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for
INTERNATIONAL COLLABORATION

A Sunday Market scene: "Traditional medicine vendors in Borneo"
(Kota Kinabalu,Sabah,Malaysia / Photo by A. Yokota)

In This Issue

JIRCAS
JAPAN INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES

Crop Improvements towards a Possible Global Warming Scenario

Because of the warmer temperatures this winter, the majority of weather forecasting agencies predicted exceptionally early blooming of the cherry blossoms. Cooler days in late March, however, caused the blossoms to appear only a little earlier than average. Nevertheless, it is true that we had an exceptionally warm winter.

In the middle of this warm winter, on the 5th of February, the Intergovernmental Panel on Climate Change (IPCC) published a report entitled "Climate Change 2007: The Physical Science Basis" as part of its Fourth Assessment Report. Under the IPCC's worst scenario, the report says, the highest estimate of global average surface air warming during the 21st century would be 4.0°C, with a likely range of 2.4 to 6.4°C.

Based on IPCC's Third Assessment Report, which projected global average temperatures to rise by about 1°C by 2030, "World Agriculture: Towards 2015/2030, An FAO Perspective" describes the impacts of global warming on agriculture and suggests mitigation strategies. The impacts include regional temperature rises, increased heat stress of crops, and higher nighttime temperatures, which could adversely affect grain formation; a possible decline in precipitation in some food-insecure regions; increased evapotranspiration rates as a result of the higher temperatures, with a reduction in soil moisture levels; and changes in the seasonal distribution of rainfall, with less rain falling during the main crop-growing season.

Given the probability of higher incidences of drought, aridity, salinity, etc., the FAO report states that greater priority will need to be given to several measures to mitigate such climate change. In the area of crop improvement, the measures to be taken include the development and distribution of drought-tolerant crop varieties, breeding for greater tolerance of crops to higher temperatures, and the development of salt-tolerant varieties of wheat, rice and oil crops.

A look at the current status of agriculture in developing regions, the main target area of JIRCAS, reveals that they depend largely on natural precipitation because of the inadequacy of irrigation infrastructure. For rice, rainfed regions that account for 42% of the world's rice cultivation areas are characterized by lower yields and higher vulnerability to abiotic stresses such as drought and problematic soils than irrigated regions. Because there is a tight link between rice production under rainfed conditions and low farmer income, stable production in these areas is essential in terms of global food security. Similar circumstances have been observed in wheat production: about half of the wheat production areas in developing regions are exposed to unstable rainfall, problematic soil conditions, and low and high temperatures, resulting in frequent production shortages. The area of land under soybean cultivation has continued to increase in South America. In Brazil, drought has been reported frequently. For example, drought in 2004-2005 caused a 17% yield loss in the southern state of Rio Grande do Sul. This low crop productivity could be accelerated further if global weather forecasts are taken into account.

Considering the current situation as well as future scenarios of agricultural production, JIRCAS has initiated research projects on "Elucidation of mechanisms of abiotic stress tolerance of plants and development of tolerant crops," with the ultimate aim of developing crop varieties that show stable productivity even under abiotic stress. To reach this targeted goal, two different approaches — conventional and molecular — have been taken. In the conventional approach, through the evaluation of a wide range of germplasm, tolerant germplasm will be identified and the DNA markers linked with this tolerance will be obtained. Both the tolerant germplasm and the DNA markers could be used efficiently in breeding programs aimed at stress tolerance.

Through the molecular approach, molecular research groups at JIRCAS have already presented promising experimental results. Over-expression of stress-associated transcription factors has led to increases in levels of tolerance to drought and other stressors in model plants under controlled conditions. An important next step is to evaluate the extent of tolerance in crops under practical cultivation. The project targeting evaluation at a practical level will be further accelerated under tight collaboration with a number of international agriculture research institutes.

Abiotic stress tolerance is very complex, with interactions among many different traits, and evaluation for tolerance itself is not easy. Therefore, close collaboration with the relevant research fields is essential if we are to gather knowledge in this area. My hope is that our research will, to some extent, help to develop measures for mitigating future global climate change.

Takashi Kumashiro
Director, Biological Resources Division, JIRCAS

Regional Economic Integration and Its Impact on Agriculture in Indonesia

The Indonesian economy was seriously damaged by the Asian economic crisis in 1997, and its GDP decreased by 13% in 1998. In spite of the various impediments such as domestic political instability, the sequence of terror attacks and natural disaster like the 2004 Indian Ocean earthquake or the Asian Tsunami, Indonesia gradually recovered its economic growth and maintains an annual growth rate of 4-5% these several years. However, compared with the other ASEAN countries, especially with Singapore, Malaysia or Thailand, which have successfully attracted foreign investors and attained developed economies through foreign direct investments (FDI), we have an impression that the Indonesian economy is still struggling for development despite its abundant natural and human resources.

A collaborative research project entitled "Impact analyses of economic integration on agriculture and policy proposals toward poverty alleviation in rural east Asia (ECOIN)" will be implemented within FY 2006 - 2010, which aims at clarifying the impacts of economic integration on East Asian agriculture and at proposing policies that take advantage of market opportunities to alleviate rural poverty and natural environmental deterioration. In this project, economic integration includes trade liberalization, expanding FDIs, increasing labor migration and other phenomena which were induced by the recent movements accelerating the socio-economic unity in the region. As one of the research subjects in the project, we are focusing on Indonesia, which is struggling against rural poverty with its unutilized and untapped potentials for development. The primary objective of the study is to identify the possibility of agricultural development within the context of economic integration.

In the first stage of the study, we conducted cost structure surveys to evaluate the comparative advantages of local crop production. We selected several target commodities including vegetables and industrial crops, from the viewpoint of their importance on diversified agriculture and value-addition. For example, we surveyed on shallot (*Bawan Merah* in Indonesian), which is one of the most important vegetables in Indonesian diet. The study area comprises two sites; Brebes District in Central Java Province and Bandung District in West Java Province. The former is a traditional production center of shallot in Indonesia and has a highly recognizable brand image, while the latter is located in a hilly mountainous zone and is an emerging production area where the farmers introduced shallot as an alternative crop to rice. By selecting two contrasting study sites, we expect that the comparative study will provide useful information on how the differences in social and economic backgrounds can affect the welfare of farmers in this era of economic integration. We are going to identify the differences in profitability and competitiveness of shallot production in the international market and collect successful cases which introduced value-addition such as agro-processing and export of the processed products.

In the next stage, we are going to revisit the study sites of the previous JIRCAS project in Indonesia and carry out monitoring surveys to know how the recent changes of socio-economic conditions have affected rural households. To prepare the possible measurements to mitigate rural poverty by using economic integration as a good opportunity, we are also going to do case studies about successful cases of agricultural diversification and value-addition, and evaluate applicability to other areas. The vertical integration with food processing companies will be the major target of the study to know the driving force and constraints for realizing poverty alleviation through integration into the regional economy.

The final outputs of the study will be the practical information and policy recommendations as well as scientific publications, which can be used by the Indonesian government in the process of policy formulation. To achieve the final goals of the project, namely, rural development and poverty alleviation, we will continue our close collaboration with the counterpart institutes, the Indonesian Center for Agriculture Socio-Economic and Policy Studies (ICASEPS) as a partner national agricultural research center and the Centre for Alleviation of Poverty through Secondary Crops' Development in Asia and the Pacific (UNESCAP-CAPSA) as a partner international organization.

Tomohide Sugino
Development Research Division, JIRCAS

Postharvest handling of shallot (Brebes, Central Java)

Landscape of hilly and mountainous rural area in Indonesia (Bandung, West Java)

Hosts of *Phakopsora pachyrhizi*, the Causal Organism of Soybean Rust in South America

Brazil, Argentina, and Paraguay produce as much soybean as the entire United States. In fact, soybean is the most important export product in these South American countries. Anyway, farmers had not paid much attention to soybean diseases until soybean rust invaded South America. Soybean rust was an endemic disease in Asian countries and Australia until the 1980s. Then, it spread to Africa in the 1990s and to southern Paraguay and southern Brazil in 2001. It spread to almost the whole area of South American soybean production, Brazil, Argentina, Paraguay, and Bolivia by 2003.

Soybean rust produces small lesions with pustules (uredinia) on leaves. The urediniospores in the uredinia disseminate by wind and cause an epidemic. When many lesions are produced on soybean leaves, premature defoliation occurs and causes yield loss as high as from 10% to 70%. Thus, control measures against soybean rust were urgently required in South America. Under this circumstance, JIRCAS started collaborative studies on soybean rust with Embrapa Soja, Brazil and CRIA, Paraguay in 2003.

The aggressive pathogen of soybean rust is *Phakopsora pachyrhizi*. It is an obligate parasite, which depends on living hosts to survive. If host plants are eliminated during the season when soybean is not planted, the inoculum potential of the pathogen is diminished and the onset of soybean rust is retarded in the next soybean cultivation.

Unlike other rust pathogens, more than 100 leguminous plants have been reported as hosts of *P. pachyrhizi*. Therefore, it is necessary for the elimination of hosts to know which plants play significant roles as inoculum sources in the field. We examined a range of hosts of *P. pachyrhizi* and compared the differences in susceptibility to the pathogen among these leguminous plants. Plant hosts were selected from leguminous species of table crops, forage crops, green manure, and weeds around the soybean fields. Of the 37 species examined, *P. pachyrhizi* produced lesions with uredinia on 21 species. The susceptibility varied largely among the different hosts. Many lesions, uredinia, and urediniospores were produced on soybean, wild soybean, and kudzu. Common bean, lima bean, perennial soybean, and snout bean produced the second most lesions with uredinia. The rest of the hosts did not produce so many lesions with uredinia.

Of these hosts, soybean, kudzu, perennial soybean, and common bean could be the real inoculum sources in the field. Volunteer soybeans are also common in the bare grounds, in the corn fields where soybeans were cultivated as the previous crop, and along roadsides. And in fact, soybean rust is frequently found on them.

Volunteer soybeans along the roadside

Premature defoliation of soybeans damaged by soybean rust

In the Central West region of Brazil, soybean is cultivated with center pivot irrigation during the dry season (from May to August). However, irrigation produces favorable conditions to the spread of soybean rust and causes rapid progress of the disease. The urediniospores produced in the irrigated soybean fields are the likely inoculum sources which spread to the neighboring cultivation fields of the following summer's crop soybean.

Kudzu is not common in South America. However, some kudzu patches are located close to the soybean fields. And soybean rust was frequently found on the soybean plants around which rust-infected kudzu was likewise present.

Perennial soybean is commonly distributed in South America. The focus of the soybean rust disease was discovered in the field bounded by perennial soybean. It was likely produced by the spread of urediniospores from the neighboring perennial soybean.

Common bean is largely planted in Brazil. The season of the common bean cultivation usually overlaps with that of soybean cultivation. Common bean rust by *P. pachyrhizi* was likewise reported in Paraná, Brazil.

In the states of Mato Grosso, Mato Grosso do Sul, and Goiás, soybean cultivation was prohibited from July to September in 2006. Although it rained from September to December, 2006, as is usual in years, the onset of soybean rust was delayed in many fields. The delay is likely owing to the elimination of the inoculum sources.

In Paraguay, farmers have been informed that kudzu is one of the inoculum sources of soybean rust. Although the eradication of kudzu is difficult because stored starch in the roots of kudzu supports regrowth, farmers are trying to eliminate kudzu by herbicide applications, digging-up, or chopping.

Masayasu Kato
Biological Resources Division, JIRCAS
Present Address: National Agricultural Research Center, National Agriculture and Food Research Organization

Contribution of Natural Fallow Vegetation to the Nitrogen Fertility of Sandy Soils in the Sahel

In addition to uncertain rainfall and locust outbreaks, the poor nutrient (carbon, nitrogen and phosphorus) status of the sandy soils is one of the causes of low and unstable productivity of pearl millet cultivation in the agro-ecosystems of the Sahel, the southern periphery of the Sahara Desert in West Africa. Improvement of soil fertility through the management of indigenous organic matters is proposed with high possibility and practicability for smallholder farmers and co-existing nomads in this region by the current JIRCAS-ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) collaboration project in Niger. With regards to nitrogen, the most limiting factor in the soil, biological nitrogen fixation (BNF) by plant-microbe interactions (symbiotic and associative) can be efficiently utilized in croplands and also in fallow lands. Actually, fallow systems have already been locally practiced by farmers for soil fertility maintenance and restoration in extensive means of management.

δ^{15}N, a compositional deviation of stable isotopes of N (^{14}N and ^{15}N) in plants, has been used as an indicator of their dependency on air nitrogen (N_2), because air and soil are exclusive sources of N and they generally have a sufficient difference in their δ^{15}N values (0‰ versus +5 to +10‰). Thus, lower δ^{15}N values (occasionally negative) in plants show their higher dependency on N_2 fixation. In this study, by means of the natural abundance method, the δ^{15}N values of fallow plant species were measured for the estimation of their dependency level on BNF and its contribution to the maintenance and improvement of N fertility of the sandy soils in the Sahel. Common plants in the Sahel have been visualized in the pictographic dictionary under the JIRCAS Website for reference: http://ss.jircas.affrc.go.jp/project/africa_dojo /Fakara_plants/Fakara_Plants_home.html.

Native plants in fallow lands with different periods (11 year-, 3 year- and 0 year-old or new) were collected during dry and rainy seasons at the Fakara District, a typical region of the Sahel with a good mixture of cultivators and pastoralists, 50 km east of Niamey, Niger. The plant samples were dried, finely powdered and adequate quantities of the samples were then introduced to an element analyzer (Carlo Erba, Flash EA-1112, Milan, Italy) connected to an isotope ratio mass spectrometer (ThermoFinnigan, Delta XP^{plus}, Hamburg, Germany) to determine their δ^{15}N (‰) values.

The vegetation of the 11 yr-old fallow was dominated by annual Gramineae species, *Ctenium elegans* and *Schizachyrium exile*, and perennial shrub, *Guiera senegalensis* (Combretaceae). The δ^{15}N values in this fallow vegetation ranged from -2 to +8‰ for all plant species. Three leguminous herbs, *Cassia mimosoides*, *Alysicarpus ovalifolius* and *Indigofera pilosa*, had δ^{15}N values at less than 0‰ , showing higher dependency on BNF and contribution to the N budget in the fallow system.

Samples of more number (22) of plant species were collected from the 3 yr-old fallow land, where non-leguminous broad-leaf annual herbs, *Mitracarpus scaber* (Rubiaceae), *Pergularia tomentosa* (Asclepiadaceae) and *Jacquemontia tamnifolia* (Convolvulaceae), were dominant. Averages and ranges in δ^{15}N values of the plants which are shown in Fig. 1. clearly demonstrate much higher dependency on BNF in leguminous plant species (*C. mimosoides* etc.) than the others. It is noteworthy that some non-leguminous *Hibiscus* sp. (a wild relative of *Hibiscus sabdarifa*), *G. senegalensis* and *S. exile* had relatively lower (+3 to +4‰) δ^{15}N values. This may suggest possible N_2 fixation by non-legumes associated with diazotrophic microorganisms in the soil of the Sahel.

In the new fallow site, a total of 27 species was collected but the total biomass was not high because of pearl millet cultivation and weeding activity during the last season. The range of δ^{15}N values shifted to more positive values, from +2 to +14‰ for all plants, as compared with those from the 11 yr- and 3 yr-old fallow lands. This could be explained by much higher δ^{15}N in soil N after several years of crop cultivation.

Plant δ^{15}N could change as affected not only by its dependency on BNF but also by the age of the fallow where it habitats. For quantitative estimation of N fixation by fallow vegetation, therefore, it would be a prerequisite to compare δ^{15}N among plant species grown on homogenous soil which has a uniform N profile in content and isotopic ratio.

From this study, it is concluded that, 1) among native fallow plants, *Cassia mimosoides* and *Alysicarpus ovalifolius*, which have higher dependency on BNF, could be efficiently utilized as technical alternative for the improvement of soil fertility in the Sahel, and 2) gramineous species with high biomass production, such as *Schizachyrium exile* and *Ctenium elegans*, should be examined for the possibility of their associative N fixation.

Satoshi Tobita, Hitoshi Shinjo* and Reiichi Miura*
Crop Production and Environment Division, JIRCAS and *Kyoto University

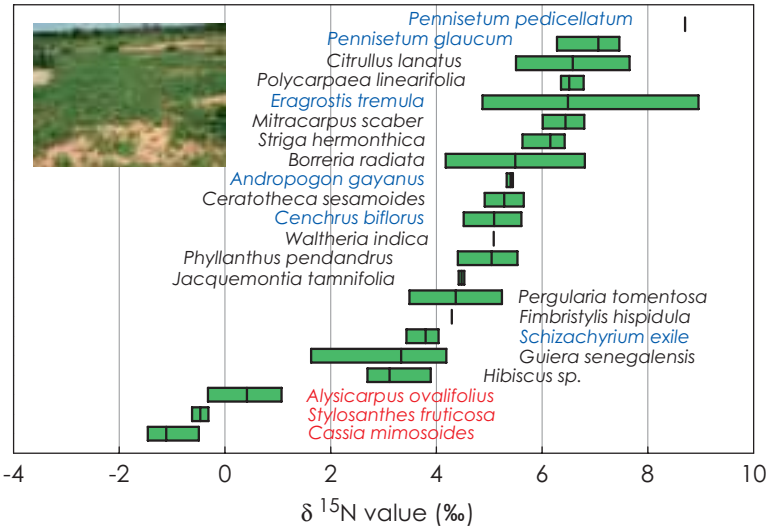


Fig. 1. Ranges (extent of each horizontal bar) and averages (vertical line in the bar) in δ^{15}N values of the native plants collected at the site experiencing 3-year fallow; scientific nomenclatures were written beside the bar in red for leguminous, in blue for gramineous and in black for other plant species. Inset: Overview of a 3 year-old fallow land at the beginning of rainy season in the Fakara District in Niger.

Establishment of a Feeding Standard for Beef Cattle and a Feed Database for the Indochinese Peninsula

Background

Consumption of beef and dairy products is expanding in nations in the Indochinese Peninsula (Laos, Cambodia and Vietnam) because of the increasingly Westernized changes in lifestyle. It is estimated that the increasing tendency in demand will continue in the future. On the other hand, the global human population is increasing and it is believed that the food supply will become inadequate to meet the total future demand. For that reason, it is important to study the nutrient requirements of local cattle accurately and to develop an efficient utilization method of local cattle feed resources that does not compete with human food resources.

Establishment of an economical and rational feeding method is necessary for the expansion of beef production/consumption in the Indochinese Peninsula nations. Therefore, a tropical beef cattle feeding standard based on net energy requirements, which has been done albeit incompletely for tropical beef cattle to date will be systematically created and a database of local feed resources will be compiled after adequate measurement of the appropriate nutritive values.

The lack of appropriate feeding standards and insufficient information on the nutritive values of feedstuffs in the region are the main constraints for the further development of cattle feeding management. In the Indochinese Peninsula, the nutritional requirements of cattle are based on information gathered from countries located in the temperate zones. Since the breeds of cattle, climatic conditions, and available feed resources in the Indochinese Peninsula differ from those in the temperate zones, the nutritional requirements of the locally-raised cattle and the nutritive values of locally available feedstuffs may not be the same as those recommended for the temperate zones. However, the energy balance in cattle fed with locally available feed has been measured to a limited extent. In order to study further 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 (KKANRDC), Khon Kaen, Thailand.

Beef cattle in Thailand

Brahman cattle

Native cattle

To prove the feasibility of the feeding management in practice using local feed resources and a locally established feeding standard in the Indochinese Peninsula.

As a result, a more efficient beef production in the tropical region (Southeast Asia, etc.) becomes possible by utilizing the feeding standard and the feedstuff database.

Takehiro Nishida
Animal Production and Grassland Division, JIRCAS

Objectives of the collaborative research

The studies that will be carried out by several research institutes and universities in the Indochinese Peninsula are outlined as follows:

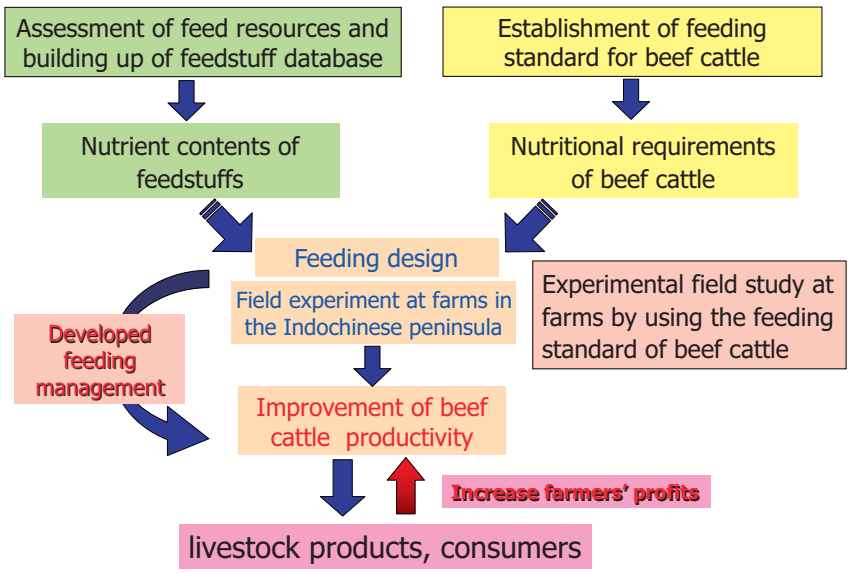
1) Assessment of feed resources and compilation of a feed database -

To establish an *in vitro* evaluation method of feed nutritive values and to investigate the availability of local feed resources and evaluation of nutrition in the Indochinese Peninsula.

2) Establishment of a feeding standard for beef cattle -

To determine the nutritional requirements of Brahman and local cattle breeds as based on net energy requirements in the Indochinese Peninsula.

3) Experimental field studies using the newly-established tropical beef cattle feeding standard -



A concept of feeding standard and feedstuff database

Towards the Improvement of the Selective Logging System in Hill Dipterocarp Forests, Malaysia

Trees of the Dipterocarp species compose the canopy or emergent layer in the tropical forest. Their trunks are sometimes over 1.5 meters in diameter and 60 meters in height, thus they are regarded as important timber resources.

The tree species that compose the canopy or emergent layer in the tropical forest are not pioneer species but late successional species. Dipterocarp forests are normally old-growth forests and contain various microenvironments, thus they are rich in biological and genetic diversity. Therefore, Dipterocarp forests are considered very important, not only economically but also ecologically.

Selective logging has been historically implemented in Southeast Asia. The selective logging management system that provides for the cutting of trees which have reached larger diameters in accordance with the standard has been practically applied. However, it is far less concerned with the regeneration rates, and there is not enough consideration for the conservation of the forests after logging. Hence, a significant decrease of Dipterocarp species was observed in many forests after several selective logging periods.

Due to recognition of the regeneration failure arising after the implementation of the selective logging system, some methods for the acceleration of the regeneration of Dipterocarp species, such as enrichment planting or cutting of the pioneering species to adjust the tree density, have been carried out in some places. JIRCAS also established a few experimental plots at hill dipterocarp forests in Malaysia in the 1990s to evaluate the effectiveness of the enrichment planting and removal of stemless palms that covered the forest floor. We have been constantly monitoring the regeneration dynamics after selective logging there. The removal of the stemless palms had significant effects towards improving the lighting condition of the forest floor and in reducing the mortality of the seedlings that regenerated naturally. However, artificial planting of seedlings is still needed where mother trees have been excessively cut, because it is impossible to cause natural regeneration without dispersed seeds from the mother trees even if other conditions were ideal.

And now, we should take into account the conservation of genetic diversity for sustainable management of the forests. Forest trees, including Dipterocarp species, are predominantly outcross species and manage to maintain their genetic diversity through this mating system. Therefore, the reduction of mother tree density causes inbreeding depression. Once the genetic diversity is reduced, the forest will degrade even further due to the increase in the mating frequency between relatives and subsequently, even more inbreeding depression will occur. To avoid such degradation, it is necessary to understand the required minimum density of mature trees within the forests.

In this study, to improve the selective logging system, we will clarify the minimum ideal density of mature trees of some dipterocarp species based on both the regeneration rate and from genetic viewpoints.

Tsutomu Yagihashi
Forestry Division, JIRCAS

New seedling of *Shorea curtisii*

Mother tree of *Shorea curtisii* that is an important native species both economically and ecologically in hill dipterocarp forests.

J-FARD & JIRCAS International Symposium to be held in September, 2007

J-FARD (Japan Forum on International Agricultural Research for Sustainable Development) and JIRCAS will jointly hold an international symposium on the contribution of Japanese agricultural researchers to meet the international development goals on September 12-13, 2007 at the United Nations University, Tokyo. Under the changing global research trend and the on-going institutional reforms, the symposium will evaluate the past experiences and try to depict alternative roles of Japanese agricultural researchers, including collaboration among them and capacity-building for the young generation. For more details, please visit the JIRCAS homepage.

Development of Stress-tolerant *Vigna* Legumes in Tropical and Subtropical Regions

The genus *Vigna* is composed of many important grain legumes that include cowpea (*V. unguiculata* (L.) Walp.), mungbean (*V. radiata*), adzuki bean (*V. angularis*) etc. These legumes are used as important sources of proteins and carbohydrates in the tropics and subtropics. But the grain yields of these legumes are severely inhibited by biotic causes, especially insect pests, and abiotic stresses, such as high temperature and drought, in these areas. Our project is aimed at developing stress-tolerant *Vigna* legumes for the tropics and subtropics.

Insect pests are one of the most important constraints to *Vigna* production in tropical and subtropical regions. And bruchid beetles cause serious damages to *Vigna* legumes during storage, usually reducing their quality and yield. Because the use of insecticides in bruchid control is not preferred for farmers in the tropics and subtropics due to the high cost and safety concerns, the breeding of *Vigna* legumes for bruchid beetles resistance is required. Our project deals with the search and development of useful breeding materials, which exhibit resistance to bruchid beetles infestation. We are examining for resistance to bruchid beetles (*Callosobruchus chinensis* and *C. maculatus*) from more than 2000 varieties and accessions of *Vigna* legumes that include wild accessions. If some resistant varieties or accessions will be found, they can be used as important sources for the breeding of bruchid beetles-resistant *Vigna* legumes.

High temperature and unpredictable droughts are the most important abiotic stresses that decrease the seed yield of cowpea in the tropics and subtropics. There are some evidences that heat stress-induced reduction in the grain yield of cowpea is caused by moderately high nighttime temperature, and not so much by higher temperature during daytime. The project is, therefore, formulated to obtain physiological and molecular information on the possible associations between plant productivity under high nighttime temperature, especially during the flowering period.

Adzuki bean damaged by bruchid beetles

Heat stress-induced low accumulation of proline in pollen is one of the physiological features connected with high nighttime temperature. In the first stage of the project, we aimed to reveal the relationship between proline accumulation in pollen and proline transporter activity. Developing a simpler screening method for the selection and crossing of cowpeas with attached heat-tolerant genes is another objective of the study.

Mariko Shono
Tropical Agriculture Research Front, JIRCAS

PEOPLE

As of April 1, 2007, JIRCAS has the following new personnel: **Dr. Kenji Iiyama**, former President of the University of Tokyo's Asian Natural Environmental Science Center (ANESC), was appointed as the new JIRCAS President. **Dr. Toshihiro Senboku**, former Director of the Tropical Agriculture Research Front, is the new Vice President. **Dr. Hitoshi Yonekura** of the Graduate School of Agricultural Science/Faculty of Agriculture, Tohoku University, was appointed as the new Executive Advisor & Auditor (Part-time). **Dr. Tadao Goto**, former Insect Management Laboratory Leader, Department of Forest Entomology, Forestry and Forest Products Research Institute (FFPRI)), is the new Director of the Forestry Division. **Dr. Tokio Inbe**, former Low-Cost Rice Cultivation Research Team Leader, NARO-National Institute of Crop Science (NICS), is the new Director of the Tropical Agriculture Research Front (TARF).

Dr. Iiyama

Dr. Senboku

Dr. Yonekura

Dr. Goto

Dr. Inbe

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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/