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for

INTERNATIONAL COLLABORATION

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JIRCAS
JAPAN INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES

The Roles of the New Audit System of JIRCAS

Mid-term objectives and plan

On April 1, 2001, JIRCAS became one of the independent administrative Institutions (IAIs), which was introduced in the Japanese government system to enhance the effectiveness, quality, and transparency of public services. The new operational system of IAIs is characterized by four principles: self-responsibility, corporate accounting, thorough disclosure, and performance-based salaries.

Under the IAI system, the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan assigned JIRCAS mid-term objectives, which JIRCAS has to fulfil within a term of five years. JIRCAS submitted to MAFF a mid-term plan to achieve the objectives, and the plan was approved by MAFF.

Finance and accounting

A number of new accounting and financial management mechanisms were introduced to the IAIs to enhance their efficiency and flexibility. IAIs were obliged to adopt accrual basis and the double entry bookkeeping methods, and produce corporate-based financial statements such as balance sheets and income and expense statements. At the same time, the IAIs can make more flexible use of their surplus and profits defined by their income and expense statements; for instance, they can allocate the surplus and profits for the purposes determined by the mid-term plan.

Under the new system, JIRCAS was obliged to ask the auditor to review every financial statement with the help of a professional accounting office.

Two kinds of financial resources are granted to JIRCAS every fiscal year. Management grants are "lump-sum grants" for which use is not specified and which can be carried forward to the next fiscal year. Facility expenses aim at contributing to the flexible operation of the IAIs.

Evaluation

In addition to financial statements, JIRCAS is obliged to submit reports describing the achievements of the mid-term plan to the IAI Evaluation Committee every fiscal year that give a true and fair picture of the state of affairs and operating results. Investigating and analyzing the statements and reports comprehensively, the committee gives an evaluation of the overall performance of JIRCAS during a certain fiscal year, and may give some recommendations for its more efficient and effective operations.

The role of auditors

The auditors' role is to review the reports and the financial statement, and report independent opinions to the president of JIRCAS. For the fiscal year 2001, the auditors had audited the reports and financial statements rather cautiously under the new system and approved them. The following table is the financial statement of JIRCAS as of March 31, 2002, which shows that JIRCAS's operations and cash flows were in conformity with general accounting principles.

Kunihiko Kato
Executive Advisor and Auditor, JIRCAS

Financial statement 2001

Income and expense statement	(¥)
Total expense	4,088,077,557
Total income	4,271,303,505
Surplus for the year	183,225,948

Balance sheet	
Current assets	487,897,507
Fixed assets	8,916,813,306
Total assets	9,404,710,813
Current liabilities	304,671,559
Non-current liabilities	600,446,822
Total liabilities	905,118,381
Total net assets	8,499,592,432
Total liabilities and net assets	9,404,710,813

Cash Flows	
Cash flows from operating activities	(¥)
Cash paid as supplies and services	-599,918,248
Cash paid as personnel costs	-1,787,970,826
Cash paid as miscellaneous costs	-765,434,206
Management grants received	3,439,046,000
Special funds from MAFF and other governmental offices	190,481,360
Miscellaneous funds	2,695,423
Total	478,899,503
Cash flows from investing activities	
Purchase of property and equipment	-257,277,702
Other expenses	-825,000
Facility expenses received	77,799,000
Total	-180,303,702
Cash and cash equivalents (End of year)	298,597,938

Cover photo: Daily cattles and rice straw feed in dry season of Northeast Thailand (Photo by M.Odai)

Control of Stored Product Insect Pests Using Natural Enemies

In Southeast Asia, post-harvest losses of crops have been estimated at about 30% and are caused mainly by improper drying and insect infestation during storage under hot and humid climatic conditions. It is very necessary to develop the technologies for reducing such losses which must be not only environmentally-friendly but also affordable to small farmers and rural enterprises in the region: thus, these technologies should be less dependent on chemicals and more dependent upon natural energy sources.

JIRCAS has been conducting a five-year collaborative research project "Development of low-input technology for reducing post-harvest losses of staples in Southeast Asia," since 2000, which aims at developing disinfestation methods for grains by employing natural insect enemies and botanicals and low-input rice drying technologies using natural energy sources such as sunlight, rice husk, and straw. We have worked with the Thai Department of Agriculture, Kasetsart University, King Mongkut's University of Technology and Khon Kaen University, as well as Japanese institutions such as National Food Research Institute and National Agricultural Research Organization. On November 29, 2001, JIRCAS held a mid-term evaluation meeting to review the results of research work carried out so far and also held a workshop at the same time to deepen the understanding of the background and significance of the project. The reviewers of the evaluation meeting suggested that we deal with ant as a natural enemy of insect pests, survey the seasonal occurrence of insect pests and natural enemies, and strengthen the collaboration and communication between the Thai and Japanese scientists.

The project leader visited four institutions to discuss research collaboration in the project in August 2002. JIRCAS and Thai researchers collaboratively conducted a survey to monitor insect pests and their natural enemies by using baited traps (Fig. 1) and pheromone traps at nine rice mills/storage houses (Fig. 2) which were located in seven provinces selected from Thailand's main rice-producing regions (central, north and northeast). They identified 34 species of stored product insect pests belonging to two orders of Lepidoptera and Coleoptera and 15 species of parasites and predators. Rice weevil (*Sitophilus* spp.), grain moth (*Sitotroga cerealella*), lesser grain borer (*Rhyzopertha dominica*) and red flour beetle (*Tribolium castaneum*) were the dominant species of insect pests in baited traps. A predator species, *Xylocoris flavipes*, and three parasitoids (*Anisopteromalus calandrae, Cerocephala dinoderi*, and *Theocolax elegans*) were predominant

Fig. 2. Rice bags stored in a milling factory, Khon Kaen, Thailand.

species of natural enemies (Fig. 3). The population dynamics of insect pests and their natural enemies were inversely proportional; the pest population dramatically increased during the period from May to August and decreased slightly in September, while their natural enemy population remained low until August and increased in September. Both pests and their natural enemies were captured in larger amounts from paddy rice-baited traps than milled rice-baited traps. Optimum temperature for development, developmental zero, total effective temperature and level of predation were investigated for *Amphibolus venator, Joppeicus pradoxus* and *Peregrinator biannulipe*. Mass-rearing mechanism has also been studied for several predators such as *Theocolax elegans, Cerocephala dinoderi, Proconura minusa, Anisopteromalus calandrae, Bracon hebetor* and *Proconura caryobori*.

Geraniol, citronellal and methone were identified as compounds responsible for the inhibition of the growth of rice weevil among the volatiles in pomelo, lemongrass and finger-root. Non-volatile compounds in *Glinus herniarioides* and *Glinus oppositifolius* showed inhibitory activity against insect pests.

Although it will take a long time to establish an integrated pest management system for stored product insect pests using natural enemies and botanicals, our scientists have already obtained several useful achievements and are making headway towards the establishment of environmentally-friendly systems for pest control.

Toru Hayashi
Director, Food Science and Technology Division, JIRCAS

Fig. 1. Monitoring insect pests and natural enemies in a milling factory with a baited trap, Khon Kaen, Thailand.

Fig. 3. Predator on a rice bag in a milling factory, Khon Kaen, Thailand.

Preparation of Cellulose Pulp from Empty Fruit Bunches of Oil Palm

As a source of both edible and industrial oils, oil palm is one of the most important tree species in Southeast Asian countries like Malaysia. However, woody fibrous residues, which remain after oil is extracted, have not been effectively utilized so far. These so-called empty fruit bunches (EFB, Photo) could serve as an alternative source for cellulose pulp, (dissolving pulp, DP) which could be used as a raw material of cellulose derivatives and regenerated cellulose.

We developed a new method of preparing DP from EFB by using environmentally friendly chemicals. EFB fibers were first hydrolyzed with dilute sulfuric acid (pre-hydrolysis). For the pulping process, a non-sulfur chemical soda-anthraquinone (AQ) was used to avoid water pollution. Ozone (O_3) bleaching was then carried out on the pulp at room temperature with or without alkali extraction afterward. O_3 is a powerful and less-polluting reagent in pulp bleaching and has the potential to replace chlorine-containing reagents commonly used in bleaching processes. For the new method, content of α-cellulose (an indicator of cellulose purity) reached above 90% for the pre-hydrolyzed pulps by methods A and B in Table. It was an acceptable level as compared with the commercial DP. Ash and pentosan contents of the pulps, which were indicators for cellulose impurity, also remained at comparable levels. The higher α-cellulose content in the pulp by method A was indicative of the effectiveness of alkali extraction after O_3 treatment in this method in comparison with the pulp by method B. Above all, it was concluded that EFB has a significant potential as a raw material to be utilized for dissolving pulp in an environmentally-friendly manner.

Photo. An empty fruit bunch (EFB, top) and its fibrous form (bottom).

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Ryohei Tanaka *et al.* 2002. Preparation of cellulose pulp from oil palm empty fruit bunches (EFB) by processes including pre-hydrolysis and ozone bleaching. Proceedings of USM-JIRCAS Joint International Symposium - Lignocellulose - Material of the Millennium: Technology and Application, Penang, Malaysia, Universiti Sains Malaysia.

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Ryohei Tanaka[1] & Wan Rosli Wan Daud[2]
[1]Forestry Division, JIRCAS
(Present, Forestry and Forest Products Research Institute)
[2]University Science Malaysia

Table. Chemical properties of EFB pulps

Preparation and pulping process	α-cellulose content (%)	Ash content (%)	Pentosan content (%)
[Method A] Pre-hydrolysis → pulping → ozone → alkali extraction	95.1	0.09	1.8
[Method B] Pre-hydrolysis → pulping → ozone	88.6	0.06	1.8
[Method C] Pulping → ozone	77.9	0.12	24.2
Commercial softwood DP	92.3	0.14	2.5

Energy Requirement for the Maintenance of Dairy Cows in Northeast Thailand

With the rapid economic development in Thailand, the demand for milk and meat has increased remarkably. The northeastern region of Thailand is a center of large-ruminant production, and dairy farming has been growing as an important agricultural sector. However, farmers still face numerous difficulties in feeding management. Only tropical grass in rainy seasons and rice straw in dry seasons are available for the roughage feeding systems. In particular, in the dry season, the shortage of roughage and its quality deterioration have been the key constraints against further development of the dairy production in the region.

The feeding strategies for dairy cattle in Thailand have been based on the standards developed in temperate countries. But these strategies cannot be applied directly to the dairy cattle in Thailand because the specific breed of cattle, available feed and the surrounding environment in the region are quite different from those in temperate regions. Nevertheless, the nutritional physiology of dairy cattle raised in Northeast Thailand has not been well characterized yet; therefore, we carried out metabolism tests to examine the effects of nutrients intake on energy and nitrogen balances of dry dairy cattle in the region and succeeded in the establishment of the energy requirement for the maintenance of dairy cattle, which can be used as a basis for designing feeding plans suitable to the region.

A total of 20 metabolism trials were conducted using four Holstein crossbred dry cows. Each cow was fed on Ruzi grass hay mixed with different levels of soybean meal. The dietary treatments consisted of a nine-day preliminary period and a five-day data-collection period. After the last dietary treatment, the cows were fasted for four days. At the data-collection period, feces and urine were collected from each cow during the collection period (Photo), and only urine was collected during the last two days of the fasting period. Oxygen consumption and the emission of carbon dioxide and methane were measured by the ventilated flow-through method during the last four days of the collection period and during the last two days of the fasting period.

The metabolizable energy (ME) requirements for maintenance were calculated through a regression analysis of energy retention against ME intake on the basis of metabolic body size. The regression equation Y=0.7851X-320.86 was obtained, and the ME requirement for maintenance was estimated to be 409 kJ/BWkg$^{0.75}$ (Figure). Compared with the values obtained in previous studies for Brahman cattle, swamp buffalo, and Thai native cattle, the value obtained in the present study was consistently higher; however, it was still 17% lower than the value for Holstein cattle (487 kJ/BWkg$^{0.75}$) as suggested by Japanese feeding standards. Our results indicated that the dairy cattle in Thailand could be raised under poorer nutritional conditions and utilize poorer quality roughage as compared with those in Japan. These findings will serve as basic information for the establishment of feeding standards in Thailand.

Photo. The cows were installed with harnesses to attach feces bags and urine tubes in order to separately collect feces and urine during the collection period.

Further studies are required to obtain more conclusive data on ME requirement for the maintenance of Holstein crossbred cattle. In addition, it is necessary to collect enough basic data to establish feeding standards for dairy cattle in Thailand. Therefore, we will carry out further metabolism experiments to obtain energy requirements for milk production and nutritive characteristics of roughage available in the region.

Masaharu Odai
Animal Production & Grassland Division, JIRCAS
(*Present, National Institute of Livestock and Grassland Science*)

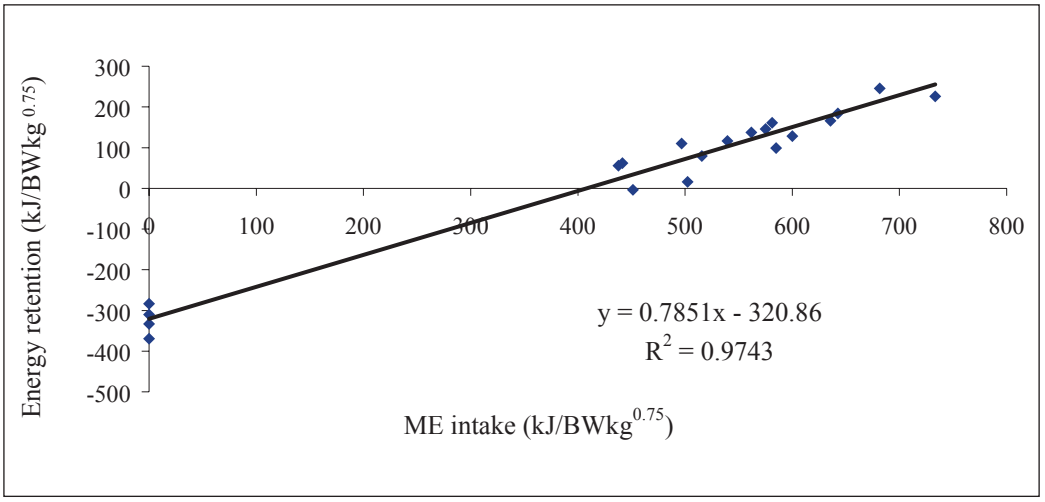

Figure. Relationship between ME intake and energy retention in dairy dry cows.

Towards Livelihoods Assessment of Technology Adaptation Research: Implications from the 17th International Farming Systems Symposium

Introduction

The 17th International Farming Systems Symposium was held at Lake Buena Vista, Florida, November 17-20, 2002. The Symposium is held every two years, rotating across five regions of the world. The Symposium is the sole global venue for farming systems and participatory research professionals to exchange information on new methods, results, and issues. Approximately 150 persons attended this year's symposium. JIRCAS participated through two presentations on agroclimatological research in Mali, West Africa. The symposium was organized around five themes in simultaneous oral sessions, several plenary sessions, a poster session, and a tools bazaar. The five themes were: 1) Diversification & Competitiveness: 2) Engaging Stakeholders; 3) Knowledge & Information Systems; 4) Education & Training; 5) Food Safety & Security.

In this article, I discuss major outputs of the 17th Symposium, supplemented with a relevant example developed for the JIRCAS-Cantho University workshop held in last November, applying the sustainable livelihoods focus in the Mekong Delta of Vietnam, where JIRCAS has an ongoing project.

Evolution to a Sustainable Livelihoods Focus

In the last plenary session, to place the work of the symposium in perspective and to set the stage for an open discussion of future issues, Dr. David Norman, Professor, Kansas State University, and one of the originators of farming systems research, gave a presentation titled, "The Historical Perspective of Farming Systems." In this presentation, Norman described the evolution of stages of farming systems thinking over the past 25 years.

The initial stage, from the late 1970s through the 1980s, was the stage of farming systems with a *predetermined focus*. Researchers sought to understand why Green Revolution technology was not uniformly successful on all farms and in all environments, and to develop research methods to improve technology development. Researchers diagnosed problems with farmers and carried out on-farm trials based on the identified priorities. Farming systems research was largely a joint effort of agronomists and economists. Its objective in this stage was to develop better recommendations centered around targeted crops and tailored to specific types of farming systems.

From the late 1980s into the 1990s, farming systems research moved into the stage of *whole farm* focus. *Participatory research* methods, including participatory breeding, IPM farmer field schools, and farmer experimental groups, appeared. Another development was the appearance of farming systems research with a *natural resources* focus. Disciplines such as plant breeding, entomology, plant pathology, aquaculture, ecology, and sociology contributed more. Output changed from recommendations for farmers to follow, to a menu of conditional options from which farmers could choose.

In the first decade of the new millennium, farming systems research expanded beyond production systems to a sustainable *livelihood* focus. Participatory analysis of total livelihood includes all activities, assets, and social relationships of households. Location-specific changes are designed to reinforce the adaptive mechanisms of households, particularly vulnerable households.

An Example of the Application of Livelihood Focus in the Mekong Delta

Fig. 1 shows two examples of how farming systems research in the Mekong Delta might be placed in a sustainable livelihoods focus. Farm households grow rice, fruit trees, and vegetables, and raise pigs, fish, and poultry (components inside the large yellow box). Farmers receive rice bran and broken rice as byproducts from milling of their rice. These are used as pig feed (white arrow 1). However, farmers also use broken rice for home consumption (white arrow 2), sale to factories producing rice paper (white arrow 3a), and poultry feed (white arrow 4). Furthermore, farmers usually have to supplement with purchased rice bran (white arrow 5) and broken rice (white arrow 3b). Assessment of increased broken rice in pig diets thus involves not only benefits from pig weight gain (number 6 in pig box), but also benefits and costs for the household (yellow arrow 7) associated with alternative uses of broken rice (white arrows 2,3a,4) and purchases (white arrows 3b and 5).

Pig waste is used as feed for several species of fish cultured in ponds (orange arrow 1). However, it contains high levels of *E. coli* bacteria and other harmful organisms (orange arrow 2). Fermentation of pig waste in biogas digesters has reduced counts of *E. coli* and *Salmonella* compared to pig waste (blue arrow 3). Assessing the effect of biogas effluent thus includes not only fish growth (number 4 in fish box) and economic costs and benefits for the household (yellow arrow 7), but also environmental benefits on water quality (blue arrow 5) and human health

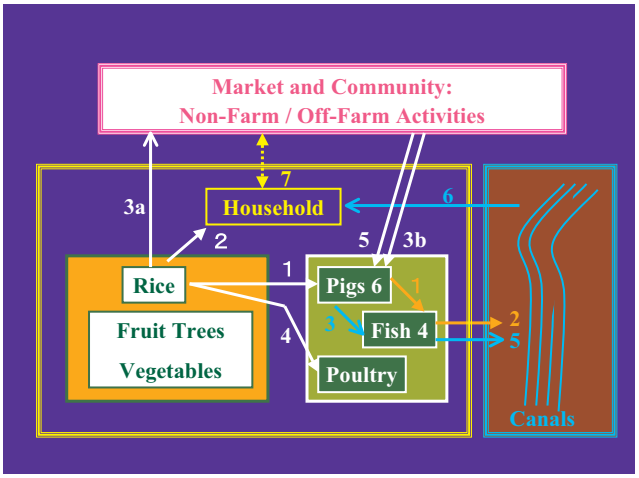

Fig. 1. Potential livelihood impacts of pig diets and wastes in a complex farming system in the Mekong Delta, Vietnam.

white arrows 1, 2, 3a, 4: uses (at arrow end) of broken rice
white arrows 3b, 5: purchased broken rice for pig feed
orange arrows 1, 2: pig waste flow
blue arrows 3, 5, 6: biogas effluent flow and indirect effects on water and human health
pigs 6: weight gain from pig diet improvement
fish 4 : weight gain from fish fed effluent
yellow arrow 7: household income costs and net gain from activities associated with pig diets or fish feeding

(blue arrow 6).

An Analysis of Topics in Oral Session Papers

Returning to the symposium, a total of 54 papers were presented in the oral sessions. The majority (69%) reported on research in Africa (28%), Latin America (22%), or Asia (19%). The balance were papers on research in developed countries (Europe, North America, or Australia, 14% total), and papers covering more than one region or of a conceptual nature (17%).

Analysis of the titles of the papers was done to identify trends in the farming systems approach today. Each title was divided into key words and phrases. Each key word or phrase was weighted by the total number of key words and phrases in the title. For example, each key word or phrase in a paper with three key words and phrases would be weighted 0.33. The key words and phrases were then grouped into categories of similarity.

The shifts described by Norman were reflected in the oral papers. There were fewer topics focused on technology and the natural environment, and more topics focused on the process of *technology change*, or on the macro-level *socio-economic environment* affecting technology change. Only 29% of the topics of the papers focused on technology-based subjects, including agroclimatological zones (Fig. 2).

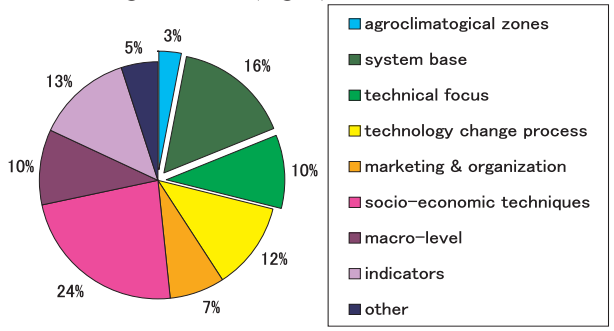

Fig. 2. Topics of papers presented in oral sessions, the 17th International Farming Systems Symposium.

In farming systems research, the term *systems base* refers to the key production activity (such as wet rice) around which other activities (such as mungbean production after rice) are centered. This may also be the *leverage point* of change for the whole system. The topics of the papers showed that the *systems base* targeted has moved far from the Green Revolution era when farming systems research first began. Only 7% of the topics focused on traditional agronomic staple food crops such as rice, wheat, or maize, that were the targets of the Green Revolution. In contrast, 25% focused on fruits, vegetables, and herbs, while another 23% focused on livestock. The importance of value-addition, which contributes to livelihood improvement, can be seen here. Another 16% of the topics involved complex systems, such as crop-livestock systems or agroforestry. Within the papers with a technology focus, 69% of the topics focused on agroecosystems, ecology, climate, and the natural environment. Production-oriented, single discipline-based topics, such as soils, fertility, water, irrigation, and genetic resources, each comprised only 6-16% of the topics. The shift to a whole-farm and natural resource focus can be seen here.

In the last plenary session of the symposium, participants were asked to identify *future themes* for the next symposium, to be held in Europe in 2004. Themes were accepted without restrictions on number or content from all participants, until everyone had offered all their ideas. Here again, trends paralleling the papers were evident. Themes focused on technology *per se* made up only 12%. Techniques to empower farmers, including social learning, farmer dialog, and farmer organizations, made up 22%. This reflects the shift in thinking from production research that leads to technology transfer to farmers, to research on how to create social processes that enable farmers to develop solutions to their own problems (Fig. 3).

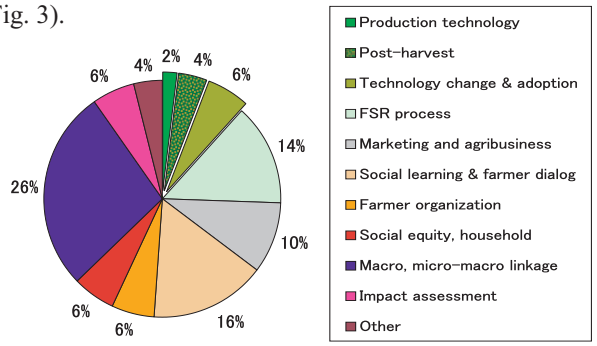

Fig. 3. Future symposium themes sought by participants in the 17th International Farming Systems Symposium.

Implications and Future Directions

The above trends have important implications for development-oriented agricultural research. Since the Green Revolution era, technology *supply-driven* agricultural research has been a frequent model, especially in Asia where wet rice provides a highly uniform production environment. Without a supply of new technology, "poor but efficient" farmers were seen as being locked into a trap of poverty. Therefore, in place of community development based on inadequate local resources, it was thought researchers should develop new technology through scientific research to be transferred to farmers.

Participatory research emerged to provide a technology *demand-driven* process. It seeks to respond to the recurrent problem of research results that are not in the end adopted by farmers, or that are changed by farmers. Researchers often think that technology use and improvement of farmer livelihood are the work only of extension, not research. The directions seen above in the symposium call this demarcation between research and extension into question. The interest shown in the symposium in social learning and farmer organizations suggests that farmer groups can play a key role in adaptation research. From the same perspective, several speakers (including David Norman) in the 7th JIRCAS International Symposium held November 2000 called for research to test "adoption pathways." We might better call these "adaptation pathways": how farmers might adapt the results of supply-side research into their real agricultural production. In place of demonstrations of technology from experiment stations, adaptation pathway research gives farmers new options to test and adapt. Farmer-to-farmer learning can add more options.

To achieve the livelihood focus called for in the symposium, indicators and methods are needed for livelihood monitoring of participatory technology adaptation research. Also, how to move from the scale of intensive participatory research on individual farms, to the scale of watersheds and villages involving multiple farms, and beyond these to the scale of whole regions, is an issue reflected in the interest in micro-macro linkages. The symposium points to a number of key directions for future development-oriented agricultural research.

John S. Caldwell
Development Research Division, JIRCAS

JIRCAS Seminar on a New Strategy for International Collaborative Research

On January 26-27, 2003, JIRCAS hosted a seminar on a new strategy for international collaborative research activities for sustainable development of agriculture, forestry and fisheries in cooperation with the Institute of Development Economics (Japan External Trade Organization), International Cooperation Center for Agricultural Education (Nagoya University), Graduate School of Asian and African Area Studies (Kyoto University), and Graduate School for International Development and Cooperation (Hiroshima University). The seminar was aimed at reviewing international collaborative research activities carried out by various Japanese institutions including public institutions, universities and people from NGO/NPOs, and establishing a common consensus and working platform to improve their efficiency and effectiveness. More than 100 participants ranging from young students to scholars and researchers, government officials, and NGO/NPO people attended the seminar.

Dr. Takahiro Inoue in his inaugural address remarked that this seminar would provide a good opportunity to discuss and seek new possibilities for international cooperation for many institutions and universities which have been facing rapid and drastic institutional and organizational changes.

Dr. Hiroyuki Kohama, a development economist and professor, University of Shizuoka delivered an hour-long keynote speech in which he emphasized a keen need for establishing a clear position and strategy for Japanese international cooperation. He also stressed the importance of public relations to deepen understanding of the national policy relating to international cooperation which might not fully coincide with the interests of a resource-limited and trade-dependent country like Japan.

The seminar then moved to the session on regional strategies for development and collaborative research focusing on Africa, South Asia and East Asia which are densely populated with extremely poor and undernourished people. Interdisciplinary presentations and discussions were held, and all speakers stressed the necessity for a region-specific and multidisciplinary approach to achieve the development goals established by international communities.

Photo. Keynote speech by Dr. Hiroyuki Kohama.

The following session reviewed present activities and problems of collaborative research activities carried out by various universities, and those of public institutions like JIRCAS. The main concern shared by speakers was how to develop an interface to facilitate inter-institutional communication and a domestic and multinational partnership to conduct more effective collaborative research activities.

The final session focused on relationships between national interests and international cooperation, the formation of a new partnership or network by combining various stakeholders not only in Japan but also abroad, and every participant agreed that the present seminar would be a good starting point to work together, and that key players should proceed to the next step.

Following this seminar, this fall, JIRCAS is planning to hold an international meeting for discussing the above-mentioned issues by inviting people from relevant institutions from other donor countries as well as recipient countries. The detailed program will be announced in the next issue of this newsletter.

Satoru Miyata
Development Research Division, JIRCAS

PEOPLE

Mr. Osamu Koyama, an agricultural economist, was appointed to Director of Development Research Division on December 1, 2002, succeeding Mr. Kazuyuki Tsurumi who left JIRCAS and now is the FAO representative in its Nepal Office. Mr. Koyama started his career at the Headquarters of the Ministry of Agriculture, Forestry and Fisheries in 1979. After serving as an econometrician at FAO from 1986 to 1993, he joined JIRCAS, and has been conducting socio-economic research such as food supply and demand analyses of the world. His new assignment covers strategic studies of JIRCAS activities, socio-economic research and applications of information technologies in agriculture, forestry and fisheries.

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