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Newsletter

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The new laboratory for TARC Visiting Research Program at Okinawa Branch (Photo by T. Senboku)

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FOR INTERNATIONAL COLLABORATION

TARC

TROPICAL AGRICULTURE RESEARCH CENTER

Germplasm Development in National and International Research Institutions

Chukichi Kaneda

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Received Doctorate Degree in Plant Breeding from Tokyo University. Born in Yamagata in 1932. Graduated from Dept. of Agronomy, Tokyo University, joined MAFF and became engaged in research at the Crop Division, Hokuriku Agric. Exp. Sta. (1955-68) and at the Crop Division, the Central Agric. Exp. Sta. as Head of Rice Breeding Method Lab. (1973-82). Visiting Assistant Scientist at the International Rice Research Institute (IRRI) (1968-72). Counsellor for Research and Development, Research Council Secretariat of Agriculture, Forestry and Fisheries, MAFF(1982-85). Became Director of Division of Summer Crop Sciences (1985-86) and then Research Coordinator General on Crop Production at the Natl. Agric. Res. Center (1986-88). Appointed as Director General of the Tropical Agriculture Research Center (1988-89) and then as Director General of the Natl. Agric. Res. Center (1989-91). Currently Professor at the Dept. of Agriculture, Kobe University (since 1991). Member of the Council of Agricultural Materials, MAFF (1985-88). Member of Board of Trustees, International Center for Tropical Agriculture (CIAT), CGIAR (since 1988). Received an Award from the Japanese Society of Breeding for "Breeding and genetic studies on brown planthopper resistance of japonica rice" (1984) and from MAFF for contribution to rice breeding in Japan (1987).

Crop germplasm development in Japan experienced considerable changes in 1990 and 1991 along with the publication of "The Basic Objectives of Research in Agriculture, Forestry and Fisheries" in January 1990. In this document, it was announced that more emphasis should be laid, firstly on meeting the various needs of consumers of agricultural products, secondly on opening new avenues in agriculture by exploiting biological innovations, thirdly on revitalizing the rural areas through the implementation of agricultural production programs specifically suited to each region. Also it was stressed that research should contribute to further development of agricultural, forestry and fishery industries in taking account of the need to preserve the environment. The last of the five main priorities involved the consolidation of basic research areas for the development of the above-mentioned activities.

In this context, breeding objectives, such as improvement of quality and diversification of agricultural products, host plant resistance to pests and diseases, more efficient response to reduced application of fertilizers, or development of cultivars with novel characteristics, will become very important in the coming decade. At the same time, basic and applied research including advanced research areas like biotechnology and/or activities in various aspects of genetic resources should also be intensified. Considering the present situation, responsibility-sharing will be sought between research institutions of the central and local governments even more than before.

Following these changes, the national organization of crop breeding was modified in October 1991 to intensify research on the grain physico-chemical characteristics of major field crops – rice, wheat, and soybean – especially in terms of evaluation and characterization. Also, laboratories for the breeding of newly introduced crops or crops which have been so far less known but are expected to be useful in future were set up in some regional experiment stations.

Such a change of priorities in Japan can be observed elsewhere under the recent changes in the socio-economic conditions worldwide, and this reminds me of the recent trends in the CGIAR system regarding priorities of research activities in international institutions, though the circumstances are much more complicated than in Japan.

In 1990, the CGIAR decided to move away from the emphasis placed on the increase in the production of food crops and extend its activities to sustainability, natural resource management and food self-reliance. A sharp delineation between the two types of activities was proposed – one emphasizing the ecoregions and the other global problems. Accordingly, the system was expanded in 1991 to include research on forestry and agroforestry, fisheries and aquaculture, irrigation management, and other fields. Emphasis of the research activities was placed on long-term sustainability, natural resource management, pest and disease management, collaboration between national partners or transnational mechanisms in adaptive and applied research.

Research activities relating to germplasm development in the international research institutions have changed their orientation. One of the most typical examples can be seen at IRRI where, after the successful release of improved varieties for many years, the significance of the distribution of lines of advanced generations was reassessed and it was eventually decided that materials of earlier generations should be distributed so as to enable national programs to select the cultivars adapted to their own ecoregions. This change was made possible because many of the rice-cultivating nations in the region had become considerably self-reliant so that IRRI could shift its activities to more strategic and basic research areas to fulfill its global responsibility.

It has often been observed that basic research can be conducted only if at least some part of practical breeding, which may be of great significance to the countries with limited financial resources is sacrificed. However, basic research should contribute in the long run to a remarkable increase of crop productivity.

At IRRI, though the increase of rice productivity has been somewhat stagnant during this decade, much effort is concentrated on bringing new genetic bases from wild relative species into cultivated rice by using novel technologies, and analyzing molecular genetic information. Also at CIAT, while developing semidwarf upland cultivars adapted to highly acidic savanna soils, the scientists are attempting to promote the acquisition of stable plant resistance to blast, hoja blanca, or planthoppers through molecular genetic analysis and other procedures.

Under the current budgetary constraints faced by the CG-system, international centers have to strike a balance between the fulfillment of their global responsibility while meeting the needs of their regional counterparts. As research on natural resource management in different ecosystems is becoming increasingly important, it is feared that site-specific research might be overemphasized. This problem may not be serious in germplasm development due to the wide use of information and technology in the evaluation of genetic resources, methods of screening, breeding, and multiplication, etc. However, international institutions can fulfill their responsibility only with the cooperation of national institutions by sharing the responsibility in the development of regional resources.

TARC has been engaged in cooperative research, by sending scientists to both national and international research organizations. Although the priorities set up by TARC may not have changed, the concept of dispatching scientists may have to be reviewed in line with the diversification of international interests.

Research Themes of TARC Visiting Research Fellowship Program 1992

The Tropical Agriculture Research Center (TARC), Ministry of Agriculture, Forestry and Fisheries, Japan, is planning to implement a Visiting Research Fellowship Program starting in October 1992. This Program emphasizes pioneer research on the conservation of the global environment and optimum utilization of bioresources in the tropics and subtropics.

The background of the Program has already been outlined in TARC Newsletter Vol.2 (3) and the qualifications and conditions were also indicated in Vol.2 (4). The details of the four themes which will be taken up at the Okinawa Branch of TARC are presented as follows:

A) Development of techniques for environmental control by using plants and microorganisms specific to the tropics and subtropics.

The increase of the population of developing countries located in the tropics and subtropics leads to the utilization of marginal lands and the clearing of vast tracts of forest land for the cultivation of food crops. These practices are characterized by a low crop productivity in addition to the rapid degradation of the environment. These circumstances strongly call for the development of agricultural technologies which enable to enhance the productivity on a sustainable basis in harmony with the ecosystems. There is a diversity of plant and microorganism germplasm with useful functions in the tropics and subtropics, and their utilization has been investigated for a long period of time.

This thrust includes the following three areas of basic research by the application of pioneering methodologies:

1) Analysis of the physiological, biochemical, and genetical background of functions for nutrient uptake, phosphate conversion and allelopathy, or the background of the manifestation of resistance to pests and diseases.

2) Identification and evaluation of physiologically active substances present in or produced by useful plants and microorganisms.

3) Analysis of environmental conditions in the rhizosphere that are conducive to the manifestation of those useful biological functions, and development of effective technologies for environment management by the incorporation of these functions.

The outcome of this thrust may contribute to the development of agricultural and forestry systems with a high productivity on a sustainable basis in the tropics and subtropics.

B) Studies on the mechanism of heat-tolerance of tropical and subtropical crops (with emphasis placed on vegetable crops)

The year-round supply of fresh vegetables is necessary to improve the nutrition level of the people in the tropics and subtropics. However, the growth of leaf and fruit vegetables in the summer is suppressed remarkably by high temperature, strong solar radiation and high humidity in these regions.

It is considered that the high temperatures in the tropics and subtropics cause a nutrient imbalance throughout the growing period of crops, suppressing the growth of both the aerial organs and subterranean parts.

This thrust also will focus on the following subjects through the application of pioneering technologies:

1) Comparison of the characteristics of photosynthesis, flowering and nutrient uptake of heat-tolerant crops.

2) Analysis of the biological mechanisms of high temperature damage and heat-tolerance of crops through the application of biochemical and physiological techniques.

The findings are expected to lead to the selection of heat-tolerant vegetable crops or cultivars, and the development of cultivation techniques to achieve a year-round supply of leaf and fruit vegetables in the tropics and subtropics.

C) Identification and evaluation of salt-tolerant crops

Among the problems relating to the deterioration of the global environment, the restoration of the vegetation of coastal ecosystems, represented by mangrove swamps, or inland areas with salt accumulation due to poor management of irrigation or geological characteristics is of utmost importance from the global viewpoint. It is thus essential to develop salinity-tolerant crops. In the past the morphological characteristics of salt-tolerant plants such as *Atriplex* spp. were identified. The presence of rice strains growing in mangrove swamps is also known.

Moreover research on gene recombination in major crops such as rice, to develop transgenic plants has been undertaken in various laboratories world-wide.

This thrust will focus on the following aspects:

1) Identification of salt-tolerant plants and evaluation of their characteristics.

2) Identification of the genes controlling the characteristics of salt tolerance.

3) Development of useful salt-tolerant crops by using gene manipulation techniques.

The results shall be utilized to develop techniques for the breeding of salt-tolerant crops.

D) Evaluation and development of techniques for long-term conservation of genetic resources of vegetatively propagated crops in the tropics and subtropics.

It is a major challenge for scientists to develop agricultural technologies for the tropics and subtropics which are environmentally sound and sustainable. This objective requires a more effective use of crops associated with specific localities with a long history of indigenous cultivation. On the other hand, valuable germplasm of such crops is being lost as a result of fast-changing natural and social conditions. It is thus essential that such genetic resources be preserved (collection, maintenance, propagation, and improvement).

This thrust covers the following areas:

1) Development of techniques for inducing flowering and fruiting, and seed production of taro, yam, etc. by using physiologically active substances, etc.

2) Improvement of seed conservation techniques.

3) Development of techniques for the in vitro preservation of genetic resources.

4) Development of methods of utilization of genetic mutations occurring in the culture process.

5) Development of methods for evaluating genetic characteristics by the use of molecular biology techniques.

The research results will contribute to a more intensive use of vegetatively propagated crops in the tropics and subtropics.

The new laboratory equipped with advanced facilities for TARC Visiting Research Program at Okinawa Branch (Photo by T. Senboku)

≪Agricultural Engineering≫

Surface Water Drainage Effects of Ditches for Direct Seeding Culture in Malaysia

*Y. Kanetani and Mohamud Fauzi b. Hj. Mansor**

The Muda area, the largest rice-growing area in Malaysia, also known as "The rice bowl of Malaysia" produces about 700,000 tons of rice which accounts for approximately 50% of the total rice production in Peninsular Malaysia. Rice production has increased since the introduction of double-cropping in 1970.

Direct seeding culture spread rapidly in the 1980s and the planted area with direct seeding in the second cropping season (main season: September to February) exceeded the transplanted area in 1986. The planted area with direct seeding during the first cropping season (off-season: March to August) has also increased since 1980. Direct seeding culture can be divided into two methods: 1) wet seeding under puddled field conditions; and 2) direct seeding under non-puddled dry field conditions. In the Muda area, wet seeding is the most popular cultivation method for direct seeding.

Generally, the tilling and puddling operations are completed using farm machinery and the seeding operation is performed by manual broadcasting. In this type of culture, pre-germinated (sprouted) seeds are used for seeding and broadcasted under wet field conditions. Since the water in the field at the time of seeding is drained off, seeding is performed only under wet bed conditions.

Surface water drainage is also a major operation for the good establishment of seedlings in wet seeding culture. Small ditches in the field are manually dug by pulling bags known as "gunny sacks" filled with soil. Attempts at using machines for surface water drainage have never been successful among the farmers although the manual gunny pulling method for surface water drainage leads to poor drainage and many ungerminated spots (also called "vacant spots"). These spots are filled up by re-seeding or re-planting by farmers which results in adverse effects on plant growth such as the increase of weeds. Therefore it is important to prevent the occurrence of ungerminated spots by surface water drainage using machines.

Use of an auger trencher for making ditches in a field (top) and fields with ordinary drainage (left) and field with ditches dug by a machine (right bottom) (Photo by Y. Kanetani)

In this study, a mechanized drainage method through ditches made by an auger trencher was examined. By this improved method of drainage of surface water the surface water circulates in the field through the ditches (small canals) made by the auger trencher. These ditches are distributed near the field levee, also called "batas" among the fields. The depth of the ditch from the field surface ranges from 26cm to 33cm, and the width of the ditches is about 40cm. It was estimated that this depth was sufficient for surface water drainage.

The ungerminated spot areas which accounted for approximately 9.3% in the ordinary method (gunny sack drainage method), decreased to 4.4% in the improved method by the use of the auger trencher. However the germination rate decreased when there were no small ditches dug manually by pulling the gunny which led the surface water to the ditches made by an auger trencher. The working rate was estimated at around 0.65 to 0.79 hectare per hour. On the other hand, if the maintenance of the ditches is good, ditches made by the auger trencher can be effective over a period of approximately 3 years.

The surface water drainage method using the auger trencher results in the enhancement of the drainage effects and decrease of the unplanted area. Furthermore it is considered that this method may be suitable for fields where the drainage canals and irrigation canals are far apart, as in the Muda area.

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≪Crop Production≫

No-tillage rotation of wheat and soybean in Brazil

H. Eguchi, T. Fujimoto, S. Hakoyama, João Nakagawa, Julio Nakagawa*, E. D. Velini* and S. J. Bicudo**

Upland cropping in the southeastern districts of Brazil located in the subtropical zone with dry and rainy seasons, is unstable due to numerous problems including erosion, drought, and low content of organic matter, mostly in the case of hillside farming. In 1972 the no-tillage cropping system was initiated in Brazil, and adopted as a means of promoting sustainable agriculture to alleviate soil erosion. Presently this system is involving more than one million hectares, centering on the State of Parana.

In this paper the effects of the no-tillage practice were studied in the joint project between the State University UNESP and TARC. In two fields with dusky red latosol (terra rossa) and sandy latosol, tillage and no-tillage plots were prepared, and continuous cropping has been implemented starting from 1985 with soybean up to date. Both plots were cultivated under the same conditions except that ploughing and harrowing were performed in the tillage plot before sowing.

Yield of wheat in the no-tillage plot was similar to that in the tillage plot of the field with fertile terra rossa. However, in the fields with sandy latosol the number of grains per ear and the 1,000 grain weight were low in the no-tillage plot, with the yield being 17% lower than that of the tillage plot.

Yield of soybean in the no-tillage plot was similar to that of the tillage plot in the field with sandy latosol. However, in the field with terra rossa it was remarkably low in the tillage plot compared with the no-tillage plot.

The low soybean yield in the tillage plot with terra rossa, was attributed to the profuse growth of weeds. In the no-tillage plot, it was easier to control weeds with herbicides, as weed seeds spread in the soil surface layer.

Soil physical properties up to a depth of 20 cm under the

Tillage plot (left side) and no-tillage plot (right side) in field with dusky red latosol.
(Photo by H. Eguchi)

no-tillage conditions showed the presence of soil compaction with a reduced macro-pore ratio at or below pF 1.5. On the contrary the soil was softer and less compact in the subsoil at a depth of more than 30 cm. Rubidium injected in the soil at respective depths was absorbed by wheat, which indicated that the activity of the wheat roots in the no-tillage plot was adequate. As a result, shallow rooting associated with no-tillage was hardly considered to be the cause of the low yield recorded in that plot.

The soil in the no-tillage plot was characterized by a large accumulation of P, Ca, Mg. etc. in the surface and deficient chemical properties in the subsoil. The content of exchangeable potassium was lower in the sandy latosol, after the soybean crop, and in the no-tillage plot. The Ca/K ratio and Mg/K ratio were much higher than the optimal levels. It was thus assumed that K deficiency is one of the causes of the low wheat yield recorded in the no-tillage plot with sandy latosol.

In the no-tillage plot the chemical properties of the surface soil and physical properties of the subsoil were adequate. It is anticipated that the yield in the no-tillage plot will be the same as that in the tillage plot. Meanwhile, in the soil with a low K content an appropriate amount of K should be applied.

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≪Crop Production≫

New Rice Varieties "Dian Jing No.23" and "Dian Jing No.24", registered in Yunnan Province in China

N. Abe, and other 35 members

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

In 1991, the provincial government of Yunnan officially approved the registration of two new cultivars developed through the Sino-Japanese cross-hybridization programs, due to the superior performance demonstrated by these cultivars in the province. Especially, "Hexi No.2" showed a good performance in the tests conducted in the paddy fields located at an elevation between 1,700-1,850 m above the sea level, while "Hexi No.22" showed a good performance in the tests conducted in the paddy fields located at an elevation between 1,500-1,850 m above the sea level.

Their characteristics are described as follows:

1. Dian Jing No.23 = Hexi No.2 : This progeny from the cross Todoroki-wase x Jinghong No.1, is characterized by a high-yielding ability, early maturity, panicle number plant type, cold resistance and high-quality of hulled rice. It is anticipated that this variety will be cultivated in several districts located in the central western part of Yunnan province, such as Dali, Baoshan, Chuxiong, etc. The planted area with the variety developed which covered more than 9,000 ha in 1991 will be increased in future.
2. Dian Jing No.24 = Hexi No.22 : This progeny from the cross Kihoh x Chugeng No.4, is characterized by a high-yield, intermediate maturity, intermediate plant type, moderate cold resistance, blast resistance, intermediate shattering habit, good ripening and intermediate lodging resistance. It is anticipated that this variety will be cultivated in several districts of Yunnan and Sichuan provinces, such as Yiliang, Yaoan, Lunan and Tonghai in Yunnan province and Liangshan in Sichuan province. The planted area with the variety developed which covered more than 1,300 ha in 1991 will be increased in future.

New registered Variety Dian Jing No. 23
(Photo by T. Yamaguchi)

Table 1. Major characteristics of the two new varieties.

Name of Variety	Dian Jing No.23	Yun Jing No.9	Dian Jing No.24	Chugeng No.3
Promising lines	Hexi No.2	(Standard)	Hexi No.22	(Standard)
Maturity	Early	Late	Intermediate	Early
Plant type denoting	Panicle number	Panicle weight	Intermediate	Panicle weight
Heading/Ripening time	Jul. 21/Sep. 2	Jul. 30/Sep. 16	Jul. 20/Aug. 25	Jul. 15/Aug. 23
Culm length cm	68	101	80	83
Panicle length cm	13.7	16.0	16.5	16.6
Number of panicles/m^2	593	418	438	415
Color of apiculus	White yellow	White yellow	White yellow	White yellow
Shattering habit	Limited	Very limited	Intermediate	Limited
Lodging resistance	High	Low	Intermediate	Intermediate
Leaf blast resistance	High	Intermediate	Very high	Low
Panicle blast resistance	Very high	High	Very High	Low
Genotype for blast resistance	Pi-k	+	Pi-km	+
Tolerance to cold weather	High	Very high	Intermediate	Intermediate
Yield (unhulled) kg/a	94.4	82.7	84.3	76.1
Yield (hulled) kg/a	78.3	69.4	70.3	62.7
1,000 grain weight g	21.9	19.7	19.9	21.0
Quality of grain	Good	Poor	Good	Intermediate

Tropical Forest Research
— International Research Cooperation in Southeast Asia —

On 8 January 1992, a TARC Seminar was organized to highlight the recent development of international cooperation on tropical forest research by inviting three professors who have been leading tropical forest research in Japan. Their presentations were summarized as follows:

1. **International Tropical Forest Research Cooperation**
(by Prof. Satohiko Sasaki, University of Tokyo)

The recent move of the International Organization on Tropical Forest Research Cooperation stems from the serious concern over global environmental issues caused by large-scale energy consumption and the deterioration of land resources due to population pressure on land development for agriculture and industries. The awareness about Sustainable Development forced the re-examination of development investment in the past. The World Bank Project Review in 1988 pin-pointed the failure of agricultural investment and the lack of sufficient development efforts in the forestry sector after the formulation of the Tropical Forestry Action Plan in 1986 motivated by the deterioration of tropical forests. The IPCC (Intergovernmental Panel on Climate Change) established by WMO (World Meteorological Organization) to tackle global warming issues confirmed the importance of forest conservation, particularly of tropical rainforests as a part of the measures to be taken against global warming. FAO initiated in 1990 the second global survey on tropical forests, by using satellites and database analyses, which will be completed in 1992. The Interim Report published in 1991 admitted the underestimation of the 1980 Survey on the degree of deforestation in 62 countries. It estimated that 16,785 thousand ha of forest was lost in 1990. The annual rate of forest loss is 1.2 %. Based on the Tropical Timber Trade Agreement adopted in 1983, ITTO (International Tropical Timber Organization) was established in Yokohama, Japan, and has made a significant contribution not only to international tropical timber trade issues but also to tropical forest conservation, sustainable development and reforestation. On the other hand, the CGIAR (Consultative Group on International Agricultural Research) suggested the integration of forest and forestry research within its activities. This proposal is based on the fact that the impact of agricultural development on forest conservation is very important in tropical developing countries, that deforestation is being caused by agricultural practices including shifting cultivation, and that forests are essential for agriculture. The CGIAR proposed the establishement of a new International Institute for Tropical Rainforest Research possibly in Southeast Asia.

2. **Species Diversity and Dynamics of Tropical Rainforest — Studies in the highly humid tropics of West Sumatra —**
(by Prof. Mitsuru Hotta, University of Kagoshima)

Ecosystematic studies on the biodiversity of woody species in the humid West Sumatra rainforest were conducted by an Indonesia-Japan botanic study team, as a part of the "Sumatra Nature Studies Project" from 1980 through 1989. The study site, which was located on the slope of Gunung Gadut (1986 m), 20 km west of Padang, the capital of West Sumatra Province, was incidentally a very moist area with a precipitation of 7000 – 8000 mm per annum due to humid air-stream coming up from the Indian Ocean. The moist forest of Malaysia-Indonesia is generally characterized by the presence of an evergreen mixed Dipterocarp forest. However, the studies revealed that the ecosystems were very different from what had been anticipated in this very moist area. The outstanding feature of the Gn. Gadut rainforest was the marked diversity of woody plants. A total of 704 (110 unidentified) species in 76 families was observed in six forest plots for studies varying from 0.08 – 1.0 ha, out of which Lauraceae, Euphorbiaceae, Meliaceae, Annonaceae, Fagaceae, Moraceae and Dipterocarpaceae were the most abundant. The forest ecosystem was constantly subject to transition by forming gaps, where a tall tree fell and pioneering species rapidly filled the open space made available for growth. The vertical space of the forest was shared by different types of woody species at different heights from the ground. The pioneering species of the gap showed a high mortality rate.

3. **Restoration of Indigenous Forest Ecosystems in Japan and in Sarawak**
(by Prof. Akira Miyawaki, National University of Yokohama)

It has been predicted that more than 40 % of the rainforest will be lost by the turn of the century, if no restoration and rehabilitation is carried out. In experiments on reforestation in Japan during the past 20 years, studies were undertaken on the type of vegetation of isolated groves of shrines and temples, where native indigenous tree species still barely survive without human intervention, due to religious reasons. The tree species that represent indigenous native vegetation were then planted at a rather higher density. Most of the reforestation operations became successful in the 10 – 15 year period after planting. The speaker stressed that the concept of "Native trees for native land" based on the existing biological field studies must be fostered on a global scale to ensure the restoration of disturbed native rainforest ecosystems. Based on this concept and the success in Japan, a Joint Tropical Rainforest Rehabilitation Project was undertaken by Yokohama National University and Universiti Pertanian Malaysia (UPM), Bintulu, Sarawak in 1991. Seeds of different species of the Dipterocarpaceae family were actively collected in the native forest after flowering was observed, but the rate of recovery of healthy seeds was low due to insect and animal damage. However, 100,000 seedlings of more than 20 species including *Shorea* spp. and *Hopea* spp. were sampled in the project nursery, and were planted in the degraded forest site of appx. 800 ha in a part of UPM Campus. Since the survival of the seedlings so far is appx. 80 %, it is considered that continuous reforestation operations with selected native tree species should be promoted. *(by the editing staff)*

TARC International Symposium 1992 in Tsukuba

Rehabilitation of Degraded Forest Lands in the Tropics — Technical Approach —

TARC is pleased to announce that the TARC International Symposium 1992 will be convened in Tsukuba Science City, Japan, during the period 16-17 September 1992, under the title of "Rehabilitation of Degraded Forest Lands in the Tropics – Technical Approach –".

The first meeting of the organizing committee was held on 14th November 1991 with the participation of researchers from five universities, the Ministry of Agriculture, Forestry and Fisheries, Forestry and Forest Products Research Institute and Tropical Agriculture Research Center, and the outline of the symposium was finalized.

The symposium will consist of a plenary session and three sessions for technical reports. During the plenary session, the major global problems faced by tropical forests, such as the current status of forest degradation and its influence on human society, cooperation programs for sustainable utilization and conservation of tropical forests or for the establishment of a tropical forest research network, will be discussed by representatives from international or national organizations.

The session for technical reports after the plenary session will cover the following three themes:

(1) Degraded forests and their environment,
(2) Agroforestry, and
(3) Plantation trials on degraded forest lands.

Six to seven papers including a key note paper will be presented for each theme by the invited delegates from the Philippines, China, Malaysia, Thailand, Indonesia, Papua New Guinea, India, Brazil, Japan and several other countries.

Further details will be given by Dr. Y. Ohno, Secretary of the Organizing Committee, TARC.

Global Desertification and Salinization

The 14th Special Workshop on Global Desertification and Salinization was held in the TARC Conference Room, January 24, 1992. There were 68 participants from various ministries, universities and private companies.

The Director General of TARC, Dr. Shinya Tsuru gave the opening remarks. The subject of the workshop is very important due to the global changes of the environmental conditions since desertification and salinization are progressing at a rapid pace, especially in the tropics. The Workshop was organized in view of the World Conference on the global environment which will be held in Brazil, this year.

The presentations were as follows:

1) **Present situation of studies on desertification and salinization.** by Dr. Naoto Owa (TARC): A review of the studies on these topics carried out in Japan, other countries and by international organizations was presented. The number of literature references on desertification increased from 209 to 504 during the period 1986 to 1990, while those on salinization increased remarkably from 661 to 1561 during the period 1988 to 1990.

2) **Soil salinization and methods of prevention.** by Prof. Dr. Satoshi Matsumoto (Fac. of Agriculture, Tokyo University): To promote dryland farming, it is important to develop methods to obtain water with good quality and to save water for irrigation. New techniques such as harvesting method of rainfall and methods for the decrease of salt concentration, cultivation methods using paper pots, and utilization of polymers on the surface soil, etc. were presented.

3) **Preservation and management of grassland resources by land information.** by Dr. Haruhiro Fujita (National Grassland Research Institute): Desertification Index can be estimated after classifying vegetation, soil, topography, climate and other terrain information from existing map sources, remote sensing data, and ground surveys.

4) **Alleviation of water evaporation and improvement of meteorological parameters by the use of windbreak facilities.** by Dr. Taichi Maki (TRAC): The use of windbreak trees and windbreak nets was evaluated from the viewpoint of the improvement of the meteorological parameters and prevention of water evaporation.

5) **Alleviation of salinization and preservation of irrigation water quality.** by Dr. Hideo Mori (Dep. Desert and Human Geoscience, Shimizu Corporation): The North-Eastern area of Thailand has experienced salinization due to the presence of a sand salt layer in the deep soil layers. Therefore, crop cultivation was evaluated after the development of an intercepting layer at a depth of about 15 cm in soil. Crop production increased 3-6 times compared with the control plot.

6) **Drought-resistant plants and techniques for the rehabilitation of vegetation.** by Dr. Masayuki Nemoto (National Institute of Agro-Environmental Sciences): Physiological and morphological properties of drought-resistant plants were outlined. The causes of desertification were analyzed and deforestation, overgrazing, excessive cultivation, and inappropriate land management, etc. were considered to be the major factors of desertification.

Immediately after each presentation, Dr. M. Mitsuchi (National Institute of Agro-Environmental Sciences), Dr. Y. Kitamura (National Research Institute of Agricultural Engineering), Dr. T. Tanimoto (Forestry and Forest Products Research Institute), Dr. C. Mizota (Iwate University), Dr. T. Yamamoto (Dryland Research Center, Tottori University) made various comments.

Discussions by Dr. Zahid Hussain (Pakistan Agricultural Research Council) and other participants took place under the chairmanship of Drs. Y. Ohno and M. Araragi.

It was eventually concluded that the progression of desertification and salinization was mostly caused by the impact of human activities. Therefore, it is essential to promote low input sustainable agriculture in harmony with the ecosystems. However, it is also essential to develop new techniques for dryland agriculture. And in some areas advanced technology may be necessary. A large number and wide range of techniques for the prevention of desertification and salinization should be developed because the techniques that are available to farmers are usually site-specific.

(Michio Araragi, Director, Marginal Land Research Division)

TARC presented a paper during the 2nd Intl. Groundnut Workshop at ICRISAT

Mr. Hideo Gocho, Research Coordinator for Information, TARC presented a paper on "Breeding for Eating Quality in Groundnut in Japan" during the workshop held at ICRISAT in India, as one of the reports from donor groups.

In Japan, groundnut is consumed mainly as a delicacy. Therefore, the eating quality and external quality of groundnut are very important.

Achievements of research carried out for quality breeding of groundnut in Japan were as follows. Smaller, sweeter and harder seeds of groundnut displayed a better eating quality than larger, less sweet and less hard ones. External quality of seed was not correlated with the eating quality. Seed hardness and sucrose content decreased with the delay in harvesting time. The values of seed hardness determined by the sensory test corresponded well to those determined by the mechanical test, indicating that selection for seed hardness could be achieved by mechanical tests carried out when the seed water content remained in the range of 5-9% at 85 days after flowering. Analysis of the sucrose content for selection should be performed 75 days after flowering in the early maturity group, 80-85 days in the medium maturity group and 95 days in the late maturity group.

In the 1960s, quality was added to the objectives of groundnut breeding and selection focused on the external appearance of seed and shell led to the release of the new varieties "Nakate-yutaka" and "Azuma-yutaka". In the 1980s, breeding for eating quality was focused on crosses with varieties displaying a high sugar content. New varieties, "Sayaka" and "Yuderakka", which showed an improved internal and external quality compared with the old varieties, were released in 1991.

LETTER TO THE EDITOR

Dr. Li Cheng Yun, who was invited to Japan from China as a research partner in the joint research program on rice breeding, contributes a letter to the editor, hoping for the promotion of a successful collaboration between Yunnan Academy of Agricultural Sciences and TARC, as follows:

I am now studying protoplast culture and plantlet regeneration in rice with a view to applying these biotechnological procedures to rice breeding under the China-Japan collaboration project initiated in 1982. During the last ten years of the project, five new rice cultivars of an intermediate type between the Yunnan and Japanese cultivars were bred by using the genetic resources of China and Japan. These new cultivars are characterized by a good plant type, good ripening, high yield and good quality on the whole. Cold tolerance ranges from intermediate to intermediate-high. Blast resistance is also high on the whole. More than 43,000 ha were planted with these varieties in the highlands of Yunnan, Guizou and Sichuang Provinces of China in 1991.

A large number of basic studies have been carried out in the field of rice breeding, for example; the relationship between anther length and cold tolerance, methods for cold tolerance characterizaiton in rice, genetic analysis of rice blast resistance of Yunnan upland rice, race composition and distribution of *Pyricularia oryzae* Cavara by selecting a set of differential varieties for classifying the races of *P. oryzae,* etc.

All of these studies have significantly contributed to the progress of rice breeding, and to the development of agriculture in Yunnan Province. The current cooperation has also strengthened mutual understanding and friendship between the two countries.

TARC in ICARDA

Sustainable Range Management Research Program

S. Takahata

ICARDA, the International Center for Agricultural Research in the Dry Areas, conducts research on rainfed agriculture in West Asia and North Africa (WANA). Its objective is to develop plant varieties, livestock production practices, farming methods and local human resources in order to help the region increase domestic food production, minimize environmental degradation, and create a self-sustaining agricultural research infrastructure.

ICARDA's research mandate covers rainfed agriculture in the 200-600 millimeter annual rainfall zones. In areas receiving around 200 mm of annual precipitation, land use is restricted largely to grazing. These areas, sometimes known as the steppe or rangelands, are increasingly showing signs of severe overgrazing. In other parts of the steppe where rainfall is slightly higher farmers are growing crops, principally barley. This inappropriate cultivation at the wetter margins of the steppe, and overgrazing at the drier margins, pose a serious threat to this environmentally fragile area.

One method to monitor overgrazing is by remote sensing. Since 1990 TARC and ICARDA have been conducting a collaborative project using remote sensing. The objectives of this project include the identification of plant types on the rangelands by aerial photography and ground surveys, and classification of these lands using satellite imagery. The project is also analyzing the dynamics of plant communities under varied conditions and grazing intensities.

The project's principal test site is the Maragha National Range in northern Syria, where salt bush has been planted and grazing trials conducted to estimate the land's carrying capacity. The TARC-ICARDA project is using satellite data of the Maragha area over five seasons to come up with composite color images using the Steppe Information Processing System, or STIPS. The resulting vegetation index map clearly shows where salt bush is planted, and where cultivation is taking place. The Global Positioning System (GPS) is helping to determine the location of these areas on the map.

Another part of the project is the use of aerial balloons to provide further detailed information on plant cover in the test field. Inflated with helium, the 14 cubic meter balloon reaches a height of 200 meters. A radio-controlled camera mounted on the balloon takes aerial photographs of a four hectare area in one shot, and is capable of taking 72 shots in one hour for the 108 hectares of the test site.

The pictures taken from the balloon will be used to analyze vegetation through digital conversion. At present scientists participating in the project have come across peculiar patterns of vegetation in the natural plot compared to the growth patterns in the improved plot.

Understanding the dynamics of the steppe is an important step toward halting environmental degradation. The TARC-ICARDA project is providing scientists and researchers with crucial information that is badly needed if further overgrazing is to be prevented.

(Senior Researcher, Marginal Land Research Division)

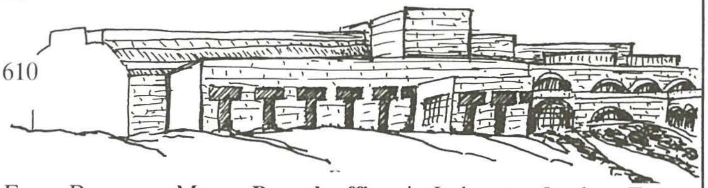
Within the framework of the Cooperative Research Project between ICARDA and TARC an agreement has been signed in October 1989. The Project has the following objectives:

1. Analysis of present systems of native pasture utilization.
2. Use of remote sensing to determine the yearly changes and distribution of vegetation types.
3. Verification of vegetation types using ground truthing, species identification and verification.
4. Identification and testing of technologies for sustainable production of good quality pastures, including species with high tolerance to drought conditions and grazing pressure.

As a result of the above agreement, TARC provided support to the project by sending a TARC scientist. In November 1991 the first review meeting was held at ICARDA Headquarters. The Project is expected to continue until 1994.

INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS

Established: 1977
Headquarters staff: 610
Area: 948 hectares



Research programs: Farm Resource Management Program, Cereals Program, Legumes Program, Pasture, Forage and Livestock Program, Genetic Resources Unit

Branch offices in Lebanon, Jordan, Egypt, Turkey, Pakistan, Morocco and Tunisia

Dr. Tsuru, TARC Director General Appointed as IRRI Board Member

The Director General of the International Rice Research Institute (IRRI) announced that the Board of Trustees of IRRI had appointed Dr. Shinya Tsuru, Director General of TARC as a new Board Member, effective January 1992. Dr. Tsuru became D. G. of TARC in October 1989 and since then has participated in all the CGIAR biannual meetings as the delegate of Japan. He replaced the former IRRI Board Member from Japan, Professor, Dr. K. Kyuma, Dean of Agriculture, Kyoto University.

Balloon Aerial Photo System, Maragha Exp. Sta. (Photo by S. Takahata)

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