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Newsletter

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Agroforestry experimentation in Thailand.
(Photo by Y. Osumi of TARC)

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TARC

TROPICAL AGRICULTURE RESEARCH CENTER

TARC TOWARD THE THIRD DECADE

Director General, Shinya Tsuru

Twenty years have passed since the Tropical Agriculture Research Center was established in 1970. Although the Center had to overcome various difficulties as any new institution, significant contributions were made in the promotion of research carried out both overseas and in Japan for the development of technology relating to agriculture and forestry in the tropics and subtropics. Recently, the research activities pursued by the Center have won a wide acceptance and appreciation in Japan, in various countries, mainly in Southeast Asia, as well as among the international research organizations.

Presently, there is a growing interdependence among the nations of the world associated with the progress in technology. On the other hand, it is anticipated that the equilibrium between the demand and supply of food will become more precarious due to the increase of the population mainly in the developing countries and to the improvement in the living standards. Against this background, it is essential that Japan as a member of the international community make a contribution commensurate to the national resources to tackle problems on a global scale, such as food production and preservation of the environment.

In most of the developing countries located in the tropics and subtropics, agriculture and forestry are the main activities which are essential for the economic development of the respective countries. Therefore, although each country is making utmost efforts for the promotion of agriculture and forestry activities, the outcome is not always successful due to the constraints on the level of technology. For these reasons, the developing countries look to the developed countries including Japan for assistance.

Recently, amidst the growing interdependence of the international community in issues relating to industrial production and natural environment, a great deal of attention has been paid to agriculture and forestry from the view point of the protection of the environment. Indeed, since agriculture and forestry activities affect considerably the natural environment on a global scale, in the tropical zone especially, such activities cannot be considered merely as problems relevant to a particular country. In this regard, if the attention is not paid to the natural and environmental resources, in the tropical and subtropical zones, it may not be possible in future to increase the agricultural and forestry output.

On the other hand, the technology originating from the developed countries, which is required for the development and promotion of agriculture and forestry in the tropics and subtropics, cannot be automatically transferred or simply modified. It is obvious that it is necessary to develop new technology that is suited to the conditions prevailing in the respective regions.

Recently, the North-South problem and economic trade frictions have been exacerbated. Also the need for Japan to make significant contributions to the international community is being acutely felt. In this context, it is important that Japan extend technical cooperation in the field of agriculture and forestry not only to the developing countries located in the tropics and subtropics but also to those in the temperate zone.

Since in Japan the collection of information relating to agriculture and forestry in the tropics and subtropics is limited, it will become essential that part of research activities carried out by the Center be directed to systematic collection and utilization of information pertaining to these fields. In addition it is important to determine how the frequent occurrence of abnormal weather in recent years, the changes in the natural environment such as the deterioration of the environment associated with human intervention and the changes in socio-economic conditions worldwide may affect agricultural activities.

Therefore, it is necessary to gather a wide range of information concerning the natural environment as well as human industrial activities worldwide in order to promote research centered on sustained production and the preservation of the environment not only for agricultural and forestry production in the short term but also for securing the survival of mankind in future. As a result, the responsibility of the Center to serve as an organization which provides information on research relating to agricultural technology overseas has become increasingly important.

As main activities, the Tropical Agriculture Research Center carries out basic and applied research aimed at achieving sustained agricultural and forestry production in the tropics and subtropics as well as at preserving the natural environment on a global scale in collaboration with research institutes of various countries and with international research organizations. Through these joint efforts, mutually beneficial undertakings may become possible in the next decade.

The 20th Anniversary of TARC, 11 June 1990

The Tropical Agriculture Research Center, Ministry of Agriculture, Forestry and Fisheries was officially established on 10 June 1970. TARC will observe the Ceremony of its 20th Anniversary on 11 June 1990 Monday. The major event of the Anniversary will be an Anniversary Lecture delivered by *Dr. Takekazu Ogura*, former Vice-Minister of the Ministry, and one of the advocative founders of our Center. He has his distinguished career as the author of a number of prominent reports and papers on international agriculture, and as the President of the Food and Agriculture Policy Research Center. His critical overview on international agriculture as well as on the progress of and the perspectives for TARC on its 20th birthday will highlight the day. In the afternoon, Panel Discussion on tropical agriculture research will follow by a group of distinguished experts of Japan. All family of TARC will join the anniversary party in the evening.

Prior to this event CGIAR DAY will be organized on 28 May, in conjunction with the International Flower and Greenery EXPO in Osaka 1990. The leaders of IARCs will be participating in the Meeting and associated events in Osaka and Tokyo. The details of this information will be available in the next issue.

TARC Contribution to the Next Century

Toshihiko Nishio

Director General, Agriculture, Forestry and Fisheries Research Council Secretariat

The Tropical Agriculture Research Center (TARC) was established 20 years ago. During this period, the Center made significant contributions in research pertaining to agriculture in the tropics and subtropics. On behalf of the Agriculture, Forestry and Fisheries Research Council of the Ministry, I would like to congratulate both the TARC researchers and their counterparts for their active participation in research.

Most of the developing countries located in the tropics and subtropics are facing serious constraints on food production and the promotion of agricultural and forestry activities to meet the needs of a rapidly growing population. In addition they are confronted with worldwide changes in the environment, including desertification and the reduction of tropical forest resources. Such complex problems must be addressed comprehensively in considering various aspects. To achieve such objectives more effectively, international cooperation is a prerequisite.

Since its establishment, the Center has promoted research in a variety of fields with a view to increasing productivity or developing sustainable production in collaboration with research organizations of a large number of countries as well as with international agricultural research organizations.

The remarkable achievements realized hitherto were undoubtedly made possible through the invaluable cooperation extended by the organizations involved. In addition to the promotion of collaborative research, as a contribution to the international community, the Center collects literature and data relating to research and development activities in various branches of agriculture carried out worldwide.

Indeed the Center is fully aware of the importance of accumulating and exchanging effectively information to keep pace with the continuous advances in science. The publication in English of JARQ, Technical Bulletin, Tropical Agriculture Research Series and now of the TARC Newsletter is likely to further enhance the information activities of the Center. Through the publication of the Newsletter, various organizations concerned worldwide will become more acquainted with the research activities sponsored by the Center overseas and in Japan. Moreover, it is anticipated that such activities will be further promoted, hence contributing to the development of agriculture and forestry in the tropics and subtropics.

Celebrating the Inauguration of TARC Newsletter

Chukichi Kaneda

Director General, National Agriculture Research Center (NARC)

I am indeed very pleased to learn that TARC will start the publication of the TARC Newsletter, a realization to which I had looked forward with great anticipation for a long time.

Within the context of the importance for Japan to promote the internationalization of its society, TARC deemed it necessary to share more frequently and even continuously with overseas counterparts its efforts and achievements in the development of agricultural technology in the tropical and subtropical zone. For the past two decades, hundreds of TARC researchers have been engaged in collaborative projects with a large number of counterparts in various countries.

Recently, the activities sponsored by TARC have become increasingly appreciated among the international and national agricultural research organizations due to the significant contributions made by the TARC researchers during their collaborative efforts in various institutes.

TARC is going to celebrate its 20th anniversary in June 1990. The onset of the publication of the newsletter is one of the steps which should enable TARC to develop into a more internationally open research institution.

I look forward with great anticipation to the flow of information which will undoubtedly contribute to further strengthening and promoting communication with the international and national agricultural research organizations.

I extend my best wishes for a successful undertaking.

TARC's New Director General Dr. S. Tsuru Appointed

The Minister of Agriculture, Forestry and Fisheries appointed Dr. Shinya Tsuru as the 9th Director General of the Tropical Agriculture Research Center (TARC), effective 1 October 1989. The outgoing Director General, Dr. Chukichi Kaneda, is currently assuming the post of Director-General, National Agriculture Research Center (NARC), Tsukuba.

Dr. Tsuru is an internationally prominent soil and environmental microbiologist and also has his outstanding career as research administrator at the Agriculture, Forestry and Fisheries Research Council Secretariat of the Ministry. Born in Tokyo, he graduated from Hokkaido University where he obtained his B.S., M.S. and Ph.D. (1961) in general and applied microbiology. In 1965, he joined the Institute of Applied Microbiology, Tokyo University as Lecturer of Microbial Systematics and Microbial Ecology. When the Ministry of International Trade and Industry (MITI) established in 1969 the Culture Depository of Patented Microorganisms at the National Fermentation Research Institute, he became the founding Chief Curator.

In 1975, he was invited to join the National Institute of Agricultural Sciences (NIAS), Ministry of Agriculture, Forestry and Fisheries, as Head of the Soil Microbiology Laboratory. His studies dealt with biological nitrogen fixation under Green Energy Project. In 1983, he was appointed as Research Counsellor, Agriculture, Forestry and Fisheries Research Council Secretariat, Tokyo, to supervise the Ministry's National Project on Biomass Conversion involving all research establishments of the Ministry. He became Director of Research Planning and Liaison Office (1986) and Acting Director (1988), National Institute of Agro-Environmental Sciences (NIAES) back to Tsukuba.

Since his overseas studies at the Institute of Microbiology, Czechoslovakia Academy of Sciences in 1966, he has been involved in various international activities. Recently, he has been active in the regulatory aspects of recombinant DNA technology as a Member of Commissions, including Safety Considerations on DNA of CSTP/OECD, and Guidelines on Field Test of Genetically Engineered Organisms (MAFF). His broad experience and expertise in new biotechnologies will undoubtedly contribute to the promotion of TARC's collaborative activities with overseas organizations in this particular area.

Unique Mechanism of Phosphorus Uptake by Pigeonpea and its Role in Cropping System of Indian Subcontinent

N. Ae, J. Arihara, K. Okada and C. Johansen

In India, pigeonpea (*Cajanus cajan* (L.) Millsp) has long been cultivated as an important grain legume. Pigeonpea can grow well both on Alfisol and Vertisol with low phosphorus fertility. In Alfisol with low fertility, a lateritic soil widely distributed in the semi-arid tropics, especially pigeonpea shows excellent growth while the yield of cereal crops such as sorghum and maize is very low unless an adequate amount of phosphorus is applied. Pigeonpea is also highly productive on Oxisol, a typical lateritic soil in the humid tropics.

A special collaborative research project between GOJ (Government of Japan) and ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) was initiated in 1985 to analyze the mechanism enabling pigeonpea to grow well on lateritic soils with low fertility.

Firstly, it was confirmed that the yield of pigeonpea was reasonably high without any application of phosphorus fertilizer in the Alfisol field of ICRISAT Center, whereas the yield of sorghum was very low. In Alfisol, since phosphorus which is tightly bound to iron component is insoluble, it is assumed that pigeonpea may have a unique mechanism to efficiently absorb iron-bound phosphorus with low solubility. We observed that pigeonpea roots released materials responsible for the increased solubility of Fe-P. The compounds analyzed by GC-MASS were identified as piscidic acid and its p-O-methyl derivative, which form chelate-compounds with the Fe component of Fe-P, resulting in the release of P.

The possibility of increasing the P uptake by the implementation of pigeonpea-based cropping system was examined. P uptake from the Alfisol with low fertility was significantly higher when sorghum and pigeonpea were planted together than separately. We also observed that in pots filled with Alfisol with low fertility the total P uptake by maize was much larger after continuous cropping of pigeonpea than after continuous cropping of sorghum. These results clearly indicate that the Fe-P solubilizing mechanism of pigeonpea has beneficial a effect on P availability in Alfisol with low fertility.

In the tropics where many soils are highly weathered, P is strongly bound to iron compounds and its availability is extremely low. Crop production is quite often seriously limited by the low availability of P in soils. Introduction of pigeonpea into cropping systems in a tropical area should contribute to the stabilization of crop productivity by promoting efficient utilization of soil P.

Pigeonpea grown on Alfisol. (Photo by J. Arihara)

Ecology of Leaf-footed Plant Bug in the Subtropical Region of Japan

K. Yasuda and S. Tsurumachi

Leptoglossus australis (Fabricius), which is widely distributed in the tropical zone, namely in Africa, India, South Asia including Indonesia and the Philippines, Northern Australia, Taiwan and some Pacific islands (R.C. Allen, 1969), is a pest of various economic crops, especially cucurbits, citrus and passion fruit (J.C. Hutson, 1936, H.E. Fernando, 1957, J.J.H. Szent-Ivany et al., 1960). The bug feeds on a wide range of plants including sweet potato, yam, legumes, coffee, cacao, rice in addition to those already listed (D.S. Hill, 1975, J.J.H. Szent-Ivany et al., 1960). The reproduction of the bug is limited to some cucurbit plants, bitter gourd, luffa etc., while most of the host plants listed above are temporary host plants.

In Okinawa, the subtropical region of Japan, Yasuda et al. (1983) also reported that the bug fed upon cucurbit and citrus crops. However, the damage caused by the pest has not hitherto been a major problem in the region, since the damage caused by the melon fly is more important. However, should the eradication project of the melon fly using sterile insects, which is in progress, be successful, the damage caused by *L. australis* may become more apparent.

In Ishigaki Island of Okinawa, the bug undergoes one to two generations on the wild host plant *(Diplocyclos palmatus)* from spring to early summer. The wild host plant starts to wilt in June and adults which emerged on it move to other host plants. In a cucurbit field, immigration of many adults is observed in late June to July. The immigration occurs under sunny conditions almost simultaneously over wide areas in the island. The effect of spraying insecticides to control the adults does not last long due to the recurrence of immigration.

It is known that the male adult of *L. australis* attracts male and female adults as well as nymphs of the same species. This phenomenon may account for the aggregation habit of the immigrant adults in a field or the large differences in the number of immigrants, which is often observed between adjacent fields. Also an egg parasitoid *Gryon* sp. (Hymenoptera, Scelionidae) of *L. australis* is found to be attracted to the male adult of the bug. It is suggested that in searching for eggs of *L. australis*, the parasitoid looks for the male adults of the bug which indicates the presence of female adults and their eggs.

From summer to autumn after the wild host plants have wilted, only cultivated cucurbits mainly consisting of bitter gourd and luffa remain as host plants of the bug. In such fields, no nymphal development is observed. The reproduction of the bug appears to be suppressed by the frequent applications of insecticides to the melon fly and the parasitization by *Gryon* sp. with a rate of 100% in most of the cases examined from August to October.

The scarcity of host plants in late fall is associated with the practice of plowing in cucurbit crops. The population of the bug decreases due to shortage of food and low temperature. As the threshold temperature for the development of the nymph is

CH HIGHLIGHT

Development of Rice Variety Resistant to Rice Tungro Spherical Virus

T. Imbe, Habibuddin H. and T. Omura

Rice tungro is one of the most serious virus disease in tropical Asia. It is a disease complex associated with rice tungro bacilliform virus (RTBV) and rice tungro spherical virus (RTSV) (Saito et al. 1981). The viruses are transmitted efficiently by the green leafhopper (GLH), *Nephotettix virescens*, in a semi-persistent manner (Hibino et al. 1979). RTBV, however, is transmitted concomitantly only when RTSV is acquired by GLH previously or simultaneously.

In Malaysia, serious epidemics occurred from 1981 to 1983 causing severe yield loss. Thereafter, the development of rice varieties resistant to the disease has been considered to be a prerequisite. A resistant variety, IR42 was introduced to control the disease and has been used as a donor in breeding work. However, Kobayashi et al. (1983) reported that the tungro resistance of this variety was controlled by resistance genes to GLH. Furthermore, they observed that a new biotype of GLH which could survive on IR42 was easily selected under laboratory conditions. This fact suggested that the tungro resistance of the variety may break down in the near future. Therefore, attempts were made to select "virus-resistant" varieties to diversify tungro resistance and stabilize rice production.

Omura et al. (1983) purified the viruses and produced antisera to each virus. Enzyme-linked immunosorbent assay (ELISA) was introduced in the screening of the resistant varieties. Seedlings of each variety, seven days old, were inoculated with viruliferous GLHs (1 or 1.5 GLH per seedling) in a translucent cylinder, and the infection was detected using ELISA 3 to 4 weeks after inoculation.

Leaf-footed Plant Bug infestation on cucurbits at an experiental field of Okinawa Branch. (Photo by K. Yasuda)

about 15°C and the average temperature in January and February in Ishigaki Island ranges from 17 to 18°C, it is assumed that the bug develops at a low rate during this period.

Rice infected with Tungro Spherical Virus (Left: diseased plant, Right: normal plant) (Photo by T. Imbe)

Kataribhog and Basmati 370 were not infected at all with RTSV. These two varieties were susceptible to GLH in antibiosis tests, and GLH showed a normal behavior upon feeding from the phloem of varieties in the experiment when the electronic measurement of insect feeding (EMIF) method was applied. These results demonstrated that the varieties were resistant to RTSV but not to the vector insects.

Pankhari 203 remained resistant to RTSV even when it was inoculated using P203-colony of GLH which could survive on the variety (Habibuddin et al. unpublished). Therefore, the variety was found to harbour RTSV resistance besides its GLH resistance.

The Japanese varieties, Aichi Asahi, Kimmaze, Nishikaze, Saikai 139, were reported to be resistant to rice waika virus (RWV) (Shimura et al. 1978), but not to GLH. These varieties were infected with RTSV at low percentages (20 to 30%), while Taichung Native 1 (a susceptible check) at a percentage ranging from 80 to 90%. These results supported previous reports stating that RTSV and RWV are identical or closely related viruses (Saito 1977) and that RWV could be substituted for RTSV for the transmission of RTBV (Hibino 1983).

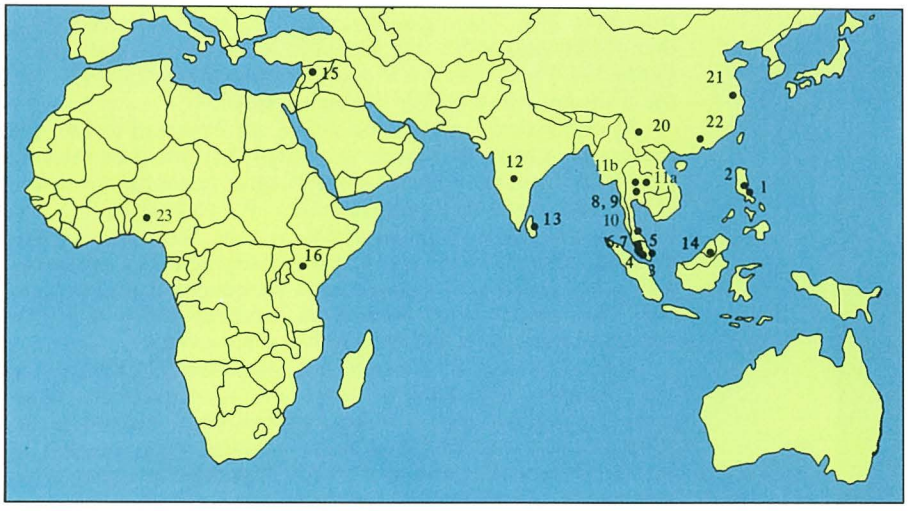
All the varieties mentioned above are expected to be gene sources for tungro resistance. Although they could be infected with RTBV and show symptoms of tungro, further transmission of the virus would be suppressed due to the absence of RTSV in the disease plants. Unexpectedly, a new Malaysian recommended cultivar, MR81 was found to harbour RTSV resistance which was considered to have been introduced from Pankhari 203. The variety could become an excellent donor of RTSV resistance because it has already been improved.

Gene analysis of RTSV resistance suggested that Kataribhog and Pankhari 203 harbour three or more recessive complementary genes (Imbe et al., unpublished). Hibino et al. (1988) already reported that some varieties were resistant to RTSV. The genetic differences in RTSV resistance among these varieties should be analyzed in future.

The Organization of Tropical Agriculture Research Center *141 staff (103 scientists)* 1 Oct. 1989

- Director General *Dr. S. Tsuru*
  - Planning and Coordination Division *Dr. M. Kobayashi, Director* (7)
    Planning of the research projects, overseas research implementation, liaison and coordination of cooperating institutions both in Japan and overseas, organization of international symposia, invitation of counterpart researchers and senior research administrators from overseas.
  - Research Information Division (since 1985) *Dr. Y. Ohno, Director* (14)
    Management of information on tropical agriculture. Information retrieval through survey missions and document analyses to file databases necessary for project organization and evaluation, coordinated by Senior Research Coordinators. Publication, documentation, library and audio-visual services.
  - Research Division I (since 1970) *Dr. T. Hidaka, Director* (31)
    Implementation of overseas research projects under agreements with counterpart institutions and IARCs, covering a wide range of disciplines including agronomy, crop breeding, physiology, ecology, plant protection, soil science, water management, animal health and production, forestry/agro-forestry, food technology and others.
  - Research Division II (since 1975) *Dr. T. Yamaguchi, Director* (10)
    Large scale programs for the promotion of farm production systems in tropical countries integrating a wide range of techniques developed under joint research with counterparts. Comprehensive studies aiming at integrated development of agriculture, animal husbandry and forestry.
  - Eco-Physiology Research Division (since 1987) *Dr. N. Murata, Director* (16)
    Basic studies on physiology and genetics underlying agricultural productivity in the tropics. Studies on the functions of crop plants, livestock and their microbial symbionts adapted to tropical/subtropical climate.
  - Marginal Land Research Division (since 1988) *Dr. M. Araragi, Director* (11)
    Studies on the structure and functions of agro-environmental resources; land and water in the marginal areas of the tropics/subtropics in particular, aiming to promote the utilization of such resources and areas under constraints for agriculture, animal husbandry and forestry.
  - Okinawa Branch (since 1970) *Dr. A. Kotani, Director* (32)
    Experimental research to solve problems relating to agriculture in the tropical zone, including crop improvement and protection, agronomy, soil management and tropical fruits production, under the subtropical conditions of the Ryukyu Islands, and to link such research results to the research pursued overseas.
  - General Affairs Section *Mr. M. Yamakoshi, Chief* (7)
  - Accounting Section *Mr. T. Murakami, Chief* (12)

TARC research staff on long-term duties in the research institutions overseas *(36 research staff,* 31 January 1990)



1. College of Agriculture and Forestry, University of the Philippines, Los Banos, The Philippines
2. International Rice Research Institute (IRRI), Los Banos, The Philippines
3. Malaysian Agricultural Research and Development Institute (MARDI), Serdang, Malaysia
4. Agriculture University of Malaysia (UPM), Serdang, Malaysia
5. MARDI Bumbong Lima, Bumbong Lima, Malaysia
6. MARDI Alor Setar, Alor Setar, Malaysia
7. Muda Agricultural Development Authority (MADA), Alor Setar, Malaysia
8. Department of Agriculture, Bangkok, Thailand
9. Department of Forestry, Kasetsart University, Bangkok, Thailand
10. Narathiwat Animal Nutrition Research Center, Narathiawat, Thailand
11a. Nakhon Ratchasima Sericulture Research Center, Nakhon Ratchasima, Thailand
11b. Chainat Field Crop Research Center, Chainat, Thailand
12. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, India
13. Central Agricultural Research Institute, Peradeniya, Sri Lanka
14. Department of Agriculture, Kilanas, Brunei Darussalam
15. International Center for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria
16. International Laboratory for Research on Animal Diseases (ILRAD), Nairobi, Kenya
17. Centro Internacional de Agricultura Tropical (CIAT), Cali, Colòmbia
18. Universidade Estadual Paulista, Botucatu, Brasil
19. Centro Internacional de Papa (CIP), Lima, Peru
20. Yunnan Academy of Agricultural Sciences, Kunming, Yunnan, People's Republic of China
21. Shanghai Academy of Agricultural Sciences, Shanghai, P.R. China
22. Guangdong Academy of Agricultural Sciences, Guangzhou, P.R. China
23. International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria

TARC Thailand Office Opened

On 8 September 1989, the new office of TARC in Bangkok was officially inaugurated in a ceremony attended by Dr. Riksh Syamananda, Director-General, The Department of Agriculture of Thailand and TARC Director-General, Dr. C. Kaneda.

TARC and the national research institutes of Thailand have been engaged in joint collaborative research for the past 22 years, which contributed to the promotion of a very close relationship, as emphasized by Dr. Hidaka in his Inaugural Lecture.

The TARC Bangkok Office had to move 4 times during this period, borrowing space in some of the laboratories and offices of the Department of Agriculture. However, such arrangements became insufficient due to the increase in the number of TARC researchers assigned to Thailand, the increase in the volume of administrative work and office automation. The inauguration of the new office was made possible through the generosity of Thai Dept. of Agriculture and by the efforts of the TARC members. The new office which covers an area of 281 m^2 and consists of 10 rooms is located on the first floor of the building housing the Soil Science Division of the Dept. of Agriculture in Bangkhen, Bangkok.

Dr. Riksh (Thailand) and Dr. Kaneda (TARC) inaugurated TARC Bangkok Office by a tape-cut.

Presently, among the various offices established by several international organizations within the premises of the Dept. of Agriculture, the TARC Office is the largest. This may well reflect the high appreciation of TARC by the Thai authorities, and symbolize joint efforts and friendly relations between the TARC researchers and their Thai counterparts.

At present, there are 11 researchers sent by TARC to Thailand for long-term assignments, who are stationed not only in Bangkhen but also in Nakhon Ratchasima, Chainat and Narathiwat, in addition to researchers dispatched for surveys or short-term assignments. The new office will certainly play an important role as a place for the exchange of information about these activities as well as for informal discussions. In addition, the office will also be a place where the increasing large number of visitors to TARC Office, from international organizations, Thai and Japanese universities, Government, the private sector, as well as students, members of JICA, and JOCV, etc. will have the opportunity of learning more about the TARC activities, exchanging information and promoting friendly relations. (*Yoshimi Ueno,* TARC Representative in Thailand)

Twenty Years of TARC-Thailand Cooperation –Past, Present and Future

Research collaboration between TARC and the Department of Agriculture and the Department of Livestock of Thailand was initiated in 1967. During this 22-year period, TARC dispatched to Thailand a total of 447 persons, including 81 researchers on a long-term basis, 125 researchers on a short-term basis, 139 administrators and 102 researchers who carried out surveys. On the other hand, TARC invited a total of 88 persons from Thailand, including 30 counterpart researchers, 24 administrators and 34 researchers who presented reports at the international symposia sponsored by TARC. These figures reflect how close the relationship between TARC and the Thai Organizations actually is.

Highlights of the collaborative research carried out in Thailand during the 22-year period are as follows:

1. In 1967, studies on the characteristics of soils of paddy fields as well as methods of fertilizer application enabled to develop a method in which emphasis was placed on nitrogen top-dressing based on the analysis of the dynamics of the nitrogen contained in fertilizer (Koyama). Research on Foot-and-Mouth disease which was carried out over a period of 10 years led to the establishment of a center for the manufacture of Foot-and-Mouth vaccine operated by JICA (Tokuda).

2. Rice cultivation technology: Based on studies on the characteristics of local rice varieties, parent plants were selected to develop high-yielding varieties with excellent quality that are resistant to pests and diseases. In addition the interaction between genetic factors and endogenous hormones in the floating habit was studied in floating rice (Hamamura). Also studies were carried out on the selection of parent plants that can be cultivated on acid sulfate soils and methods for the detection of resistance to drought were developed (Yagi). Moreover, in indica rice varieties, seedling establishment was improved by the application of calcium peroxide due to the high threshold of oxygen concentration for germination (Takahashi).

3. Intensive utilization of paddy fields: Studies were carried out on rice-based cropping systems including rotations with maize, sorghum and soybeans, followed by the development of methods of cultivation of early maturing rice varieties (Sakata).

4. Upland crops: The outcome of studies on varietal characteristics, methods of cultivation and breeding in cassava was very successful (Umemura).

5. Animal husbandry: In the research project on the improvement of grasslands, the analysis of the seasonal changes in dry matter production of pasture crops led to the production of seeds of Rhodes grass (Yoshiyama).

6. Crop protection: In the course of the studies on virus diseases of rice and leguminous crops, a new virus disease, rice gall dwarf, was discovered. Subsequently, the causal virus was isolated, identified, classified and the mechanism of occurrence of the disease was analyzed, Regarding insect pests, the incidence of outbreaks caused by the rice gall midge, a recalcitrant pest, was analysed. Thereafter integrated methods of control including the cultivation of resistant varieties, the use of natural enemies and the application of preventive measures were developed (Hidaka, Kobayashi). The mechanism of aflatoxin contamination of maize after harvest was clarified, leading to the implementation by JICA of a project aimed at the improvement of the quality of maize (Kawashima).

7. Soil research: Studies on the preservation of the productivity of soils of paddy fields were carried out and the role of microorganisms in the denitrification and nitrogen fixation processes was elucidated (Araragi). In addition, phosphorus fertility of paddy soils was analysed to develop a method of application of phosphorus fertilizers depending on the soil types (Motomura). In the case of upland soils, the beneficial effect of the application of organic materials as mulches for the improvement of soil moisture was revealed, while the dynamics of nitrogen contained in fertilizers was analysed (Igarashi). Studies on the excess and deficiency of soil nutrients including trace elements are currently being carried out (Watanabe). In addition various studies which are presently in progress will be reported in future.

As research collaboration between the Thai organizations and TARC will undoubtedly expand, it is hoped that future research will eventually involve the application of biotechnological procedures and the development of new materials.

(Terunobu Hidaka)

TARC Int'l Symposium 1989

Vegetables Production in the Tropics

The 23rd International Symposium on Tropical Agricultural Research sponsored and organized by TARC in collaboration with the National Research Institute of Vegetables, Ornamental Plants and Tea was held at Tsu Center Palace Hall, Tsu City, Mie, 20-22 September 1989.

The objectives of the Symposium were to discuss the following aspects:

1) Trend of production of major vegetables in tropical/subtropical countries over the past decade.

2) Constraints on vegetable production in the region in relation to yield instability caused by diseases and to low quality due to prolonged transportation under high temperature conditions.

3) Well-documented examples of technical improvement in vegetable production over the past decade.

4) Recent advances in vegetable research on such subjects as development of new varieties and cultivation methods to enhance and stabilize the production.

5) Recent progress in vegetable research in several other fields.

Dr. Guy Henry of CIAT (Columbia) discussing his views in TARC Int'l Symposium.

About 200 participants attended the Symposium including delegates from: India, Sri Lanka, Thailand, Malaysia, Philippines, Indonesia, China, Brazil, Peru, Japan, FAO (RAPA), AVRDC, ICRISAT, CIP, ICARDA and CIAT. Their presentations included 11 country reports on the trend and constraints of vegetable production and on vegetable research advancement in the respective countries. Technical reports (22) involved recent progress in research on tropical/subtropical vegetable production.

The main problems brought forth in the country reports and technical papers were focussed on the following issues: (i) lack of good cultivars well-adapted to the tropics/subtropics, (ii) insufficient development of cultivation methods and production systems, (iii) insufficient development of pest and disease control, (iv) inadequate handling and transportation system of vegetable crops. Furthermore, discussions were focussed on (i) the means of organizing cooperative networks to promote technical development for vegetable production, (ii) collection, conservation, characterization and utilization of genetic resources, and (iii) application and transfer of biotechnological procedures and other advanced technologies to vegetable research.

Proceedings of the Symposium will be published soon by TARC.

(Yoshikazu Ohno)

SABRAO Congress in TSUKUBA

Breeding Research in Asia/Oceania

The 6th SABRAO Congress was held in the Tsukuba International Conference Hall during the period 21-25 August 1989.

The SABRAO Congress which is held every four years is organized by the Society for the Advancement of Breeding Research in Asia and Oceania. The previous Congresses took place in Tokyo (the first, 1968), New Delhi, Canberra, Kuala Lumpur, and Bangkok. The main theme of the Congress, "Breeding Research: The Key to the Survival of the Earth" emphasized that breeding research plays a major role in human welfare.

The 1989 Congress aimed at contributing to the regional development of breeding research by discussing the latest research achievements and relevant information, during symposia, oral presentation, poster sessions, and scientific excursions. The number of participants was 402, including approx. 200 from overseas.

Congress symposia focussed on 3 areas: 1) Practical aspects of biotechnology in breeding (6 papers). Application of biotechnology in crops, forest trees, animals, silkworm and fish. 2) Plant breeding and genetic resources (5). Animal genetic resources of Asia and silkworm varieties in Japan. 3) Plant breeding and genetic resources (5). Aspects in collection, conservation, evaluation and utilization of genetic resources, were discussed.

The oral presentation (145 papers) and poster (122 papers) sessions covered a wide range of subjects: 1) Genetic Resources, 2) Origin and domestication of plants and animals, 3) Breeding and reproductive system, 4) Genetics of and breeding for resistance, productivity and quality, 5) Genetics of and breeding for morphological, physiological and biochemical traits. 6) Distant hybridization, 7) Genetic engineering and biotechnology, 8) Quantitative genetics and selection methods, 9) Heterosis breeding, 10) Mutation breeding, 11) Forest tree breeding, 12) Animal breeding, and 13) Silkworm breeding. Two papers were contributed from TARC.

The Congress had the special honour of the presence of His Imperial Highness Prince Ayanomiya, who presented his report on "Genetic relationship and classification of catfish of Thailand". Prince Aya is presently studying fish biology at Oxford University and has conducted field work in the Mekong River area. His presentation attracted press interest. The next 7th Congress will be held in Taipei, Taiwan in 1993.

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