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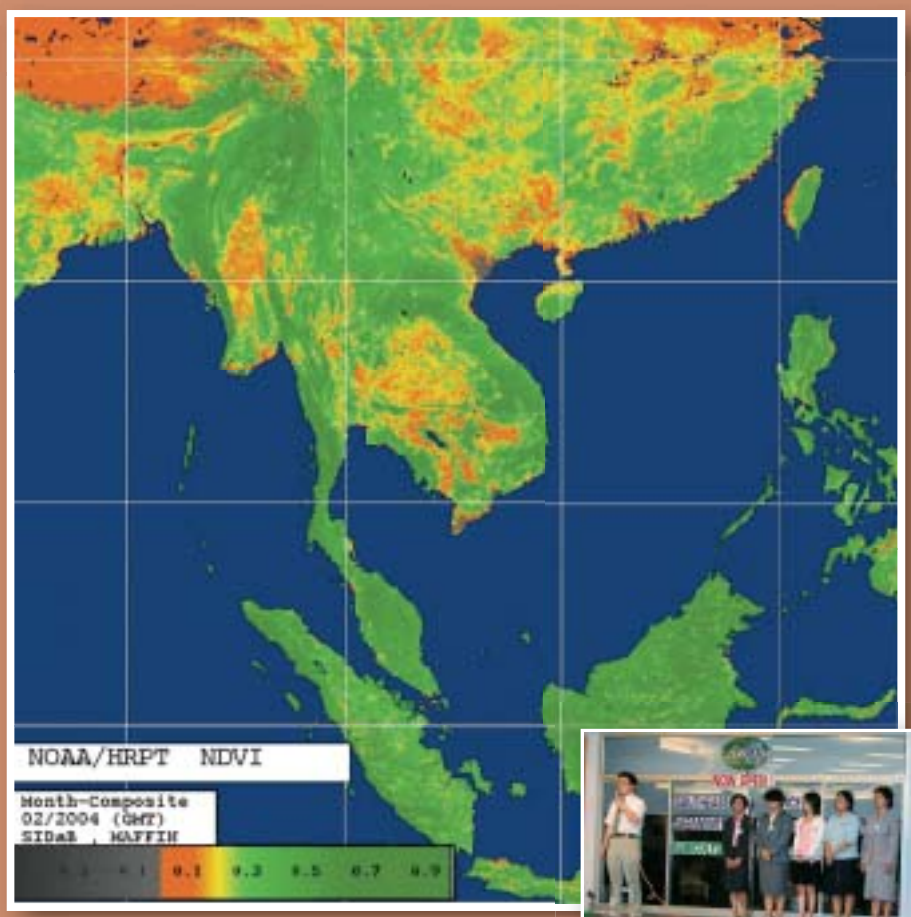

Opening ceremony of JIRCAS' Southeast Asian Office in December, 2004 ▼ (Photo by K. Hamano)

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JIRCAS
JAPAN INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES

Biomass Research - A Key to Solving Energy, Environmental and Agricultural Challenges

Why biomass?

Our society, characterized by mass production, large-scale consumption and excessive wastes, relies too much on fossil resources for both energy and industrial raw materials. Fossil resources reserves are limited, and when consumed they emit greenhouse gases that cause climate change. Thus, it is obvious that development of renewable energy and alternative material sources, which put less pressure on the environment, is indispensable for sustainable development. Biomass, defined as materials derived from plants and animal manure, is a kind of renewable energy along with solar, wind, wave and water energies. It is produced by green plants converting solar energy into plant materials through photosynthesis and does not increase CO_2 in the atmosphere on consumption; accordingly called "carbon neutral." Furthermore, biomass is the only renewable material resource that can replace petroleum in the future. Annual production of biomass is estimated to be approximately 25-35 billion tons in carbon, which is roughly 7-10 times the total energy humankind consume annually.

In addition to its potential in solving the environmental and energy problems, biomass research can contribute to solving the major issues that the agricultural sector is facing - the low level of farmers' income and stagnant rural economy. Biomass utilization will provide new uses, and thus, alternative markets for agricultural products which have lost competitiveness due to overproduction or shrinking market.

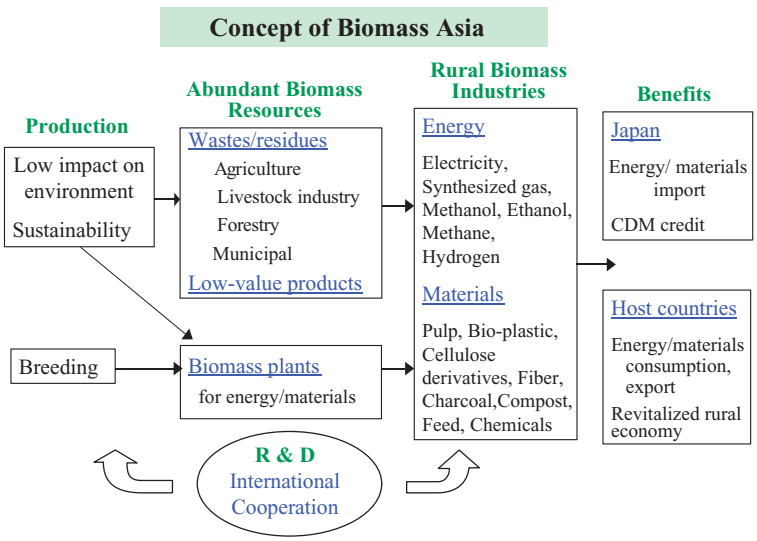
Promoting biomass utilization and establishing biomass industries will also create new jobs and wealth in rural areas. Since biomass is bulky and widely dispersed, thus its collection and transportation is difficult and costly, biomass utilization facilities will be inevitably situated in the vicinity of the regions where biomass feedstocks (crop residues, animal excreta, energy crops, etc.) are produced.

From "Biomass Nippon" to "Biomass Asia"

In 2002, the Japanese Cabinet decided on a comprehensive plan called "Biomass Nippon (referring to "Japan" in Japanese) Strategy" to promote the utilization of biomass as a source of energy and products. According to the Biomass Nippon Strategy, a number of measures have been taken aiming at a new sustainable society where people enjoy high-quality life with minimum pressures on the environment.

In accordance with Kyoto Protocol, Japan has to reduce greenhouse gas emissions by 6% from 1990 levels by 2008-2012. In order to achieve the carbon emission reduction target, Japan needs to use one of the Kyoto mechanisms, the "Clean Development Mechanism" (CDM), through which industrialized countries can promote sustainable development by offering financial and technical support for emission reduction projects in developing countries, in return for the credit against their Kyoto targets.

Asian countries are expected to make rapid economic progress, which has a great impact on the world's energy situation and the environment. Most of them likewise possess abundant biomass resources. Therefore, Japan should cooperate with Asian countries in biomass research and development to attain sustainable development in the region. The concept for cooperation between Asian countries and Japan in promoting biomass utilization is demonstrated in the figure below entitled "Concept of Biomass Asia." The main points are as follows: (1) Japan can contribute to converting the abundant biomass in Asia into various forms of energy and materials using its technologies and to developing practical methodologies, in collaboration with Asian countries. (2) Host countries can use the energy and materials domestically or could export them to other countries like Japan. (3) Biomass industries would be relatively small-scale rural enterprises in most cases, and would eventually help revitalize the rural economy. (4) Benefits of Japan are new sources of energy, usable materials and CDM credits. (5) A crucial point here is sustainable production of biomass - a subject where researchers in agricultural sector could contribute the most.



Towards building a Biomass R & D cooperation network in Asia

In order to materialize the objective, JIRCAS has launched a 3-year feasibility study project named "ASEAN Biomass R&D Strategy," in cooperation with the Advanced Institute for Science and Technology (AIST), National Agricultural Research Organization (NARO), National Institute for Rural Engineering (NIRE), National Food Research Institute (NFRI), Forestry and Forest Products

Research Institute (FFPRI), Research Institute of Innovative Technology for the Earth (RITE), and University of Tokyo. The purposes of the study are aimed: (1) to assess biomass resources in ASEAN countries, (2) to identify the relevant technologies to be applied, (3) to assess the possible environmental and economical gains, (4) to build up a network of ASEAN biomass key players, (5) and finally, to formulate a strategy for promoting the utilization of biomass in the ASEAN countries.

JIRCAS and other "ASEAN Biomass R&D Strategy" project institutes are also planning to hold a "Biomass Asia Workshop 2005," in cooperation with the Ministry of Agriculture, Forestry and Fisheries. We will invite government officials, scientists, and technical experts from Asian countries to this forum and discuss how to promote biomass utilization in the region.

I hope all these collective activities would contribute to building a framework for enhancing biomass research and development in Asian countries.

Yutaka Mori
Director, Food Science and Technology Division, JIRCAS

"Rainfed Agriculture Project" from the Viewpoint of Farm Management

Whenever our plane lands and takes off, the sight of vast, lush and symmetrical rice paddies near Bangkok International Airport never ceases to amaze and make us realize that Thailand is one of the major agricultural countries in the world. On the other hand, we can see the small and irregular rice fields with limited irrigation in Northeast Thailand, which is quite a different scenery from above. As shown in statistical figures revealing the huge gap in the rate of irrigation between Northeast Thailand at 9.3% only in contrast to Central Thailand's at 55.3%, together with its average farm income at merely 72,700 baht annually as compared to Central Thailand's at an average of 108,600 baht, the Northeast area is said to be the least developed and poorest region in Thailand. This actually shows a distinct aspect of Thai agricultural development.

In the research site of our "Rainfed Agriculture Project," located near Khon Kaen City, majority of the farmers cultivate the glutinous rice in paddy fields for self-consumption, besides planting sugarcane in upland crop production for cash income. However, they cannot often transplant the rice because of severe dry spells even during the rainy season, and occasionally suffer from floods before harvesting. Meanwhile, in sugarcane production, small farmers depend on the factory for marketing and moreover have to request the large-scale farmers to plow their fields because they don't have any tractor or sufficient farming equipment. In this manner, they are incapable of independent farm management. They are thus hampered, not just by the climatic conditions, but also by the lack of economic resources, which are beyond their control.

"Rainfed Agriculture Project" is aimed at establishing technologies for efficient utilization of water resources, such as pond and underground water, in order to alleviate the water shortage. From the viewpoint of farm management, this implies that "water supply" which is one of the main constraints due to lack of effective control, should be channelled into useful means of production, to be spatially and timely allocated by farmers themselves, through the use of new techniques. Likewise, the farmers need to recognize that their yield will depend on their own efforts or initiatives and not on external factors such as the rainfall or prices. Hence, it is imperative to implement economic programs, specifically appropriate production and marketing systems, and likewise equip farmers with agricultural hardware technologies to boost their productivity.

Masuo Ando
Development Research Division, JIRCAS

Non-irrigated paddy fields in Nong Saeng Village.

Utilizing the pond water by portable pump.

Water Management for Paddy Fields Located at the "Origin" of the Small Tributary of the Mekong River

Khon Kaen Province of Northeast Thailand, located in the Chi River Basin, a Mekong River tributary, is one of the research strongholds of the "Rainfed Agriculture Project." The collaborative study site is particularly located in Nong Saeng, a village in the basin, which is likewise the common target area for each of the project themes focused on participatory methods of research. Moreover, evaluation of water resources, the major focus of the first half of the project, was conducted in a small watershed that catches flows from the headwaters of the Mekong River.

From globally diverse viewpoints, analyses of water resources are currently carried out, with the Mekong Basin in the limelight, as a geo-hydrological model. As a matter of fact, hosts of researchers also venture from other Japanese institutes and universities to expand scientific studies on different aspects of this area. Accordingly, since the necessity of water resources is recognized worldwide, there is no room to doubt the prime importance of such researches today.

Meanwhile, as we likewise explore and scrutinize this corner of the Mekong Basin, our study focuses chiefly on how to facilitate irrigation of the paddy fields to support farmers' livelihoods under the adverse condition of water scarcity of this rainfed area. Because, although every farm may appear to be only one point of the Mekong Basin, it is the only means of local farmers to be able to eke out a living. The farmland is everything for them. Thus, we are driven to prioritize the importance of effective management of water resource in each farm site for income-generation of the local farmers, as well as a more extensive, wide-ranging macro study.

Henceforth, it should be one of the guiding principles of JIRCAS, in dispatching researchers to the study site, to perceive research not just from the general viewpoint, but more significantly from the fundamental perspective of agriculture.

Chikara Ogura
Crop Production and Environment Division, JIRCAS

Shallow groundwater appeared on the cross-section of the newly constructed pond. This water slightly seeped through from the uppermost parts of Mekong River.

Collaborative Research Activities with Local Farmers on Livestock Development

Participatory research is a unique feature of our project entitled "Increasing Economic Options in Rainfed Agriculture in Indochina through Efficient Use of Water Resources", through which the Livestock Division of JIRCAS had a series of interviews and study sessions in the Mahasarakam Animal Nutrition Research Station, with 22 local farmers who have a stake in livestock development in Nong Saeng Village. Specifically, we have two flows of research exchanges, one which facilitates inputs from farmer to researcher and the other from researcher to farmer. Based on the outputs, we are evaluating the development of feeds based from rice bran and cassava roots for cattle fattening, and likewise, the feeding management of bagasse from sugarcane wastes among farmers. Simultaneously, test growing trials of sugarcane crossbreeds for cattle feed are in progress. These breeds were created by JIRCAS and Khon Kaen Field Crop Research Center, and then their nutritive values were evaluated by the Khon Kaen Animal Nutrition Research and Development Center.

Discussion with farmers at the cattle barn in Nong Saeng Village.

Through these interactive research activities, we highly anticipate the establishment of high biomass forage crops based on sugarcane during the dry season, along with enhanced livestock productivity in the process.

Though initially confused about the method of participatory research at the beginning of this project, currently, our research activity is performing surprisingly well, due in fact to close cooperation with farmers. These activities are also impossible without strong research support from counterparts possessing high research caliber. Furthermore, I firmly believe that our strong international partnership was forged through long-term collaboration between former researchers in JIRCAS and the research centers in Thailand.

Tomoyuki Suzuki
Animal Production and Grassland Division, JIRCAS

Mekong Delta Ⅱ Project for the Development of Diversified Farming

Agriculture in Vietnam has rapidly developed after the Doi Moi Policy was implemented in 1986. Consequently since 1990, the quantity of rice exports has increased, which resulted in Vietnam becoming the second biggest rice exporting country in the world. However, the prices of rice in the domestic market have also been more steadily influenced by the international rice market. Thus, the sudden steep decline of international rice prices in 2000 and 2001 likewise accelerated the diversification of Vietnamese agriculture. In the process, diversified farming, which combines rice, livestock, fruits and fish production, has attracted a great deal of attention in the Mekong Delta. This farming strategy synchronizes the four component activities through by-products exchange. It's attractive since it contributes not only to the increase of individual farmers' income, but also to environmental conservation through effective resource utilization.

Indeed, it was Mekong Delta Ⅱ Project that tackled the important issue of improving this diversified farming technique. In this project, practical technologies to support the advancement of diversified agriculture have been established. Among these, row seeding technique and bio-digester method are identified as the model technologies. Specifically, row-seeding technology enables straight-row planting of rice by utilizing a simple plastic sowing equipment. It was proven to save seed amounts and realize yield increases. Bio-digester application, on the other hand, is the technology that produces methane gas for cooking through excreta fermentation. This process minimizes fuel cost and mitigates the deterioration of water quality. In fact, these two technologies have gradually been disseminated in the research area since successful completion of on-farm trials. Other applications such as rice composting and the technical method that optimizes fish densities have also been demonstrated as practical. It was revealed that income increases after the 4 above-mentioned technologies are introduced together into diversified farming. Moreover, the technology for stable seed production of prawn was also established which enabled the rice-prawn farming system to expand. This is one practice that showcases divergence from traditional rice monoculture.

Pigpen connected to the fishpond by pipe.

Accordingly, most of the breakthroughs developed in the Mekong Delta Ⅱ Project were adopted after thorough diagnostic and pre-evaluation procedures based on farming systems approach. In the process of technology selection, the results of evaluation by farmers, extension workers and researchers were comparatively studied. The methods of assessment and final farming design to be collaboratively implemented by farmers, extension workers and researchers were neither derived solely through farmers' initiative nor only by researchers' creative inputs. Consensus among these three parties enabled these practical technologies to be developed. Mekong Delta Ⅱ Project should be appraised, not only with regards to the intensification of agricultural diversification in the Mekong Delta, but also in terms of validating a new participatory approach to comprehensive research projects.

Ryuichi Yamada
Research Planning and Coordination Division

Straight-row planting by simple plastic equipment.

Biogas digester connected to the pigpen.

Promotion of Sustainable Farming Systems through Improved Nitrogen Flows in Agricultural and Fishery Activities

Water pollution caused by fertilizers, agro-chemicals and wastewater from animal husbandry has been negatively affecting the life of local people in some regions in developing countries recently. Mekong Delta in Vietnam is the region where nitrogen loading for agricultural land is the highest in Southeast Asia. In this research, nitrogen flows in the Cantho Province of Mekong Delta were studied in 1999 and future cycles were estimated up to 2010. Such information will help us to understand problems in the near future and to come up with possible solutions.

First, a model for the nitrogen cycling in Cantho Province was constructed and nitrogen flows in 1999 and 2010 were quantified. The numerical data for 2010 were derived from an official agricultural development plan authorized by the local government. Moreover, missing information was supplemented from published reports and local expert knowledge.

From the results gathered, the conclusion indicates that wastewater from animal husbandry needs prior treatment before its release to minimize ecosystem damage. In order to control water pollution and maintain sustainable farming systems, priority should also be focused on increasing the quantity of livestock excreta which can be applied to agricultural land after appropriate processing. Moreover, the research clarified that composting of swine feces and the use of biogas digester are feasible technologies that can treat livestock wastes to recycle and minimize leaching out of nitrogen to the environment.

On-farm experiments were then conducted to evaluate the feasibility of these technologies and clarify the technical problems which farmers encountered. Based on the results of the on-farm experiments, training courses were organized so that local farmers could learn how to apply these techniques. Experts in Vietnam and JICA youth volunteers have also continued the activity and are trying to disseminate information and conduct skills training on the breakthrough technologies developed under the JIRCAS Project.

Takeshi Watanabe
Crop Production and Environment Division, JIRCAS

Cost-Efficient Swine Feeding Techniques in the Mekong Delta Region of Vietnam

The quantity of pork production constitutes about 70% of total meat output, therefore, the status of swine husbandry is of prime importance in the livestock industry of the country. Most of swine production, as an important component of the farming systems in the Mekong Delta Region, is carried out by small-scale farmers who depend on pork as a means of income-generating activity. However, the problems of a nutritional imbalance in the pigs' diet, which results in the low quality of pork, and increasing financial burden on farmers for the purchase of commercial feeds, have become apparent. Thus, this study was conducted with the aim of reducing feed costs while simultaneously improving pork quality by experimenting with each of the following aquatic plants, water hyacinth and water spinach, and an agricultural by-product, sweet potato vine, as potential swine feed substitutes.

The thickness and iodine value of the back-fat, and crude protein content of the meat are the important indicators corresponding to the consumers' taste. The results of the study indicate that the value of at least one of the indexes, which measures the quantity of crude protein, was improved in pigs fed with diets of raw water hyacinth or water spinach. In addition, the decrease of the feed costs and the increase of the unit price of pork in hogs nourished with the plants improved the cost-benefit performance. Feeds derived from sweet potato vines also exhibited positive results. The overall outcome proved that these feed resources could be used at the majority of farms in the regions.

Seishi Yamasaki
Animal Production and Grassland Division, JIRCAS

Table 1. The effects of feeding water hyacinth, water spinach and sweet potato vine on the back-fat thickness, meat quality and economic value of pigs

	Water hyacinth[1)]		Water spinach[1)]	
	control	test	control	test
Meat quality				
Back-fat thickness, mm[1)]	18.0 [a]	15.7 [a]	—	—
Crude protein, %	20.7 [a]	21.4 [b]	21.1	21.3
Iodine value of the back-fat	63.9 [a]	54.7 [b]	34.4 [a]	32.9 [b]
Economic value/head, % [2)]				
Selling price	100	105	100	110
Feed cost	100	90	100	95
Profit [3)]	100	110	100	127
Cost performance [4)]	100	89	100	94

[a, b] Mean values in the same row labeled with different letters are significantly different at $P<0.05$.

1) The effects of each of the coupled diets, control and test, were determined. Proportions of commercial protein concentrate feed of control diets were reduced and that of water hyacinth or water spinach were increased in the test diet.

2) Relative to the controls. Control = 100.

3) The selling price subtracted by the feed cost.

4) Selling price/live weight.

Development of New Technologies for the Control of Citrus Huanglongbing (HLB) in Southeast Asia (2004 - 2008)

Citrus HLB, or citrus greening disease, is seriously threatening the productivity of citrus trees in tropical and subtropical regions in East and Southeast Asia. "Huanglongbing" is the Chinese name for this, which means "yellow dragon disease." The yellowed leaves of severely affected trees have provided the basis for this particular appellation (Fig. 1). The term "greening," on the other hand, originates from the color of the infected fruits. Instead of becoming orange when ripe, fruits of affected trees remain green. Recently, the disease has been spreading in temperate regions, presumably under the influence of global warming. In 2003, the disease was also detected in the Ryukyu Islands belonging to Okinawa and Kagoshima Prefectures, areas which are located very close to the main citrus production regions of Japan (See JIRCAS Newsletter No.36 p.4).

Citrus HLB is transmitted by an insect vector, the Asian citrus psyllid, *Diaphorina citri* (Fig. 2). HLB-free trees are easily infected through the sucking of young shoots by these viruliferous vectors. It is therefore essential that we develop technologies to control vectors through investigation of psyllid ecology. In order to implement research aimed at the development of disease-prevention technology, JIRCAS has initiated a five-year project starting from April, 2004, in collaboration with Vietnam's Southern Fruit Research Institute (SOFRI) and France's Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), as well as with other Japanese national and prefectural agricultural research institutes that are currently investigating the domestic problems of the disease.

The main purpose of the project is to evaluate each of the available physical, chemical and biological control methods that reduces the likelihood of transmission of HLB disease in healthy trees of newly-planted citrus orchards. Development of monitoring techniques and analysis of dispersal modes of citrus psyllids in the field, measuring the probability of bacterial transmission through these vectors, survey of natural enemies such as parasitoids in the fields in Vietnam and evaluation of their effectiveness under field conditions, analysis of bacterial multiplication and symptom development and discovery of increasingly efficient diagnostic methods for the pathogenic bacteria are being undertaken. Simultaneously, assessment of the potential influence of citrus rootstocks on disease expression in sweet lime, evaluation of the economic impact of HLB in farm management and mapping of HLB and psyllid occurrence for risk assessment are also major topics that will be covered through research in Vietnam.

After thorough evaluation of different control methods, these can then be integrated in a follow-up project to establish comprehensive prevention technology applicable for use in citrus orchards. Along these lines, JIRCAS will strive to achieve the overall goals of the current project, which seeks to apply practical disease-control methods in Southeast Asian citrus orchards where HLB is endemic, and to disseminate useful scientific information to the responsible local research scientists and administrators, thus enabling them to provide agriculturists with appropriate guidance on disease control.

Takeshi Kano
Research Planning and Coordination Division, JIRCAS

Fig. 1. Citrus plants showing symptoms of HLB.

Fig. 2. *Diaphorina citri*, the insect vector of Citrus HLB (body length: 3 mm).

Launching of JIRCAS' Southeast Asian Office

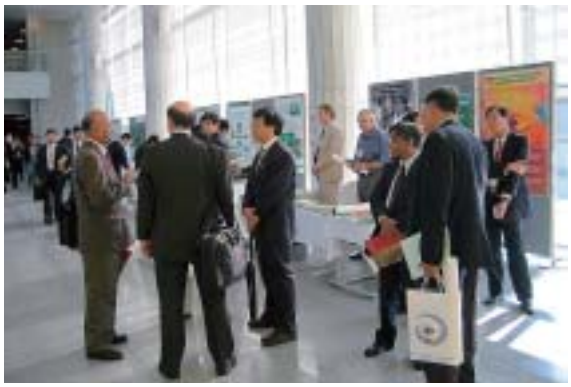
JIRCAS opened its Southeast Asian Office at the premises of the Department of Agriculture, Thai Ministry of Agriculture and Cooperatives in Bangkok, Thailand on December 1, 2004 and held an opening ceremony well-attended by various guests last December 2 (please see cover picture). The former office has served as a base camp for JIRCAS researchers working in Thailand for more than 30 years. But the Southeast Asian Region has intensified the integration of socio-economic activities including agriculture, and we should not only work more competitively but also handle many development issues through a regional and/or multilateral, rather than a bilateral framework. Therefore, the new office will serve as a common platform for every partner involved in agricultural research for advancement of the region and act as initiator and coordinator for implementing new collaborative research projects, using both our own resources and external ones. The new office welcomes every stakeholder in the region, and we hope that it will give you and ourselves, an opportunity to exchange ideas and work more closely.

Please contact the office at: Tel.:+66-2561-4743 or +66-2940-5949, E-mail: jircas-bkk@inet.co.th.

The World Rice Research Conference : A Fitting Tribute to the International Year of Rice

The World Rice Research Conference (WRRC), one of the most significant events of the International Year of Rice, was held in Tsukuba on November 5 to 7, 2004 after the Opening Ceremony and Keynote Speech in Tokyo on November 4, 2004. The scientific symposium was organized by six Japanese institutes including JIRCAS, in cooperation with the International Rice Research Institute (IRRI), where as many as 1250 participants, including 300 from overseas, gathered. Almost all disciplines related to rice were covered by 20 Sessions, 6 workshops as well as 3 keynote speeches. Not only 145 speakers, but also 300 poster presenters, contributed to the impact of the activity as well. The exhibition which featured 35 displays by several companies including rice bread makers, also added the broader perspective of new rice uses. The proceedings of this conference, "Rice is Life - The Scientific Perspectives for the 21st Century" which will include all presentations and outstanding posters, will be published in 2005 by IRRI.

The conference revealed the positive collaboration between IRRI and JIRCAS, which assumed the role of secretariat for the whole event. We hope that it will also bring about a fresh partnership for the new strategic research on rice in the 21st century.



(Photo by T. Uetani)

Kazunobu Toriyama
Development Research Division, JIRCAS

JIRCAS Visiting Research Fellowship Program 2004 at Tsukuba and Okinawa

Long-term Program at JIRCAS Tsukuba from December 2004 to November 2005

No	Name	Nationality	No	Name	Nationality
1	Cemal Atici	Turkey	6	Andrew Kalyebi	Uganda
2	Zhijie Wang	P. R. China	7	Subramaniam Gopalakrishnan	India
3	Feng Qin	P. R. China	8	Mohamed Faize※	Morocco
4	Sobrizal	Indonesia	9	Syeda Shahnaz Parvez	Bangladesh
5	Trimurtulu Nunna	India	10	Ashraf Suloma Mahmoud	Egypt

※Start from Feb. 2005

Long-term Program at JIRCAS Okinawa from December 2004 to November 2005

No	Name	Nationality	No	Name	Nationality
1	Robert Bellarmin Zougmore	Burkina Faso	6	Xueqin He	P. R. China
2	Saleh Mahmoud Ismail Ibrahim	Egypt	7	Bambang Sugiharto	Indonesia
3	Peruma Vidhana Arachchige Lal	Sri Lanka	8	Mustad Maulid Macha	Tanzania
4	Jilin Tian	P. R. China	9	Mohammad Abul Kashem Chowdhury	Bangladesh
5	Ashok Kumar	India			

Short-term Program at NIAS from November 2004 to March 2005

No	Name	Nationality	No	Name	Nationality
1	Qiang Fu	P. R. China	3	Tran Danh Suu	Vietnam
2	Souvanh Thadavong	Lao PDR	4	Ghulam Muhammad Ali	Pakistan

PEOPLE

Mr. Tokuzou Ono was appointed as Director of the Administration Division on October 1, 2004, succeeding Mr. Norio Kikuchi. Prior to joining JIRCAS, he served at the National Institute of Livestock and Grassland Science.

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