ISSN 0919-8822
Oct. 2007
No.51

JIRCAS Newsletter

for
INTERNATIONAL COLLABORATION

Culminating Ceremony of the JIRCAS Visiting Research Fellowship Program 2006 at Tsukuba
(Photo by T. Hayashi)

In This Issue

JIRCAS
JAPAN INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES

Challenging Times for Incorporated Administrative Agencies for Research and Development

I have been engaged continuously in projects for the global environment towards the reduction of greenhouse gas emission from tropical peat swamps supported by the Ministry of Environment, and also the development of effective utilization technology for biomass in the ASEAN region supported by the Ministry of Education, Culture, Sports, Science & Technology (MEXT), after my retirement from the University of Tokyo on March, 2004. In addition, I have also been involved in projects for the recovery of greenery in poor soils such as from the deserts in Northwest China, from the highly alkaline soil in Northeast China and from the strong acidic soil in Southern Thailand. My vision as a scientist is the establishment of "Field Science" which should be akin to an organic union between field investigation and laboratory work. Although the target subject is not yet completed, the exchange of knowledge and technology among scientists in developing areas, and a close combination between regional know-how and scientific knowledge are vital for the improvement of these important concerns. My work has just started to accomplish the abovementioned objective.

I was appointed as the president of the Japan International Research Center for Agricultural Sciences (JIRCAS) since April this year. I decided to accept the assumption of the position, because I was assured that I can promote my vision further based on the support from the experienced JIRCAS staff.

Three months after assumption of office, my candid impression is that I am standing in the middle of a very shaky period for "incorporated administrative agencies for research & development", including JIRCAS. The Japanese Government undertook a radical reorganization of all of the autonomous administrative organizations, including institutes for research & development. The expectation upon JIRCAS to perform its mandates, which include responsibility to promote scientific activities at the international level towards solving problems of global hunger as declared in the United Nations Millennium Development Goals, and also to secure the food security of the Japanese people at the domestic level, is really high.

The Japanese Cabinet has decided on a new long-term strategic policy, the so-called "Innovation 25" last June 1, 2007. The policy declared the importance of "incorporated administrative agencies for research and development" as crosslink institutions, between basic research activities in universities and developing researches in industries, towards the construction of an ideal future society. In addition, the Council for Science and Technology Policy advanced to the Cabinet the establishment of Overseas Cooperation Teams for Science & Technology. However, some other governmental consultative committees, such as the Council on Economic and Fiscal Policy suggested the radical restructuring of all the autonomous administrative organizations.

I have to ask many staff of JIRCAS to correspond or give their opinions on the above situation. I feel that it is getting to be a really hot summer for all of us. The results of the restructuring plan will be made clear by the time this newsletter will be published.

I have visited the University of Tokyo a number of times soon after my assumption to the presidential post of JIRCAS and asked some scientists of the University about their impression of JIRCAS. Unfortunately, approximately half of the scientists didn't know the aims and activities of JIRCAS. This is understandable since I didn't know about JIRCAS myself before I started the research projects concerning sustainable biological production in harmony with the global and regional environments in Southeast Asia, as a staff of the Asian Natural Environmental Science Center (ANESC) of the University of Tokyo. On the other hand, many scientists in the area also taught me more about JIRCAS.

JIRCAS is the representative for agricultural researches in Japan because many staff of JIRCAS contribute deeply not only to the development of agricultural research activities, but also to regional economics and society through earnest collaborations with partner scientists in the region. This may be due to the fact that the overseas activities of JIRCAS staff do not simply return benefits to the people in Japan. The most important aim of JIRCAS is to develop science and technology for sustainable agricultural production, in harmony with the environment and ecosystem in developing areas, and to transfer such scientific and technological knowledge to them. These activities closely relate to food security in Japan because we have to import huge amounts of agricultural products from these areas.

Hence, we should exert more efforts to further the extent of our overseas activities, which will be expressed through the construction of databases related to crops and biomass productions and their regional distributions, characteristics and utilization of crops and biomass, present status of regional economics, education and culture, and information for researchers and research institutes, for sharing not only with Japanese society, but also worldwide. I am sure that these efforts will contribute towards resolving the current difficult situation of JIRCAS and affirming the basis of its existence.

Kenji Iiyama
President, JIRCAS

On Becoming a World-Class Research Center - *Message* -

1) My responsibility

I was appointed as Vice-President of JIRCAS starting April, 2007, at the end of my stint as Director of the Tropical Agriculture Research Front (TARF) of JIRCAS.

As the new Vice-President, I'd like to consider JIRCAS' future research objectives and to complete the current Second Medium-Term Plan with confirmation of the progress of each research project this year before the midterm evaluation comes into view for the next (the Third) Medium-Term Plan. We will have to indicate the research direction of JIRCAS by that time.

During the midterm evaluation of our progress, we will have to modify the plans of some research projects and take more aim at the projects' targets or accelerate their progress to reach their goals, storing knowledge and outputs, which will be considered for the research subjects of the next Medium-Term Plan.

2) The meaning of organization

With regards to any comment on "organization," generally speaking, our organization ought to be a functional and collective group, and should be re-created or re-invented (not merely supported) by each constituent member. The organization should be constantly dynamic in motion. A driving force is necessary for this and the driving force of JIRCAS is our staff. Altogether, we, the personnel: researchers, administrative and technical support staff, including part-time employees, are expected to be the important driving force in JIRCAS. And we are all required to be vividly aware of this collective force towards creating a new united front.

In order to efficiently manage the function of an organization like JIRCAS, all members are expected to strive harder and use their own expertise effectively. And in addition, close communication among members is also needed.

We have to examine ourselves - how can research capitalize on the advantages of JIRCAS and how can we show our JIRCAS presence to the Japanese people, in other word, to the taxpayers? And what should we do ourselves, individually, is being asked right now.

3) Necessary conditions in order to be a world-class research center

An article of the "Kagaku Shinbun" (one of the science newspapers in Japan, where I found the article last June) mentioned the topic," What is the necessary attribute of the world's top class research centers?" This was pointed out as a result of the research survey by the National Institute of Science and Technology Policy, MEXT, Japan. Nine world-famous research centers in the U.S. (such as the Cold Springer Harbor Laboratory in the life sciences field, the Center for Global Change Science of MIT and the School of Earth Sciences of Stanford University in the environment and energy science fields, etc.) were selected and surveyed.

The article pointed out, "The most important indispensable condition is the co-existence of excellent leaders (visionary, research-oriented and well-coordinated leaders, especially in the interdisciplinary research field). The second necessary condition which was indicated is the presence of excellent fellows, good research colleagues and counterparts, including support staff. Of course, the third necessary requirement in order for an organization to function and operate well is an efficient and systematic management. It is needless to say that a systematic management is highly necessary for effective collaborative research work. All three factors, good leaders, supportive staff and systematic management, are all very important conditions. All the world-famed research centers are, without exception, characterized by this well-balanced combination of vision, human resources and excellent management.

Anyhow, top quality "human resources" is the key component of any research organization and of the building-up process of world-class research centers, as stated at the conclusion of the article.

4) Postscript

Anyway, turning back to the case of JIRCAS, and when asking myself the same question, I have this to say as my answer, "I would like to exert my best efforts to re-invent and manage JIRCAS well, and henceforth will request all members of JIRCAS for their cooperation."

Now, all the constituent members of JIRCAS, researchers, administrative and technical support staff, including part-time employees, should join hands together anew bearing this thought in mind.

Toshihiro Senboku
Vice-President, JIRCAS

Research on Water Supply Fluctuation in the Indochina Region

Global warming, which has become the top agenda of the G8 summit in Germany and recently a very popular topic, obstructs the growth of crops and intensifies changes in precipitation patterns. Thus, many researchers anticipate that it will have a big influence on the agricultural markets. Furthermore, production of wheat, barley, and canola last winter in Australia decreased by about 60% as compared to the normal cropping year due to a serious drought brought by El Nino. Water is an indispensable input for agricultural production, and the fluctuation of water supply caused by global warming and deforestation leads to unstable production levels and prices of food.

The target area of this project is the Indochina region, which includes the lower Mekong River Basin, where the tributary water levels are highly variable as is the annual level of precipitation. Supply and demand models for rice in these countries, which include among other factors, evapotranspiration (ET) and precipitation as water variables impacting on regional yields and planted areas, are developed to aid in the design of agricultural policies and planning. These models clarify how production volume per area and planted acreage change when the amount of the water supply changes.

Of the many research analyses on the relationship between water and agriculture, a large proportion of these focused on water shortages. However, flooding is also a problem in Southeast Asia, and this project will likewise analyze the impacts of floods on agricultural production and the markets. Currently, the relationship between rice production and changes in daily rainfall is being analyzed carefully and correlated with the analyses of flooding. Furthermore, a stochastic model is being developed to analyze the relationship between fluctuations of water supply allocations and agricultural productions. Water variables, such as ET, are formulated using historical time trends and variations in this stochastic model and these variables will be inserted into the supply and demand models for rice. Figure 1 shows the map of the rates of increase of the coefficient of variation in the case of 20% expansion of the random fluctuation of ET. Figure 2 shows the fluctuation of farm prices in the same case. Geographically-detailed maps for these water supply changes are drawn using GIS data and these will be provided to agricultural policy makers and planners.

The National Institute for Agro-Environmental Sciences (NIAES) has developed a cropping model for Thailand in which the variables are temperature, solar radiation, etc., and then the regional yields of rice were estimated. The National Institute for Rural Engineering (NIRE) likewise developed a water supply model of the Mekong River Basin in which the variables are irrigation water use efficiency, storage/conservation rate of rainwater, etc., and then the regional planted acreages of rice were estimated. These results were inserted into the supply and demand models and the impacts of changes in the system of water allocation on the markets of agricultural products were analyzed.

These supply and demand models will be included in the World Food Model of JIRCAS and the impacts of water supply changes in the Mekong River Basin, the main rice-producing region, on the world food market will be analyzed. The final output of the project will be the risk evaluation for food exporter and importer countries, conducted through analysis using the World Food Model which factors in water supply changes.

Jun Furuya
Development Research Division, JIRCAS

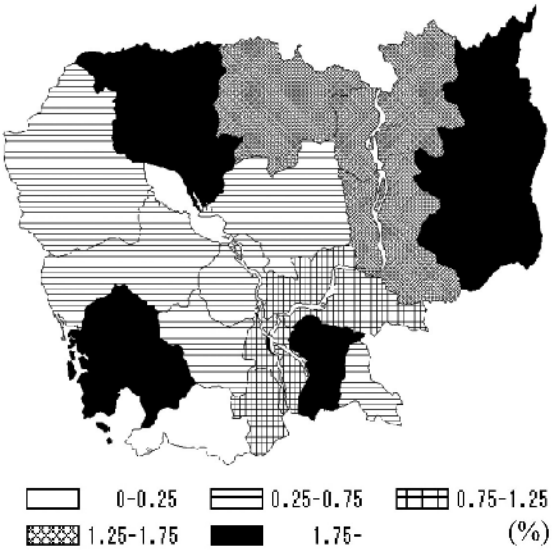


Fig. 1. Provincial map showing increases in the variation of planted areas of rice in Cambodia.
Numbers indicate the differences in the coefficient of variation in case of 20% increase in water supply fluctuation over the baseline.

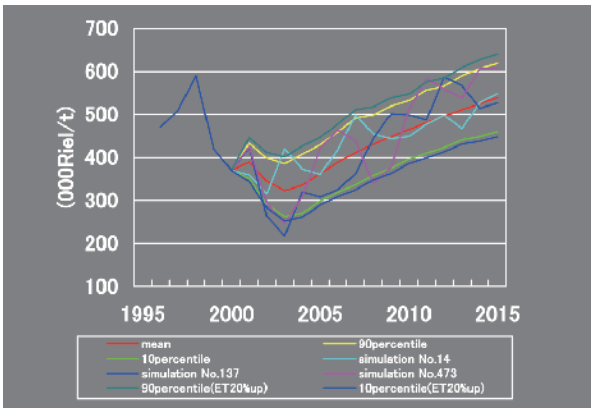


Fig. 2. Fluctuation in prices of rice in Cambodia due to variation in water supply levels
Variations in prices of rice are shown using 10 and 90 percentiles in case of 20% increase in water supply fluctuation over the baseline, respectively.

Development of Water Resources in Northeast Thailand

Background of research

Annual rainfall in northeast Thailand ranges from 1,000 to 2,000 mm, more than that in other tropical arid regions. Normally, rain falls intensively in the period from August to November per year and the pattern of rainfall is erratic, resulting in difficult conditions for increasing crop production. To take measures, many ponds have been constructed in this area, but the problem related to water remains unsolved probably because of intensive evaporation from the ponds and their limited water storage capacity. Under this scenario, JIRCAS started the research project for the efficient use of water resources, in cooperation with the Land Development Department (LDD) and Khon Kaen University in 2002.

Topography and geology in northeast Thailand

The typical topography of northeast Thailand is characterized by an undulating hilly landscape. Generally, land use sequence from the top of the hills to the downstream ranges from forestry for the top, sugarcane and cassava fields for the middle part and rice cultivation for the lowland. We selected a study site, about 30 km south of Khon Kaen and investigated its soil characteristics and geological structures. It was discovered that loamy sand (LS) is present from the surface to a depth of about 1 m; followed by sandy clay (SC) beneath at about 1 m to about 4 m. Below the SC was weathered sandstone down to about 30 m where groundwater exists.

We also measured the groundwater level of the site. In the forest on the hillside, groundwater level is low throughout the year and it is recharged in this same area (Photo 1). In the lowland, which is used for paddy fields during the rainy season, groundwater is confined by the clay layer and the water level in the well, which was drilled through the clay layer, is above the ground surface (Photo 2).

Groundwater level and soil moisture

We measured the soil moisture in the lowland and the forest in order to clarify the influence of groundwater on soil moisture in the surface layer (< 1 m). The result is shown in Fig. 1. The soil in the forest is very dry during the dry season, while that in the lowland is wet even during the dry season, indicating that it is possible to reduce irrigation and to grow upland crops and vegetables by using the residual soil moisture. We are now planning to develop a proposal for suitable land use during the dry season in cooperation with farmers.

Promotion of groundwater use

Our investigation suggests that groundwater is one of the most important water resources in the region with advantages such as low evaporation loss and less annual fluctuation which enable a stable water supply for agriculture. At present, we are analyzing the sustainable yield of groundwater, water quality and ideal socio-economic conditions for groundwater utilization in order to promote the use of groundwater efficiently.

Hiromasa Hamada
Crop Production and Environment Division, JIRCAS

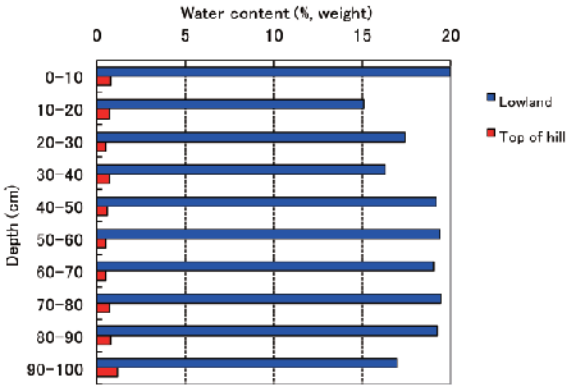


Fig. 1. Soil moisture on top of the hill and lowland

Photo 1. Top of the hill - Land use is forestry. Groundwater level was 12.23 m deep (depth of the well is 30 m) as measured on December 21, 2005.

Photo 2. Lowland - Land use is for paddy fields during rainy season. Groundwater level was 0.5 m above the ground surface (depth of the well is 30 m) as measured on December 20, 2005.

Boosting the Regional Economy by the Industrial Application of Local Agricultural Products

In Asian agricultural villages, there is a wide variety of local resources such as local vegetables and traditional fermented food. Local inhabitants have long utilized those resources in traditional ways, and they are not scientifically studied although many of them have the potential for industrial utilization. In recent years, especially in China and Thailand, it has been pointed out that it would be possible to improve the incomes of farmers living in poor agricultural areas by developing value-added products from local agricultural resources. And, if those farmers will learn the methods to develop value-added products from familiar materials, it will help jumpstart the regional economy's autonomous growth. In fact, in Thailand, a government project called, "One-Tambon, One-Product (OTOP)," which aims to enhance small and medium-sized enterprises present in local agricultural areas by developing new products with added commercial values, had produced several achievements during the last several years.

Meanwhile, we have found that several Asian local vegetables and traditional foods exhibit various useful properties such as physiological functionalities through previous JIRCAS projects. In this research project, "Value-addition to the local agricultural products in Asia", we aim to elucidate the useful properties of a wide variety of local agricultural resources scientifically, and to develop model food products.

Physiological functionalities of Southeast Asian local vegetables

In Southeast Asia, various local vegetables such as the flowers and young shoots of tropical plants and aquatic plants, which are taxonomically far different from the common vegetables in other parts of the world, are consumed. We can find that there is a lot of local vegetables exhibiting unique chemical compositions and promising bioactivities related to the prevention of diseases. Currently, we are searching for practically useful local vegetables in order to develop functional model food products through the current JIRCAS project, in collaboration with The World Vegetable Center (AVRDC), Kasetsart University, National Food Research Institute, and others.

Up to date, approximately 1,000 items of local vegetables that are collected from local markets in Thailand and Laos, farmers' yards, and experimental fields of schools are being studied for their antioxidant and antimutagenic activities. We have found that many local vegetables, mainly young leaves of woody plants, show much higher activities than that of Western or Japanese vegetables. And the active constituents are isolated and identified from some of the local vegetables that have remarkably high activities. We have already patented a novel chemical compound isolated from a Thai vegetable. Now, we are studying the behavior of functionalities of local vegetables during processing to develop a new functional food.

Physiological functionalities of Chinese traditional foods

In China, where the philosophy of "Ishokudougen", which means that medicine and daily diet are equally important for health or where eating for health is maintained in each daily meal has long been widely accepted, various traditional foods which exhibit physiological functionalities are consumed. Collaborative studies with China Agricultural University which aim to develop new functional food products are in progress. We particularly focus on the inhibitory activity against various glucosidases which are involved in blood sugar level, and suppressive activity against acetyl cholinesterase which is associated with the progression of dementia. We found that some fermented soybean food exhibited an inhibitory activity against glucosidases related to the mechanism controlling blood sugar.

Kazuhiko Nakahara
Post-harvest Science and Technology Division, JIRCAS

A market in Vientiane, Laos where various local vegetables are lined up.

Research on Suitable Stock Management in Tropical/Subtropical Areas

Fisheries production highly depends on the volume of catch of natural marine resources. The total annual world catch from the ocean in 2004 was about 86 million tons which accounts for nearly 83% of the total fisheries production (104 million tons). On the other hand, total production of marine aquaculture was only about 18 million tons. Although the figures are increasing year by year, catch by fishing hereafter should still be the major component in total fisheries production.

However, without control, excessive fishing (overfishing) can easily happen and consequently can cause the reduction and extinction of these resources. Accordingly, in developed countries, fishing is controlled by certain rules for sustainable use of fisheries resources. On the other hand, in most developing countries, there is constant concern about overfishing since stock management is usually inappropriate or has not been adopted at all. Therefore, studies for stock management methods and environmental conservation of fishing grounds should be required also in tropical and subtropical developing countries.

In this collaborative project with the Fisheries Research Institute, Malaysia (FRI) and University of Malaya (UM), we assess the stocks of commercially important fish species in the west coast of the Malay Peninsula by analyzing their catch data and biological data, and by finding the requirements for sustainable production by clarifying the biological characteristics, ecological interactions and habitats of fishes in the areas. We aim to construct and propose a stock management model based on the findings obtained by these studies above.

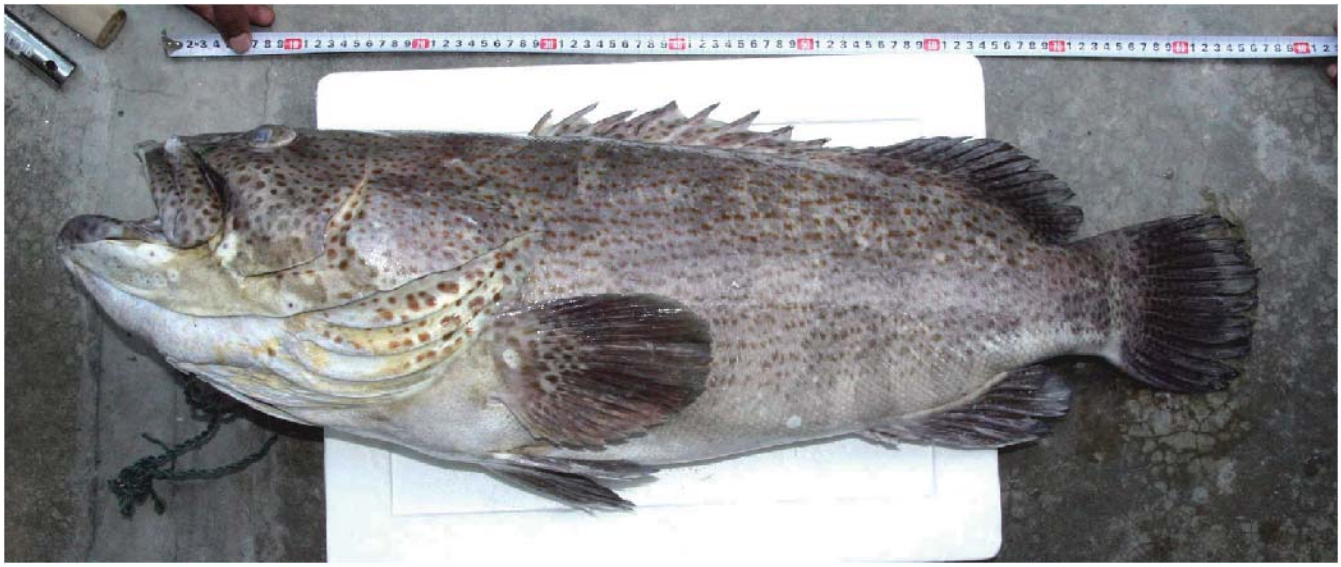
Not only in Malaysia, but also in Southeast Asia, snappers and groupers are the most important targets of coastal fisheries. Furthermore, the juveniles caught in brackish mangrove areas are also used for aquaculture. To obtain the information necessary for proper stock management of these fishes, fishing data sampling and market research are conducted to find seasonal changes of the catches in each species and to estimate annual catches. Test fishing activities are also conducted in the off-shore areas to measure the trend of abundance or availability of supply.

Brackish mangrove areas are quite important as the nurseries for these commercially important species. We clarify the energy flow in the food web of the ecosystem by investigating the biomass and productivities, and estimate the carrying capacities of the areas in order to utilize these data for the construction of the proper stock management model.

In Malaysia, although the strict stock management implemented in Japan can not be adopted soon, at least this project is expected to disseminate the concept of sustainable stock management based on scientific data.

Shoji Kitamura
Director, Fisheries Division, JIRCAS

Basket trap fishing for juveniles of snappers and groupers in a brackish mangrove area



An orange-spotted grouper (total length: 88 cm, body weight: 11 kg), a target species for stock assessment

JIRCAS Visiting Research Fellowship Program (FY 2007) at Tsukuba, Okinawa and the Project Sites

Since 1992, JIRCAS has been implementing the "Visiting Research Fellowship Program," under which promising researchers from developing countries are invited to conduct collaborative research to address various problems confronting developing regions on a global scale, which include the critical situation of food production, desertification and the gradual disappearance of genetic resources, as well as to enhance their capacity-building to enable them to respond effectively to their countries' development needs. Under the FY 2007 Program, a total of sixteen researchers were invited, eleven of which carried out research at JIRCAS Headquarters in Tsukuba City (Tsukuba Type), two at the Tropical Agriculture Research Front (TARF) in Okinawa (Okinawa Type), and three in Thailand/Philippines, where JIRCAS researchers are conducting collaborative research activities (Project Site Type).

(Naoya Fujimoto, International Relations Section)

Tsukuba Type (May 2007 - April 2008)

No.	Name	Nationality	Affiliation	Division in JIRCAS
1	Hamwieh, Aladdin	Syria	International Center for Agricultural Research in Dry Areas (ICARDA)	Biological Resources Division
2	Fu, Chunhua	P.R. China	Huazhong University of Science and Technology	Biological Resources Division
3	Nguyen, Thi Minh Nguyet	Vietnam	Molecular Biology, Agricultural Genetic Institute	Biological Resources Division
4	Tachaapaikoon, Chakrit	Thailand	King Mongkut's University of Technology	Post-harvest Science and Technology Division
5	Apiwatanapiwat, Waraporn	Thailand	Kasetsart Agricultural and Agro-Industrial Product Improvement Institute	Post-harvest Science and Technology Division
6	Khetkratok, Natchaya	Thailand	Khon Kaen University	Crop Production and Environment Division
7	Ipinmoroti, Rufus Rotimi	Nigeria	Cocoa Research Institute of Nigeria	Crop Production and Environment Division
8	Hossain, A.K.M. Zakir	Bangladesh	Bangladesh Agricultural University	Crop Production and Environment Division
9	Soni Darmawan	Indonesia	Bandung Institute of Technology	Development Research Division
10	Dang, Dung Thi	Vietnam	Hanoi Agricultural University	Crop Production and Environment Division
11	Liu, Heguang	P.R. China	Chinese Academy of Agricultural Sciences	Development Research Division

Okinawa Type (May 2007 - April 2008)

No.	Name	Nationality	Affiliation	Division in JIRCAS
1	Rauyaree, Payungsak	Thailand	Department of Agriculture, Thailand	Crop Genetic Resource Group in TARF
2	Joyia, Muhammad Fiaz	Pakistan	Pakistan Agricultural Research Council	Island Environment Management Group in TARF

Project Site Type (May 2007 - April 2008)

No.	Name	Nationality	Affiliation	Project Site
1	Kanjanaworakul, Poonmanee	Thailand	Kasetsart University	Kasetsart University, Philippines
2	Muhammad, Farooq	Pakistan	University of Agriculture, Pakistan	International Rice Research Institute, Philippines
3	Sitthiwong, Jutamas	Thailand	Ubonratchathani University	Department of Livestock Development, Thailand

JIRCAS Newsletter
Japan International Research Center for Agricultural Sciences (JIRCAS)

October 2007-No.51
Publications and Documentation Section

1-1 Ohwashi, Tsukuba, Ibaraki 305-8686, JAPAN
Phone. +81-29-838-6340 Fax. +81-29-838-6656
letter@ml.affrc.go.jp
http://www.jircas.affrc.go.jp/