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Newsletter

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Joint standing crop evaluation tour in the Yunnan Experimental Field by Japan-China rice breeders
(Photo by A. Kobayashi)

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TARC
TROPICAL AGRICULTURE RESEARCH CENTER

20th Anniversary Commemorated on 11 June 1990

TARC STEPS FORWARD TO ITS THIRD DECADE

The Tropical Agriculture Research Center (TARC), Ministry of Agriculture, Forestry and Fisheries was officially established on 10 June 1970. The 20th Anniversary was observed on 11 June 1990 with approximately 200 participants including distinguished guests and invitees from the Ministry, agricultural research institutes, and many former staff members of TARC that carried out duties overseas.

The day's events were started with a Ceremony, during which Dr. Shinya Tsuru, Director General of TARC, delivered a speech outlining past achievements and future objectives of TARC. Mr. Tatsusuke Yoshimura, Research Councillor, on behalf of Agriculture, Forestry and Fisheries Research Council, expressed his views on the further development of TARC and its diversifying activities, in collaboration with research organizations overseas. The Ceremony was followed by Commemorative Lectures given by three speakers.

Dr. Takekazu Ogura, former Vice-Minister (1961-63) and Chairman, Agriculture, Forestry and Fisheries Research Council (1963-75). MAFF. Graduated from Tokyo Univ. Law School. Senior Official of the Ministry (1934-63) and was particularly involved in the agrarian reform and rural development in post-war Japan by "Agricultural Basic Law" (1961). Prominent author, as Chairman, Food and Agriculture Policy Research Center, of a number of publications including "Can Japanese Agriculture Survive?" (in English). Presently assumes Chairman, National Tax Commission for national taxation system reform.

Agriculture Research with Global Scope, Ogura

The first speaker was Dr. Takekazu Ogura, the Advisor to TARC and former Vice-Minister of Agriculture, who masterminded the structural transformation of Japan's agriculture in 1960s (Agricultural Basic Law), and is a prominent leader of national and international policies of agriculture. As one of the founders of TARC, he started his lecture with his humor, referring to several interesting surveys and writings of his own on national and international agriculture.

He remarked that the value criteria of the contemporary society are dominated by economic efficiency (economism). Dr. Ogura reviewed the current status of agriculture in Japan and suggested that the agricultural research at the national institutes should place more emphasis on basic research, leaving applied research and extension to regional experiment stations.

Dr. Ogura also suggested that TARC should expand its activities to encompass a larger number of regions by creating specialized divisions for Africa, the Middle East, Latin America and South Asia, as it is likely that Southeast Asia will reach self-sufficiency in food because agriculture is making sound progress.

In the next decade, he thinks TARC would be no more for tropical agriculture only, but its commitments will extend to worldwide problems in agriculture, which, as a matter of fact, was initially planned for TARC at the time of inauguration 20 years ago.

Pioneering Area Studies in Kyoto, Watabe

Prof. Tadayo Watabe, who led his research career as Director, the Centre for Southeast Asian Studies, Kyoto University, gave a keynote lecture on "Tropical Agricultural Research in Universities." He is well known for his studies on the history of rice and rice civilization in Asia. TARC considers the Centre of Kyoto as a model institution for *area studies* from the academic viewpoints.

In his presentation Dr. Watabe mentioned that Kyoto University has a long and unique tradition of overseas expeditions or explorations since the Meiji era, and some of the prominent leaders among faculty members were Profs. Hitoshi Kihara (wheat genetics) and Kinji Imanishi (primate research). Early in 1941, an interdisciplinary group of young faculty members conducted an *area study* on the ecology of Ponape Island in the Pacific. The first well-organized overseas expedition was led by Kihara and Imanishi to Karakorum/Hindu Kush in 1955, which marked the real beginning of *area studies* in Kyoto University under the first official funding of the Ministry of Education.

The major financial source for tropical *area studies* in Japanese universities has been the "Overseas Scientific Studies Allocation" of the Ministry of Education, which started with only 6 grants in 1963 and now covers 220 grants annually. Special studies conducted by the Institute for the Study of Languages and Cultures of Asia and Africa, Tokyo University of Foreign Studies, National Ethnology Museum and the Center in Kyoto are being supported by this particular public funding.

The Center for Southeast Asian Studies of Kyoto, where Dr. Watabe was Director during 1979-85, was established 30 years ago to create a truly interdisciplinary institution for *area studies* in Southeast Asia. The staff of about 30 comprises ethnologists, historians, economists, political scientists, sociologists and some 5 to 6 agricultural scientists. The Center explored new scientific approaches in interdisciplinary collaborative studies on specific areas, particularly of Southeast Asia as the major research ground. In 1979, two major subjects of study were identified.

The first dealt mainly with the agricultural studies of rice in Asia. The research dealt primarily with the cultural, historical and ethnological aspects of the development of rice cultivation in Asia in addition to agronomic and biological studies of rice. These multi-disciplinary studies on rice, participated by more than 20 experts, resulted in the publication of 3 volumes of "Asian History of Rice" in 1985. The studies clearly identified and demonstrated one current of agriculture that originated

Dr. H. Ishikura, a founder of TARC, toasted for the further advancement of TARC on the 20th Anniversary

in Asia, independent from another origin in the Middle East, as Solheim published in *Nature*.

The second subject of *area studies*, directed by Prof. H. Fukui, an agricultural scientist, involved a rice-farming village of Northeastern Thailand, Dongdeng Village. This intensive as well as extensive study concentrated on one village for a period of 3 years mobilized more than 40 researchers that lived in the research site. This particular study in Thailand provided valuable information and experiences in exploring methodology in *area studies*.

Four years ago, another Centre for *area studies*, the Center for African Area Studies, was established in Kyoto University, and it is anticipated that the two Centers will continue to explore interdisciplinary collaborative *area studies*, especially in the tropical regions.

* *Solheim, W.G.II: An Earlier Agricultural Revolution, Scientific American 226 (1972)*

* *Watabe, T. et al.: Asian History of Rice 3 Vols. Shogakkan Publ., Tokyo (1987)*

Strategic Implementation of Comprehensive Projects, Okabe

Mr. Shiro Okabe, former Director-General of TARC (1977-81), who returned to Japan after his 8-year mission at the CGPRT Centre of UN/ESCAP located in Bogor, Indonesia, is currently assuming the position of Senior Advisor to TARC, and Editor of the Japan Agriculture Research Quarterly (JARQ). As one of the most experienced administrators of TARC during 20-year history of the Center, Mr. Okabe was invited to present his views on the TARC program development.

Commending the strenuous efforts made by the members of TARC in the last decade, Mr. Okabe expressed his high appreciation of the achievements realized during that period. He recognized that significant progress in various aspects of TARC's operations had been made, including the consolidation of the research activities and increase in the number of staff members and collaborating overseas institutions as well as in the budget of the Center.

He particularly valued highly the establishment of the national coordination mechanism for implementing international research programs in agriculture, for which the Director-General of TARC is fully responsible. Such a consolidated structure at the national level for international agricultural cooperation has reflected the increasing awareness on the part of the Government of the need for Japan to become more involved in overseas programs, particularly in collaborative research activities with the developing countries. These increased contibutions would be commensurate to the remarkable economic development of Japan.

With a view to promoting the activities of TARC more effectively and efficiently, Mr. Okabe suggested some improvements of the strategies adopted for the implementation of the TARC programs. He particularly emphasized the need for improving, among others, the following two aspects: First, TARC should devote more time and efforts to the preparation and formulation of well-defined research projects, in order to ensure the effective implementation of collaborative research programs with the relevant institutions overseas and also in Japan.

Second, it would be important to utilize the national coordination mechanism described above more effectively. There is an increasing need for undertaking comprehensive research projects rather than a variety of individual studies on a small scale. In implementing those comprehensive projects, which would require continuity and consistency on a mid- or long-term basis, functional linkages will have to be established among the institutions concerned i.e. TARC and collaborating institutions not only overseas but also within the country. Mr. Okabe suggested that to achieve this objective, a contract arrangment clearly specifying long-term and immediate objectives, strategies, duties and work plan be considered by TARC and the relevant institutions overseas. To mobilize the national coordination mechanism, a special linkage between the TARC's programs and the national programs in the country would have to be developed for each program of TARC.

Mr. Okabe proceeded with his discussions by presenting his views on the implications of international research activities in the agricultural sector for Japan. He indicated three directions in this connection. The first is the direction of research interest originating from Japan and extending overseas, namely endogenous research interest. The second is the opposite direction to the above that could be formulated in a developing country and transferred to Japan, in other words, exogenous research interest. The third direction would involve a common interest of research mutually beneficial to both industrialized and developing countries. The results of this type of research, biotechnology for example, can be shared by researchers and other parties without a border. Mr. Okabe was of the opinion that in view of the increasing importance for TARC to follow the second and third directions, special consideration will have to be made regarding the research manpower arrangements.

The human resources for research at TARC should consist of an adequate proportion of subject matter experts, general matter specialists in tropical agriculture and young scientists, to enable TARC to maintain a well-balanced strength to meet the research needs in tropical agriculture development.

Royal Visit of H.R.H. Princess Sirindhorn of Thailand to TARC

On 28 June 1990, TARC was honoured by the Royal Visit of H.R.H. Princess Sirindhorn of Thailand. In the Tsukuba Agricultural Research Complex, she visited TARC, National Institute of Sericultural and Entomological Science and National Institute of Agrobiological Resources. TARC acted as the principal host of the royal visit due to the close collaboration between the Thai agricultural research organizations and TARC throughout the past 20 years, which yielded a number of valuable achievements.

Her Royal Highness was welcomed by all the staff members of TARC including a large number of women, had an audience with Director-General, Dr. S. Tsuru and Division Directors in relation to the recent achievements in joint Thai-Japan research in agriculture and forestry, and inspected technical displays of TARC research activities overseas.

The Director General, joined by Dr. T. Nishio, D.G. of the Agriculture Research Council Secretariat of the Ministry, expressed his special thanks for the royal visit to TARC, which will undoubtedly contribute to the enhancement of the research collaboration between the Thai organizations and TARC.

Prof. Tadayo Watabe, Professor Emeritus, and former Director (1979-85), the Centre of Southeast Asian Studies, Kyoto University. Graduated from Dept. of Agronomy, Kyoto University (1949) and taught in the universities of Kyoto and Tottori. Joined Faculty of Agriculture, Kyoto University in 1972 and organized interdisciplinary project research on the civilization of rice agriculture of Asia. Presently, Professor, the University of the Air.

Mr. Shiro Okabe, Advisor to TARC. Graduated from Hokkaido Univ. (1946) and joined Ministry of Agriculture as a researcher at Hokkaido Agr. Exp. Station, and led his research career at National Institute of Agricultural Sciences as a plant breeder. Staff of World Bank Hqs. (1972-75). Assumed Director of Research Div. II and D.G. of TARC (1975-81). Contributed to the foundation and establishment of UN/ESCAP CGPRT Center in Bogor, Indonesia as the first Director General (1981-89).

Patterns of Soil Distribution in Relation to Parent Materials, Landforms, and Climate Types in the Philippines

T. Hamazaki and E.P. Paningbatan, Jr.

The collaborative research project between the Tropical Agriculture Research Center (TARC) and the University of the Philippines at Los Baños (UPLB) entitled "Studies on the Genesis, Characteristics and Productivity of Red-Yellow and Related Soils in the Philippines" was initiated in 1986. The objectives were to study the genesis, physico-chemical and mineralogical properties of Red-Yellow and related soils in the Philippines; to determine their patterns of distribution in relation to parent materials, topographic position and climate; to classify these soils according to some soil classification systems; and to evaluate their productivity potential to implement agricultural development programs in the Philippines.

Nine areas all over the Philippines have been studied and soil samples from 48 profiles were collected and analyzed.

1. Main upland soils in the Philippines consisted of Red soils, Yellow soils, Dark Brown soils, Terra · rossa-like soils, Terra · fusca-like soils, Rendzina-like soils, Brown Upland soils, Pseudogley-like soils, Andosols, Vertisols, Brown Lowland soils, and Gray Lowland soils.

2. From residual, old alluvial and volcanic mud flow andesite and basalt materials, Red soils and Yellow soils were formed on hills, and upper and middle terraces.

The Red soils were strongly acid with a low activity* under climatic conditions characterized by less than 2 dry months, strongly to moderately acid with a low activity under climatic conditions characterized by 2 to 4 dry months, and moderately acid under climatic conditions characterized by more than 4 dry months.

The Yellow soils were strongly acid with a low activity under climatic conditions characterized by less than 2 dry months, strongly to moderately acid under climatic conditions characterized by 2 to 4 dry months, and were hardly formed under climatic conditions characterized by more than 4 dry months.

On lower terraces, only Yellow soils were formed. The Yellow soils were moderately acid with a low activity under climatic conditions characterized by less than 2 dry months, and moderately acid under climatic conditions characterized by 2 or more dry months.

These Red-Yellow soils were classified as Kandihumults, Kandiudults, Kanhapludults, Haplohumults or probably Haplustults in the Soil Taxonomy.

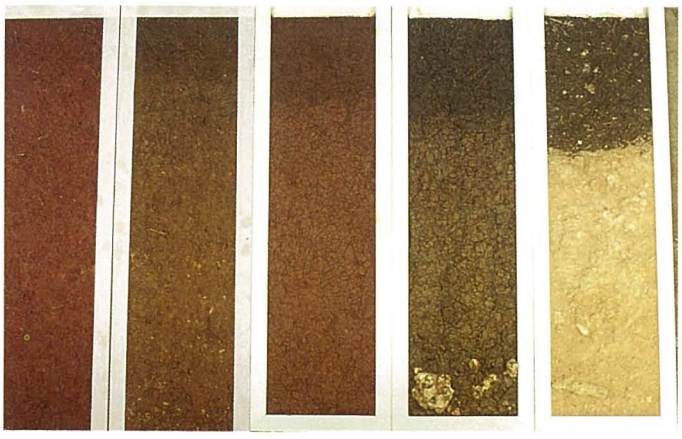
(* Low activity indicates a CEC value of less than 16 me/100 g clay.)

3. From residual, aquatic and/or eolian materials on limestone, Red soils were formed on hills, Terra · rossa-like soils on flat higher terraces, Terra · fusca-like soils on flat lower terraces, and Rendzina-like soils on recently raised coral terraces and slope of rolling terraces. Red soils were strongly to moderately acid, Terra · rossa-like soils slightly acid, Terra · fusca-like soils slightly acid to neutral, and Redzina-like soils neutral to slightly alkaline.

Terra · rossa-like soils and Terra · fusca-like soils were classified as Paleudalfs, Hapludalfs, Paleustalfs or Haplustalfs, and Rendzina-like soils as Rendolls or Haplustolls in the Soil Taxonomy.

4. Under climatic conditions characterized by more than 4 dry months, Brown Upland soils with soft powdery lime (Ustropepts) developed from residual material of calcareous shale and sandstone on hills, and Vertisols with soft powdery lime (Pellusterts) and Calcaric Brown Lowland soils (Ustropepts) from calcareous alluvial deposit on recent plains.

5. Monoliths of main soils in the Philippines were also prepared. *(Photo)*



Monoliths of Philippine soils, from left, Red soil, Yellow soil, Terra · rossa-like soil, Terra · fusca-like soil and Rendzina-like soil (Photo by T. Hamazaki)

Mechanism and Control of Aflatoxin Contamination of Maize in Thailand

Koji Kawashima, Shoichi Kawasugi and Prisnar Siriacha

Aflatoxins are a group of mycotoxins that are known to man as the most potent carcinogens produced as secondary metabolites by a ubiquitous mycelium fungus, *Aspergillus flavus*. A large number of agricultural commodities in the tropics, especially groundnuts and maize, are often contaminated with a certain level of aflatoxins due to handling practices under a warm and humid climate.

Maize is an important crop in Thailand besides rice, cassava and sugar cane, and 4 to 5 million tons are produced annually. Since the 1970s it has been suggested that the commercial value of Thai maize as feed grain would be far improved, if aflatoxin contamination could be better controlled. Under an agreement between the Department of Agriculture (DOA) of Thailand and TARC, a research project was initiated to clarify the mechanism of contamination and to develop control methods that can be applied under local farm conditions.

During the first phase of the studies, maize as a commodity was traced from the production site in farms through buyers and to storage facilities all over Thailand in order to analyze precisely the process of contamination during marketing.

It was generally observed that mechanically shelled kernels without subsequent drying became rapidly infected with *A. flavus* mold when the initial moisture content exceeded 20%. However, the infection did not occur when the kernel moisture contents were less than 17%. It was also found that the injury of maize kernels during the shelling process led to aflatoxin formation. The time required for aflatoxin formation in wet shelled maize due to the *A. flavus* infection was normally 4 to 7 days.

In order to eliminate aflatoxin contamination, several methods were tested. Methanol was found to inhibit the growth of *A. flavus* and kept maize free from aflatoxin as long as the kernels were not exposed to atmosphere. Among the methods tested, the following procedure was found to be most effective for preventing aflatoxin contamination in stored maize.

Maize harvested during the rainy season with a high moisture content was mechanically shelled and immediately stored in HD (high density) polyethylene bags placed in conventional 100 kg jute bags used for maize. The open ends of the plastic bags were tightly bound and sealed with strings. Aflatoxin contamination was perfectly controlled at zero level over a period of 60 days by this simple procedure.

The possible mechanism of the inhibition of mold growth and aflatoxin formation can be explained as follows: (1) The respiration of wet maize creates an anaerobic condition within the plastic bag, (2) Some microorganisms in the bag consume ox-

ygen, which results in the inhibition of the mold growth and aflatoxin formation as well. During the storage there appeared some smell due to the presence of yeast-like organisms. However, most of the smell was removed when maize was dried, and the whole storage process did not affect the color of maize and other factors which determine the commercial value.

The method developed primarily for local small scale clients is safe, simple and cheap. As the method does not require specialized equipment or procedures, it is technically and economically applicable in rural Thailand. The method also controls the contamination with other molds such as *Fusarium* and *Penicillium*.

The preservation of Thai maize in a simple sealed plastic film bag and maize free from (left) and contaminated by (right) A. flavus infestation (Photo by K. Kawashima)

Breeding of rice varieties for high-yield and resistance to cold weather and blast disease through the utilization of unexploited genetic resources

N. Abe, Y. Fujimura, M. Inoue, M. Iwano, K. Matsunaga, N. Horisue, K. Moriya, T. Higashi, Y. Kunihiro, H. Uchiyamada, Z. Oyamada, A. Todoroki, Wang Yonghua, Jiang Zhinong, Wang Huaiyi, He Yunkun, Xiong Jianhua, Kong Ping, Zhang Sizhu, Li Zhiyong, Li Jiarui, Li Chengyun, Huang Yinmei, Sun Youquan, Zhou Yiping, Li Xiuying, Pan Huanping, Liu Ji, Hu Rukai, Chen Guoxin, Chen Tianrong, Wu Ruhui, Chen Quanchang, Feng Zhengyou, Zhang Zhaoming, Li Jianping, Liu Qiongfen

Yunnan district of China is known as one of the areas where rice cultivation originated. The Tropical Agriculture Research Center (TARC) has been cooperating with the Yunnan Academy of Agricultural Sciences by undertaking collaborative studies on the breeding of rice varieties for high-yield and resistance to cold weather and blast disease through the utilization of unexploited genetic resources since 1982.

In 1990, the government of Yunnan Province registered three new rice varieties developed by cross-hybridization of the Yunnan and Japanese breeding materials under this cooperative effort, as those varieties are considered to be superior varieties in the Yunnan Province, especially in the keng-rice (japonica) region located between 1,500-2,000 m above the sea level. The characteristics of the three varieties are indicated in Table 1.

Highly resistant varieties to cold weather were identified from the Yunnan breeding materials. Those varieties showed a higher resistance than a Japanese variety "Somewake," which is considered to display the highest resistance among the Japanese varieties. These materials were used as parents and several promising lines were bred and are expected to be useful materials for further improvement.

New registered Variety Dian Jing 20 (Photo by A. Kobayashi)

Table 1. Major characteristics of the three new varieties

Name of variety Promising lines	DIAN JING No. 18 Hejiao No. 4	DIAN JING No. 19 Hejiao No. 5	DIAN JING No. 20 Hejiao No. 10	YUN JING No. 9
Maturity Plant type Heading/Ripening time Culm height cm Panicle height cm Number of panicles/m^2	Early Intermediate type July 16/Aug. 31 83 17.2 714	Intermediate Intermediate type July 26/Sept. 5 84 17.0 438	Intermediate Partial panicle weight type July 23/Sept. 12 86 15.7 509	Late Panicle weight type July 30/Sept. 16 101 16.0 418
Color of apiculus Shattering habit Lodging resistance	Brown Limited High	White yellow Intermediate High	White yellow Intermediate High	White yellow Very limited Low
Leaf blast resistance Panicle blast resistance Genotype for blast resistance	High Very high Pi-i	High Very high Pi-i	High Very high +	Intermediate High +
Resistance to cold weather Yield (unhulled) kg/a Yield (hulled) kg/a 1,000 grains weight g Quality of grain	Very high 97.9 80.3 22.8 Intermediate	Intermediate 79.9 68.9 22.6 Good	High 98.6 79.7 19.1 Intermediate	Very high 82.7 69.4 19.7 Poor

Nobel Laureate
Dr. Borlaug Praised the Role of Wheat NORIN 10 in Green Revolution – *CGIAR Delegates Visited Tsukuba*

Dr. Borlaug stands by the statue of late Dr. Inazuka, the breeder of Norin 10 with Chief of Jouhana, Mr. Kawada. (Photo by the courtesy of Toyama-Ken)

CGIAR official delegation, headed by Nobel Laureate, Dr. Norman E. Borlaug, visited International Garden and Greenery Exposition 1990 in Osaka for Official CG DAY observed on 28 May 1990 with a CGIAR Symposium including Dr. Borlaug as a keynote speaker. The CG Delegates, including Drs. Winkelman (CIMMYT), Lampe and Khush (IRRI), Sawyer (CIP), Walsh (ILCA), Doyle (ILRAD) and Von der Osten (CG Hqs.) then moved on to Tokyo and Tsukuba for meetings with IARCs' Board Members and representatives from Japan.

In Tsukuba, on 31 May 1990, Directors General and their deputies of 11 national agricultural research institutes had an afternoon discussion session with the CG Delegates, which was followed by a reception. Earlier in the morning the CG Delegates had technical visits to the respective institutes of their professional interest in Tsukuba National Agricultural Research Complex.

In the Meeting in Tsukuba, Dr. Borlaug gave a lecture on "Origin and Impacts of the Green Revolution," in which he acknowledged specifically the role played by a wheat variety of Japanese origin "NORIN 10." The variety provided the critical genetic traits of high-yielding and dwarf characteristics in his programs of breeding Mexican dwarf varieties that achieved Green Revolution.

After his official schedule, Dr. Borlaug for the first time paid his call on home of late Dr. Gonjiro Inazuka, a wheat breeder, who devoted his 13 years of research and field trials to the breeding of NORIN 10 in a regional experiment station in Iwate of northern Japan from 1926 through 1938. He passed away in 1988 at the age of 91.

In Jouhana Village, Toyama Prefecture, the Nobel Laureate visited Inazuka's old country house, planted a tree and gave a memorial lecture in the town hall, which was attended by about 300 village farmers.

TARC in China *(continued from p. 8)*
Agro-Environmental Resources Studies Initiated in Dry Western Region, Xinjiang

The Japan-China Collaborative Research Program has recently extended its activities to an arid area in the western part of China, the *Xinjiang Uygur Autonomous Region*. After a series of bilateral discussions, the Director General of TARC, Dr. S. Tsuru and Dr. Xia Xun Cheng, Director General of Xinjiang Institute of Biology, Pedology and Desert Research, Chinese Academy of Sciences, met on 8 March 1990, in Urumqi, China, to confirm the details. The project to be implemented involves collaborative studies on agro-environmental resources in dry areas.

The *Turfan Depression (oasis)* was selected as the specific research site. In this area, water from melted snow and glacier in the surrounding Tian Mountains (Tian Shan) accumulates and circulates in a sophisticated subterranean irrigation network (*Karez* or *Qanats*) thought to have been developed in Persia more than 2000 years ago. Through a system of pumps and reservoirs, the water irrigates fields where a variety of crops is being cultivated.

The projected research program will include the following subjects. 1) Studies on soil classification and properties in dry land. 2) Studies on climate characteristics and water distribution in dry land and development of measures to prevent wind erosion. 3) Cartographic assessment of agro-environmental resources, in which the dynamic changes of vegetation in dry land are analysed by remote sensing technology.

TARC researchers have been dispatched for long- and short-term assignments to the Institute in Urumqi since March 1990 to undertake pedological and agro-meteorological studies. *(Araragi)*

The site of joint research in Turfan Depression, showing wind-erosion of soil, where meteorological survey is now underway. (Photo by S. Nakai, Urumqi)

TARC International Symposium 1990 in Kyoto

The International Symposium of TARC 1990 will be convened on "Soil Constraints on Sustainable Plant Production in the Tropics," in Kyoto, 14-16 August 1990, in conjunction with the 14th International Congress of Soil Science as its satellite meeting. The Symposium aims at focussing on various problems of soil constraints on sustainable plant production in the tropics, with cultivated lands, pastures, forest and agroforestry lands.

While the Country Reports will be presented from India, Sri Lanka, China, Thailand, Malaysia, Indonesia and Japan, during the afternoon sessions of 14 and 15 August, the Technical Reports on the following subjects from international and national institutions will be discussed in the sessions of 15 and 16 August: Land management for sustainability (Jones · *ICARDA*), Soil constraints in humid West Africa (Kang · *IITA*), Soil constraints to legumes (Haque · *ILCA*), Pastures on Oxisols in Colombia (Mitamura and Ogawa · *TARC/CIAT*), Poor acid soils of tropical America (Toledo · *CIAT*), Nutritional factors of tropical peat soils (Tadano · Japan), Soil productivity induced by pigeonpea (Arihara, Ae and Okada · *TARC/ICRISAT*), long-term organic matter application in Ultisols of Thailand (Inoue · *TARC*), Soil salinity control (Miura · *JICA/TARC*) and Sustainable soil fertility through agroforestry systems (Young · *ICRAF*).

The 1990 International Symposium will follow up the previous Symposium of 1981 held in Tsukuba on "Distribution, Characteristics and Utilization of Problem Soils."

Research Information Division

Dr. Yoshikazu Ohno, Director

Profile of TARC Divisions

Eco-Physiology Research Division

Dr. Nobuo Murata, Director

Research Information Division, which was established in 1985, is in charge of the management of information on tropical agriculture. Efficient research for the promotion of tropical agriculture requires an adequate knowledge of the characteristics of such agriculture. Six research coordinators for information and five researchers of the Division are collecting systematically information on agriculture from each region of the world, by analyzing and evaluating the characteristics of agriculture on a regional basis, providing the advice and guidelines required for the promotion of technical development and formulation of the collaborative research projects between TARC and institutions overseas.

To utilize efficiently the collected data, databases are being constructed on personal computer or online, such as *TARC bibliographic information system* (Tropis) and *TARC slide information system* (Trosis), etc. The development of a text digitizing information system using a laser disk with a higher filing capacity is currently being planned.

Due to our geographical isolation, Japanese researchers on tropical agriculture have been suffering from the scarcity in readily available information on tropical agriculture and forestry. In order to ameliorate the situation, the Division assumes a mission to construct useful databases exploitable for the advancement of overseas research in these fields.

TARC is sponsoring and organizing each year an international symposium on a selected subject pertaining to tropical agriculture to promote efficiently research activities on tropical agriculture. Ten to fifteen scientists from research institutes of tropical countries and international institutes are invited to the symposium, which contributes to exchange of mutual understanding. In 1990, the symposium will be held as a satellite symposium of the 14th International Congress on Soil Science in Kyoto, during the period 14-16th August.

The Division is in charge of the publication of several English journals as follows: JARQ (Japan Agriculture Research Quarterly), Technical Bulletin of TARC, TARS (Tropical Agriculture Research Series; Proceedings of International Symposium on Tropical Agriculture Research), Newsletter TARC, Research Highlights (in preparation), TARC 20th Year Review in 1990 (in preparation) and other four publications in Japanese.

The Division is also in charge of the TARC Library operated by two librarians and assistants where the volumes of 160 scientific journals and approximately 50,000 books are stored.

Research field: plant nutrition, Born in 1935. Received Doctorate Degree from Tohoku University. After working at the Tohoku National Agricultural Experiment Station, he joined TARC in 1970 and carried out research at IRRI (1970-72) and IAPAR in Brazil (1975-80). His main contributions include rice physiology with emphasis placed on photosynthesis under tropical conditions and nutritional factors affecting upland rice yield in Brazilian latosols. Thereafter he was appointed Senior Researcher at the National Insitute of Agricultural Sciences, Head of Laboratory at Hokkaido National Agricultural Experiment Station and National Research Institute of Vegetables, Ornamental Plants and Tea. He joined TARC again in March, 1989, where he is currently assuming the position of Director of the Research Information Division.

The Eco-Physiology Research Division was established in 1987 to analyse in greater detail the factors controlling the equilibrium of the various components of agro-ecosystems in order to develop more appropriate techniques or select crops that can tolerate adverse conditions such as drought, salinity, high temperature, waterlogging, etc. in the tropical zone. In addition the Eco-Physiology Research Division is currently promoting studies on the application of biotechnological procedures to the improvement of crops, better utilization of resources such as micro-organisms, biomass conversion, etc. in the tropics or subtropics.

Currently, four major projects are being carried out.

1) Tropical legumes and biological nitrogen fixation: In collaboration with the Department of Agriculture, Thailand, nitrogen fixation of leguminous crops and forest trees is being assessed by the method of ^{15}N natural abundance method. To support these studies, rhizobial isolates from Thai soils are being examined in Tsukuba for their nodulation gene structure.

2) Stress tolerance of cowpea: To improve the stress tolerance of cowpea, an important crop in Sub-Saharian zone, a scientist is stationed at an outreach of the International Institute of Tropical Agriculture in Kano, Nigeria, to perform physiological studies to evaluate germplasm and breeding lines of cowpea. Supportive studies are also being conducted in Tsukuba.

3) Sweet potato and potato: The identification of viruses of sweet potato is a major research objective at the International Potato Center, Lima, Peru as virus diseases are a major constraint on international germplasm exchange as well as practical farming. A virologist is stationed in Lima to characterize viruses occurring in Central America. As the basis of germplasm collection and utilization of potato, the classification of clones of potato and its relatives in terms of mitochondrial genes is also under way in Tsukuba.

4) Rumen microorganisms in Malaysia: Utilization of coarse fodder is essential for animal production in tropical developing countries. Research is being conducted in collaboration with the Malaysian University of Agriculture to characterize rumen bacteria in order to promote fodder utilization of cattle and other ruminants and to explore the possibility of their improvement. It was shown that the ability to decompose toxic substances produced by mimosa can be remarkably improved by the introduction of exotic rumen microorganisms in Malaysia.

Born in Osaka in 1933. Received Doctorate Degree from Kyoto University in plant breeding. Engaged in research in the Department of Genetics. National Institute of Agricultural Sciences (1957-1981). Carried out research in the U.S.: Department of Plant Pathology and McArdie Laboratories for Cancer Research, University of Wisconsin (1965-1967), Department of Bacteriology, University of California, Davis (1970-1971, 1972, 1978). Research at the Department of Molecular Biology, National Institute of Agrobiological Resources (1984-1986). Served as the First Officer, Plant Breeder and Geneticist, Plant Breeding and Genetics Section, Joint FAO/IAEA Division, International Atomic Energy Agency in Vienna (1986-1989). Assumed the present position in 1989. Major research subjects: resistance to blast and bacterial leaf blight of rice, classification of Xanthomonas, Erwinia, Corynebacterium plant pathogens in terms of DNA homology, conjugal gene transfer in Erwinia, Rhizobium and Agrobacterium species.

TARC in China

Japan-China Collaborative Research in Agriculture in Progress

Ancient China prospered as one of the early agricultural civilizations in Asia. Agriculture still maintains the vital role of sustaining the livelihood of 1.2 billion people in China. In August 1981, the then Agricultural Minister, Mr. T. Kameoka, visited Mr. Lin, Minister, Dept. of Agriculture of China, in Beijing, and reached an agreement on the implementation of Japan-China Collaborative Research in Agriculture. In February 1982, the first official meeting of Japan-China Exchange Group in Agricultural Sciences and Technology followed up this decision at Minister level and discussed the details of the project implementation: "Breeding of Rice Varieties for High-yield and Resistance to Cold Weather and Blast Disease through the Utilization of Unexploited Genetic Resources." TARC was assigned to act as the counterpart institution on Japanese side, and embarked on our first engagement in a non-tropical region. The Project aimed to mutually benefit the scientific interest of two countries, especially by exchanging more than 600 selected rice varieties expected to be utilized in extensive breeding programs of various objectives.

In 1987, a new program on "Vegetable Production" was initiated under the understanding between TARC and Shanghai and Guangzhou authorities. Another program was implemented this year (1990) on environmental resources studies in a western dry area, Xinjiang Region, with Xinjiang Institute of Biology, Pedology and Desert Research, Chinese Academy of Sciences. During the past 9 years, Japan-China cooperative studies have constantly been making strides.

Rice Breeding Project in Yunnan Achieved Success

Yunnan Province which is located in the southwestern part of China, is bordered by Burma on the west, and by Vietnam and Laos on the south. Yunnan covers an area of 394,000 square kilometers with a population of 32,553,817 (July 1, 1982). Yunnan has 24 ethnic groups such as Yi, Bai, Hani, Zhuang, Dai, Miao, Lisa, Hui and others, in addition to the Hans. A remarkable variety of plants exists in the region, especially genetic resources of rice are abundant, since the Yunnan district is known as one of the areas where rice cultivation originated.

Since 1982, the Tropical Agriculture Research Center, Japan and the Yunnan Academy of Agricultural Sciences, Peoples' Republic of China have been implementing a cooperative research program entitled: "Breeding of Rice Varieties for High-Yield and Resistance to Cold Weather and Blast Disease through the Utilization of Unexploited Genetic Resources." The main objectives of the cooperative research program are as follows:

(1) Breeding of japonica rice varieties adaptable to the Yunnan district.

(2) Development of breeding methods for the effective utilization of unexploited genetic resources.

In 1990, the government of Yunnan Province registered three new rice varieties developed by cross-hybridization of the Yunnan and Japanese breeding materials under this cooperative effort, as those varieties are considered to be superior varieties in the Yunnan Province. These three varieties were planted over more than 20,000 ha in 1990. The three varieties are:

1. Dian jing No. 18 = Hejiao No. 4: This progeny from the cross TODOROKIWASE x YUNJING No. 135, is characterized by a high-yield, early maturity, intermediate plant type, cold resistance and blast resistance.

2. Dian jing No. 19 = Hejiao No. 5: This progeny from the cross TODOROKIWASE x YUNJING No. 135, is characterized by an intermediate plant type, high-quality of hulled rice, blast resistance and intermediate maturity.

3. Dian jing No. 20 = Hejiao No. 10: This progeny from the cross TODOROKIWASE x YUNJING No. 9, is characterized by an intermediate plant type, blast resistance, high-yield and intermediate maturity. *(see Newsletter TARC Vol. 1, No. 2)*

Based on the comparison between the Japanese breeding materials and the Chinese ones for resistance to cold weather, it was observed that the breeding materials from Yunnan district included rice varieties highly resistant to cold weather.

In order to establish an effective breeding program for resistance to blast disease, it is essential to analyse the distribution of the pathogenic races in the region and to classify the rice varieties on the basis of their reaction to the various pathogenic races. Two hundred and forty blast fungus isolates collected from the 14 counties in the Yunnan province were divided into 27 pathogenic races according to the differentiation method developed by Yamada et al. It was observed that multiple pathogenic races were present in a paddy field in Yunnan province in 1988, and that the pathogenic race composition in a paddy field varied from year to year. Based on the research results mentioned above, an identification method of the pathogenic races of blast fungus was developed using the Yunnan breeding materials. *(Yamaguchi)*

Vegetable Research Projects in Shanghai and Guangzhou

Since 1987, a collaborative research project between Japan and China on the "Development of Stable Production of Vegetables in the Tropics" has been carried out at the Horticultural Crop Institute of Shanghai Academy of Agricultural Sciences in Shanghai and the Economic Crop Institute of Guangdong Academy of Agricultural Sciences in Guangzhou.

The project involves "Varietal Improvement of Stress Tolerant Vegetables" including cucumber, sweet pepper, Chinese cabbage and "Stable Production of Vegetables in Summer" including tomato, sweet pepper, melon, strawberry, spinach and other leafy vegetables. TARC has been sending a total of 3 researchers on long-term assignments to both institutes for collaborative research since 1987. Promising F1 lines of cucumber and sweet pepper with higher heat tolerance and quality were developed by crossing Chinese and Japanese varieties. Also the remarkable effect of cover materials on sweet pepper yield during the hot season was revealed. The current studies deal with the cultivation of strawberry for early harvest and the development of a method for the cultivation of net melon by grafting to pumpkin stocks.*(Ohno)*

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Diversification of paddy fields by the introduction of vegetable culture in Guangzhou (Photo by Y. Ohno)

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