welcome trainees from other IAAs, universities, national and public institutions, and the private sector to develop human resources, raise technical standards, and transfer technical information. We will also actively welcome trainees

from abroad.

3) We will, when commissioned by the government, promote the nurturing of researchers engaged in international agriculture, forestry, and fisheries research.

(3) Collaboration with the government

We will send our staff to government committee meetings and conferences, and provide domestic and overseas technical information upon request. We will also help with international cooperation and exchanges on scientific technology provided by the government.

(4) Cooperation with international organizations and academic societies

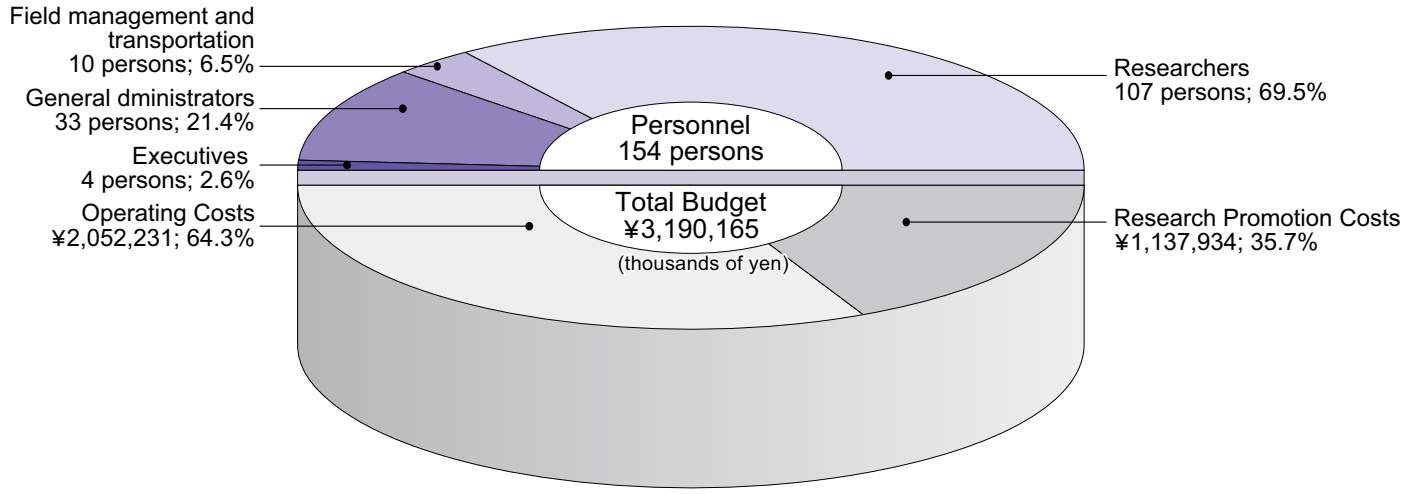
As an organization that carries out comprehensive research on agriculture, forestry, and fisheries, JIRCAS will dispatch its staff to committee meetings and conferences held by international organizations and academic associations. It will also provide domestic and overseas technical information on request.

FINANCIAL OVERVIEW Fiscal Year 2007

(thousands of yen)

TOTAL BUDGET	**3,190,165**
OPERATING COSTS	**2,052,231**
Personnel (154)	1,663,651
President (1), Vice-President (1), Executive Advisor & Auditor (2)	
General administrators (33)	
Field management and transportation (10)	
Researchers (107)	
* Number of persons shown in ( )	
Administrative Costs	388,580
RESEARCH PROMOTION COSTS	**1,137,934**
Research and development	472,292
Overseas dispatches	202,567
Research exchanges/invitations	16,110
Collection of research information	107,010
International collaborative projects	280,060
Fellowship programs	59,895

Budget FY 2007 (Graph)



MEMBERS OF THE EXTERNAL EVALUATION COMMITTEE AND PROGRAM REVIEW MEETINGS

Members of the JIRCAS External Evaluation Committee

Haruo INAGAKI	Chair of the Committee Former Counselor, Japan Food and Agriculture Organization Association
Haruyuki MOCHIDA	Professor, Graduate School of Life and Environmental Sciences, University of Tsukuba
Fumio TAKASHIMA	Former President, Tokyo University of Marine Science and Technology
Kunio TSUBOTA	Deputy Director/Professor, Asia Center, Kyushu University

External Reviewers for the JIRCAS Program Review Meetings

[Agro-environment]

Kenji HATA	Professor, Center of Field Sciences, Faculty of Bioresource Sciences, Akita Prefectural University
Toshiaki IMAGAWA	Principal Research Coordinator, National Institute for Agro-Environmental Sciences
Shigeru KAMEYA	Director General, Ishigaki Branch, Okinawa Prefectural Agricutural Research Center
Masanori SAITO	Principal Research Coordinator, National Institute for Agro-Environmental Sciences

[Crop Production]

Hiroaki INOUE	Professor, Graduate School of Bioresources Sciences, Nihon University
Nozomu MINAGAWA	Research Manager, National Agriculture Research Center for Kyushu Okinawa Region, National Agriculture and Food Research Organization

[Agro-biological Resources]

Ikuo ANDO	Head, Biotechnology Laboratory, Department of Rice Research, National Institute of Crop Sciences, National Agriculture and Food Research Organization
Tatsuhito FUJIMURA	Professor, Graduate School of Life and Environmental Sciences, University of Tsukuba
Kyuya HARADA	Team Leader, Soybean Genome Research Team, Division of Genome and Biodiversity Research, National Institute of Agrobiological Sciences
Hitoshi NAKAGAWA	Director, Institute of Radiation Breeding, National Institute of Agrobiological Sciences

[Animal Production & Grassland]

Toshiaki IMAGAWA	Principal Research Coordinator, National Institute for Agro-Environmental Sciences

Hitoshi NAKAGAWA	Director, Institute of Radiation Breeding, National Institute of Agrobiological Sciences
Fuminori TERADA	Director, Livestock Research Support Center, National Institute of Livestock and Grassland Science, National Agriculture and Food Research Organization

[Fisheries]

Yukimasa ISHIDA	Director, Project Management Division, Tohoku National Fisheries Research Institute, Fisheries Research Agency
Takashi MINAMI	Professor, Graduate School of Agricultural Sciences, Tohoku University
Toshio TAKEUCHI	Professor, Graduate School of Marine Science and Technology, Tokyo University of Marine Science and Technology

[Development Research]

Kazuhiko KOBAYASHI	Professor, Graduate School of Agriculture and Life Sciences, the University of Tokyo
Takashi KUROSAKI	Professor, Institute of Economics, Hitotsubashi University
Keishiro ITAGAKI	Professor, Faculty of International Agriculture and Food Studies, Tokyo University of Agriculture

[Post-harvest Science & Technology]

Yoshiaki KITAMURA	Director, Food Engineering Division, National Food Research Institute, National Agriculture and Food Research Organization
Tojiro TSUSHIDA	Director, Food Function Division, National Food Research Institute, National Agriculture and Food Research Organization

[Biomass Utilization]

Mitsutoshi NAKAJIMA	Professor, Graduate School of Life and Environmental Sciences, University of Tsukuba
Koichi YAMAMOTO	Principal Research Coordinator, Forestry & Forestry Products Research Institute

[Forestry]

Naoto MATSUMURA	Professor, Graduate School, Faculty of Bioresources, Mie University
Akira SATO	Professor, Faculty of Regional Environment Science, Tokyo University of Agriculture

JIRCAS STAFF in FY 2007

President

Kenji Iiyama

Vice-President

Toshihiro Senboku

Executive Advisor & Auditor

Shigeo Matsui
Hitoshi Yonekura

Research Strategy Office

Osamu Koyama, Director

Research Planning and Coordination Division

Masami Yasunaka, Director
Toshihiro Uetani, Senior Researcher

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Takeshi Kano, Head
Kazuo Ise, Senior Researcher

Research Planning Section
Masayoshi Saito, Head
Kazuhiro Suenaga, Senior Researcher

Research Evaluation Section
Hiroko Takagi, Head

Field Management Section
Haruo Tamura, Chief Field Operator
Tsugio Tokushuku, Field Operator

Research Support Office
Moriji Uchino, Head

Research Support Section
Shigeyoshi Sumita, Head
Hatsui Yashiro, Assistant Head
Junichi Irino, Overseas Travel Subsection Head
Gaku Takeda, Overseas Operations Subsection Head
Shinichi Yamada, Intellectual Property Expert
Hiroyuki Watari, Budget Subsection Head

Research Coordination Section
Takahito Noda, Head

Public Relations Office
Tadahiro Hayashi, Head
Mie Kasuga, Senior Researcher

International Relations Section
Naoya Fujimoto, Head
Kunimasa Kawabe, Senior Researcher

Publications and Documentation Section
Akihiko Yokota, Head
Hiromi Miura, Network Subsection Head
Noriko Yatabe, Managing Subsection Head (Librarian)

Regional Research Coordinators
Satoru Miyata, Representative of Southeast Asia Office (Thailand)
Hiroshi Kudo, Representative of South America Office (Brazil)

Administration Division

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Ryoichi Saito, General Affairs Assistant Head
Kaoru Watanabe, Personnel Management Assistant Head
Yoshihiko Sumomozawa, General Affairs Subsection Head
Yukio Konuma, Social Affairs Chief
Katsunori Kanno, Welfare Subsection Head
Yoshinori Kawasaki, Personnel Subsection Head
Keisuke Takada, Personnel Officer

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Hiroshi Miyamoto, Accounting and Examination Assistant Head
Nobuhiko Nakamura, Procurement and Asset Managing Assistant Head
Koichi Fuse, Financial Subsection Head
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Toshiki Kikuchi, Overseas Expenditures Subsection Head
Takao Oga, Audit Subsection Head
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Takashi Kitami, Procurement Officer
Tsuneyoshi Sasaki, Supplies/Equipment Subsection Head
Kuniaki Katsuyama, Facilities Subsection Head

Administration Section
(Tropical Agriculture Research Front)
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Hisato Ohshima, General Affairs Subsection Head
Yasuhiro Onozaki, Accounting Subsection Head
Osamu Oikawa, Accounting Officer

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Jun Furuya, Agricultural Economics
Satoshi Uchida, Geographic Information Systems
Shigeki Yokoyama, Agricultural Economics

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Hiroshi Komiyama, Development Economics
Kazuo Nakamoto, Agricultural Economics
Shunji Oniki, Agricultural Economics
Masato Shirai, Agricultural Economics
Tomohide Sugino, Development Economics
Ryuichi Yamada, Agricultural Economics

Researcher
Shintaro Kobayashi, Agricultural Economics

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Masanori Inagaki, Wheat Breeding
Kazuo Nakashima, Plant Molecular Biology
Hiroto Ohkubo, Plant Pathology
Seiji Yanagihara, Rice Breeding (Tropical Agriculture Research Front)
Xu Donghe, Plant Molecular Genetics
Nobuya Kobayashi, Physiology and Breeding
Hiroshi Tsunematsu, Rice Breeding
Yasunari Fujita, Plant Molecular Biology
Naoki Yamanaka, Plant Molecular Genetics

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Kyonoshin Maruyama, Plant Molecular Biology
Takuma Ishizaki, Plant Molecular Biology (Tropical Agriculture Research Front)

(Kazuko Yamaguchi-Shinozaki, Plant Molecular Biology)

Crop Production and Environment Division

Osamu Ito, Director

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Satoshi Nakamura, Insect Ecology
Satoshi Tobita, Plant Physiology and Nutrition

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Hiromasa Hamada, Groundwater Hydrology
Naruo Matsumoto, Environmental Conservation
Guntur V. Subbarao, Crop Physiology and Nutrition
Masato Oda, Crop Management
Hide Omae, Crop Science
Junichi Sakagami, Crop Improvement
Matthias Wissuwa, Physiology and Genetics
Yasukazu Hosen, Environmental Soil Science
Takeshi Watanabe, Soil Chemistry
Takayuki Ishikawa, Plant Physiology
Keiichi Hayashi, Soil Management

Researcher
Sachiko Senô, Crop Science

Animal Production and Grassland Division

Shuichi Oshio, Director

Project Leaders
Kazunobu Toriyama, Soil Science
Kazuhiro Suenaga, Genetics and Breeding

Senior Researchers
Yasuo Ando, Plant Microbiology
Kazumasa Shindo, Pasture Management
Makoto Otsuka, Animal Nutrition
Seishi Yamasaki, Animal Nutrition

Food Science and Technology Division

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Yoshinori Murata, Applied Microbiology
Eizo Tatsumi, Food Science
Koji Yamaki, Food Functionality
Tadashi Yoshihashi, Food Evaluation

Researcher
Takamitsu Arai, Molecular Microbiology

Forestry Division

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Atsushi Sakai, Silviculture
Tsutomu Yagihashi, Silviculture
Masaharu Sakai, Forest Soil Science
Yasuhiro Yokota, Social Forestry

Fisheries Division

Shoji Kitamura, Director

Project Leader
Marcy N. Wilder, Crustacean Biochemistry

Senior Researchers
Kaoru Hamano, Aquatic Animal Physiology
Yukio Hanamura, Marine Biology
Shinsuke Morioka, Fish Biology
Sayaka Ito, Freshwater Ecology
Katsuhisa Tanaka, Marine Chemistry

Researchers
Toshihiro Yamamoto, Fish Ecology
Tomoyuki Okutsu, Aquatic Animal Physiology

Tropical Agriculture Research Front

Tokio Imbe, Director
Yoshinobu Egawa, Research Coordinator
Yoshimitsu Katsuda, Public Relations Officer

Islands Environment Management Group
Group Head, Project Leader
Kiyoshi Ozawa, Agrometeorology

Senior Researchers
Fujio Nagumo, Soil Science
Ken Nakamura, Soil Science

Researcher
Yoshiko Iizumi, Water Management

Crop Genetic Resources Group
Stress-Tolerant Vigna Project Team
Group Head, Project Leader
Mariko Shono, Plant Physiology

Sugarcane Improvement Project Team
Project Leader
Koshun Ishiki, Plant Breeding and Genetic Resources

Senior Researcher
Mitsunori Sato, Sugarcane Breeding

Crop Production and Protection Group
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Group Head, Project Leader
Yoshimi Yonemoto, Pomology

Senior Researchers
Tatsushi Ogata, Pomology
Hidenori Kato, Molecular Biology

Citrus Greening Disease Management Project Team
Project Leader
Yasuo Ohto, Plant Pathology

Senior Researchers
Katsuya Ichinose, Entomology
Tadafumi Nakata, Entomology
Youichi Kobori, Entomology

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Yuho Maetsu, Machine Operator
Koji Yamato, Machine Operator
Hirokazu Ikema, Machine Operator
Masato Shimajiri, Machine Operator
Takashi Komatsu, Machine Operator
Masakazu Hirata, Machine Operator
Yasuteru Shikina, Machine Operator
Masashi Takahashi, Machine Operator

Researchers on Loan to Other Organizations

Africa Rice Center (WARDA)
Ryoichi Ikeda, Rice Breeding

THE JAPANESE FISCAL YEAR AND MISCELLANEOUS DATA

The Japanese Fiscal Year and the Annual Report 2007

The Japanese fiscal year is defined as the period of fiscal activity occurring from April 1 through March 31 of the following year. Thus, Fiscal Year (FY) 2007 covers the period from April 1, 2007 through March 31, 2008. The Annual Report 2007 summarizes the full extent of JIRCAS activities that occurred during this period. The subsequent Annual Report will detail events and programs from April 1, 2008, through March 31, 2009 (FY 2008).

Buildings and campus data

Land	(units: m^2)
Tsukuba premises	109,538
Okinawa Tropical Agriculture Research Front	294,912
Total	404,450

Buildings	(units: m^2)
Tsukuba premises	10,749
Okinawa Tropical Agriculture Research Front	9,474
Total	20,223

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