Japan ISSN 0915-7476

Newsletter

CONTENTS

Hermetic storage of maize to prevent Aflatoxin contamination in Thailand. (Photo by K. Kawashima)

Vol.4, No.1
January 1993

FOR INTERNATIONAL COLLABORATION

TARC
TROPICAL AGRICULTURE RESEARCH CENTER

Studies on postharvest technology at TARC — A Research Strategy —

Koji Kawashima

1. Research system of TARC:

Before discussing the research strategy on postharvest technology at TARC, the general framework of TARC operation may need to be understood, as briefly summarized as follows: (1) Most of the researchers are recruited from various institutes affiliated to the Ministry of Agriculture, Forestry and Fisheries. (2) TARC researchers are mainly engaged in collaborative research work and not in technical assistance, unlike JICA members. (3) TARC adopts a more flexible attitude in the planning and implementation of programs, depending on the situation and requirements of the counterpart institutes. (4) Since a large number of research fields is covered, the number of researchers in the individual fields is rather small.

2. Main geographic areas covered by TARC:

Since the number of researchers in individual fields is comparatively small, TARC has to carefully select the geographic area for postharvest research to ensure that the specific objectives will be achieved. If we take into account the cultural, historical, geographical, and social background, it is natural that the TARC activities are mainly focussed on Asian countries where agricultural production has been fairly developed. It should be pointed out that the research commitments in developing countries require a longer period of engagement, and hence, several researchers are normally assigned on a long-term basis successively to a particular project before final results are obtained.

3. Research on postharvest technology:

Since its establishment in 1970, TARC has been increasing its overseas activities, and currently the number of researchers sent abroad annually exceeds two hundred. However, the activities have been predominantly concerned with programs related to preharvest aspects of crop production, such as plant breeding, plant protection, soil fertility, water management, etc., while programs on postharvest technology have accounted for only a minor part.

For food production in the developed countries, emphasis is placed on the wholesomeness, diversity, higher quality and convenience of the products. Agricultural products are, in a sense, industrial raw materials that should exhibit certain quality standards for the production of processed food. Southeast Asian countries including ASEAN are currently achieving a high level of economic growth. People with higher incomes require a larger quantity as well as a higher quality of food products.

In the meeting on reassessment of TARC's overseas collaboration in the 1990s (Tech. Doc. No. 86, 1991), it was pointed out that research on postharvest technology will be one of the most important subjects in the developing countries of Southeast Asia in the near future.

4. Research subjects:

At the beginning research will be centered on problems relating to storage, distribution, preliminary processing and shelf life extension of major crops. For example, in the case of paddy the studies will involve: drying, threshing, milling, storage, protection from damage, safety, packaging, processing including by-product utilization, distribution of processed products. For fruit and vegetables, packaging, shelf life extension and processing will be focussed on. Mycotoxin problems of agricultural products are to be tackled urgently since many people are consuming contaminated toxic food.

The priorities of research on postharvest technology for agricultural products vary from country to country, depending on the cooking and eating habits, taste, processing and evaluation methods, distribution systems, etc. In the developing countries, there are traditional or indigenous postharvest techniques, which should be studied carefully as they are valuable. Traditional technology is generally rational and well adapted to the environment. For example, natural enemies are used to protect agricultural products against insects to minimize the use of pesticides.

In most cases, in the developing countries the total mass of products of individual lots is rather small. For example, since the capacity of farmer's storage houses for paddy or maize is in the order of several tons, technology adapted to small scale handling is required. There must be some modification in the application when modern technology is introduced to developing countries in order to achieve useful, realistic and sustainable objectives. It is obvious that sun-drying can not be readily replaced by automatic drying facilities. Suppose fruits are collected to produce processed food like canned fruits on an industrial scale, one must take into account the fact that the size, maturity, taste and even variety of the fruits will not be uniform. Fundamentally, the postharvest technologies that are introduced to the developing countries should be suitable for the conditions prevailing in the respective countries. Since the social environment varies from one country to another, researchers should analyse and fully understand the problems specific to each country.

The way of conducting research on postharvest technology is different from that on preharvest technology; the researchers must first understand the social background of their work and must apply the technology accordingly. They have to communicate effectively not only with researchers but also with extension officers, farmers, middlemen, brokers, merchants, wholesalers and businessmen, in some cases. Researchers should show a degree of flexibility in their approach to research.

As for the profile of Dr. K. Kawashima, please see pg. 7 of the TARC Newsletter, Vol. 3, No. 3, July 1992. He moved from Res. Div. II to Res. Div. I on April 1st, 1993.

5. Research on postharvest technology in developing countries:

In future, agriculture will still remain a very important activity in most of the Asian countries. Asian countries such as Vietnam will emphasize paddy production and become strong competitors to paddy-exporting countries like Thailand. Thailand will aim at producing paddy products with higher quality, which will require advancements in postharvest technology.

Thailand which used to export four million tons of maize, now utilizes most of the maize as feed for the production of poultry meat. It must be emphasized that a country which produces raw materials of good quality has a greater advantage even in the market of final processed foods.

Self-sufficiency in agricultural products besides paddy has been achieved satisfactorily in many Asian countries, resulting in a heavier competition among them in the marketing of surpluses. As the next step, they will place more emphasis on studies on postharvest technology for agricultural products.

The structure of TARC is being reorganized to actively promote research on postharvest technology overseas. (Director, Research I Division)

1992 Annual Conference for Promotion of Research on Tropical Agriculture

The 1992 Annual Conference for Promotion of Research on Tropical Agriculture was held at TARC on 25 February 1993. There were sixty four participants including representatives from the Agriculture, Forestry and Fisheries Research Council Secretariat, the 11 Agriculture and Forestry Research Institutes and 6 Regional Agricultural Experiment Stations. Nine professors from several universities attended the meeting as advisors.

The Director General of TARC, Dr. Kobayashi, briefly introduced the proposed reorganization of the Center at the opening of the meeting. The research activities of TARC carried out during the 1992 fiscal year were reviewed and evaluated in detail. Among the research achievements, 8 subjects deemed particularly important are indicated in Table 1. These will appear in the Highlight column of this Newsletter.

Emphasis of the discussions was placed on studies for the optimum utilization of natural resources in marginal lands and plant pathology studies in the developing countries.

The recent situation and possible approaches to the management of plant genetic resources were reported. In this regard, the 27th International Symposium organized by TARC which will be held in Tsukuba during the period August 25-26 will deal with problems relating to the management of plant genetic resources in the Tropics.

The results of the study meeting on post-harvest loss of rice were reported. Recent progress in the joint projects IRRI and ICRISAT/Government of Japan was outlined.

Discussions on the possibility of initiating a form of research cooperation in India, Mexico, Costa Rica, Ecuador and Chile were also held. The successful start of the TARC Visiting Research Fellowship Program was conveyed by the Director of the Okinawa Branch.

The initiation of four new projects listed in Table 2 was approved.

TARC is scheduled to be re-organized on October 1st of this year for further promoting activities covering a range of research fields including fishery sciences. The new Center will provisionally consist of a Planning and Coordination Division, an Administration Division and 7 Research Divisions; ① Overseas Information, ②Genetic Resources Management, ③Environmental Resources, ④Crop Production and Postharvest Technology, ⑤Animal Husbandry and Grasslands, ⑥Forestry and ⑦ Fisheries in addition to the Okinawa Branch. The number of staff members will increase to 167 (presently 145). The geographical zones covered by the new Center will include the tropical and sub-tropical zones as well as temperate and cool zones.

The designation of the new Center and the divisions will be decided in the near future. (N. Nakaya, Director of Planning and Coordination Division)

Table 1. Major Research Achievements in 1992

No.	Subject	(Place of study)
1.	Comparison of characteristics among brown planthopper populations	(Vietnam and Kyushu, Japan)
2.	Tests for rice blast resistance	(China)
3.	Improvement of direct seeding technology for double cropping of rice	(Malaysia)
4.	Nitrogen fixation of mungbean	(Thailand)
5.	Analysis of light conditions in tropical forests	(Thailand)
6.	Mechanism of rock weathering in the arid tropics	(Tsukuba, Japan)
7.	Optimal salt concentration for mangrove growth suggested by photosynthesis	(Okinawa, Japan)
8.	Diagnosis of virus diseases of papaya by ELISA method	(Okinawa, Japan)

Table 2. New projects starting from 1993

No.	Subject	(Place of study)
1.	Integrated crop protection technology for direct seeding of rice	(Malaysia)
2.	Improvement of agro-environment in marginal drylands	(China)
3.	Rehabilitation of degraded tropical forests	(Malaysia and Indonesia)
4.	Development of farming technology for sustainable land utilization	(India)

"Silk Road through the Desert" A TARC scientist wrote a book.

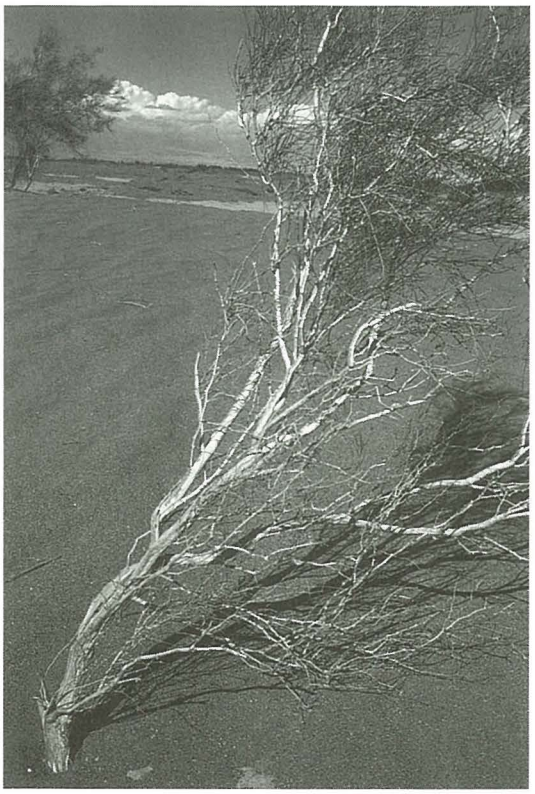
Dr. Taichi Maki of the Marginal Land Research Division published a book entitled "Silk Road through the Desert" coauthored by his wife, Mrs. Midori Maki, in Sept. 1992.

The book written in Japanese is full of beautiful pictures and covers topics from history, geography, climate, people, plants and animals.

In the desert area of Xinjiang Province, China, Dr. Maki experienced a strange phenomenon; "I felt as if an ice particle fell on my cheek", he told, "But it was only a drop of sweat." He estimated that the temperature of the sweat may have decreased to 20°C because the extremely hot (50°C) and dry (5% R.H.) air had removed the evaporation heat from a drop of sweat.

Dr. Maki is a member of the Japan – China Joint Research on Environmental Resources at the Xinjiang Institute of Biology, Pedology, and Desert Research, Chinese Academy of Sciences. A conference organized to review the project was held at the Tsukuba Center for Institutes on 4 March 1993. Twenty papers were presented and they were published as Proceedings.

The first 5-year period (1988-93) of the project entitled, "Analysis of water movement and soil characteristics of arid lands" was completed and the project will be continued for another 5 years (1993-98) under the title, "Establishment of sustainable agricultural techniques in marginal arid lands through the improvement of environmental resources".



A deformed tree by dry strong wind with drifting sand observed in Turpan, China.

≪Insect Pest≫

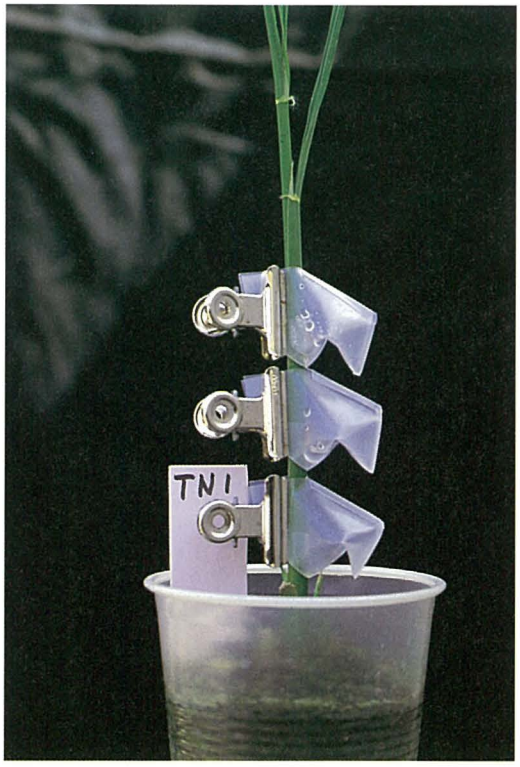
Biotype of Japanese BPH Population resembles that of the population in the Red River Delta, Vietnam

T. Wada and K. Ito*

Rice planthoppers, *Nilaparvata lugens* (BPH) and *Sogatella furcifera*, invade Japan in June and July, every year from South China. Chinese entomologists demonstrated that there is a large number of immigrants annually in April and May in South China from countries located further south and that the local planthopper population in South China, thereafter, originates from these immigrants. Thus, the origin of Japanese planthoppers may be traced to some areas in the Indochina Peninsula.

We compared the biotypes (virulence on resistant rice varieties) of eight BPH populations collected in the fields of the Indochina Peninsula and Japan in 1992 to determine the possible origin of the Japanese BPH. Collection sites included four fields located in tropical Asia (Muda area, Malaysia, Central Plain Thailand; two fields in the Mekong Delta, Vietnam), two fields in subtropical Asia (Red River Delta, Vietnam) and two fields in the temperate zone (Kyushu, Japan). The insects used for the experiment were the female adults of the progenies arising after a few generations. The standard rice varieties used were TN1 (susceptible check), Mudgo (resistance gene: Bph1), IR26 (Bph1), ASD7 (bph2), Rathu Heenati (Bph3) and Babawee (bph4). We determined the amount of honeydew excreted on rice plants by an insect using the parafilm sachet method. Since the resistance of these varieties is caused by the inhibition of planthopper feeding, the quantity of honeydew which reflects the feeding activity of the insect can be used as an index of virulence of the insect on the rice plants.

The eight BPH populations were classified into two groups according to the virulence on ASD7 which was moderately resistant to the Japanese and Red River Delta populations. When we used the relative excretion index (REI) which indicates the mean amount of excretion on a resistant variety to the mean amount of excretion on TN1 (=100), the value of the index ranged from 10 to 26 in the Japanese and Red River Delta populations. On the other hand, the REI value on ASD7 ranged from 73 to 97% for the Malaysian, Thai and Mekong Delta populations, indicating that resistance of ASD7 entirely broke down in the tropical fields of Indochina.



Parafilm sachets used to determine the amount of honeydew excreted by a planthopper on rice plants.

Although IR26 was moderately susceptible to all the populations, the REI values were slightly higher for the tropical populations (REI; ca. 60) except for the Malaysian one than for the Japanese and Red River Delta populations (REI; ca. 40). Rathu Heenati and Babawee still remained highly resistant to all the populations except for the Mekong Delta population which included a low percentage of planthoppers capable of attacking either variety.

As a result, the biotype of the Japanese population bore a close resemblance to that of the Red River Delta population. In the Red River Delta, the planthopper density increases every year from late April with the flowering of the spring crop (the 1st crop of the year) and the southwest monsoon becomes stronger from May. As a result the ecological and meteorological conditions appear to be conducive to a mass exodus of the planthoppers from the Red River Delta in spring. It is therefore suggested that the planthoppers in the subtropics of the Indochina Peninsula may be involved in the large migration system of planthoppers which extends to the temperate area of East Asia.

* Present Address. Kyushu National Agricultural Experiment Station

≪Forestry≫

Analysis of Light Conditions under Canopies of Fast-growing Tree Species in the Tropics

K. Nakashima, B. Thaiutsa, S. Kaitpranaet* and M. Jamroewnpruksa**

In the tropics, forest deterioration has made rapid progress the past decades due to excessive logging, shifting cultivation or forest clearing for agricultural production. Preservation of forest resources and reforestation of degraded forest lands are an important task in the tropical countries. Production of wood and food is, however, essential in those countries. These conflicting requirements, namely the need to preserve forests and increase food production, have to be met at the same time. Although agroforestry is considered to be one of the systems that could contribute to solving these problems in the tropics, ecological studies and studies on the physiological properties of trees and crops in agroforestry systems are limited. To identify a technology for effective control of the light energy for the cultivation of trees and crops in agroforestry systems, spectral reflectance and transmission of light energy in leaves of tropical fast-growing trees and light conditions under the canopies of those species were studied during the cooperative research project with Kasetsart University, Thailand.

Part of the solar radiation energy is reflected on the surface of a leaf and the rest is absorbed by the mesophyll cells of leaf. The spectrum of transmitted light in a leaf is, therefore, very different from that of solar radiation. In fast-growing tree species, the absorbance of the light energy of the leaf was very high for blue, green and red light, ranging from 400 to 700 nm wavelength which is called "photosynthetically active radiation(PAR)", but low for far-red light in the range from 700 to 1100 nm wavelength.

Transmission of light energy in a leaf varies with its age, too. Transmission was higher in a young leaf than in a mature or an old one for green and red light, in the range from 500 to 700 nm wavelength but it was lower in an old leaf than in a young or a mature leaf for far-red light, in the range from 700 to 1100 nm wavelength. These results were similar to those reported in other plant species.

Reflectance of light energy on the surface of a leaf was considerably high for far-red light but very low in the range of PAR. However, the transmission in a leaf was very low in the

range of PAR and high for far-red light. As reflectance and transmission in leaf were significantly different among tree species, these leaf traits could become useful for differentiating various species.

Under the closed canopy of fast-growing trees, most of the natural radiation (direct solar radiation and sky radiation) energy was reflected or absorbed by the leaves of the canopy and only part of the radiation reached the ground. The diffused light under the canopy was very different from that of natural radiation and the spectrum exhibited approximately a constant energy at all wavelengths, whereas it varied remarkably at each wavelength for natural radiation. Transmission of the diffused light was extremely low for the range of PAR and far-red light and was different in each tree species.

Light conditions under canopy also differed with the tree age and spacing of stands. In *Acacia auriculiformis* and *A. mangium* stands at 2 × 2m and 2 × 4m spacings, the relative light intensity (RLI) decreased rapidly to less than 20% three or four years after the trees were planted and the decrease of RLI continued with the tree growth subsequently. In the *A. leptocarpa* stands planted at 2 × 2m, 2 × 4m and 2 × 6m spacings, a large amount of energy of diffused light was observed at all the wavelengths in the stands at a wider spacing.

Relative light intensity under the canopy is closely related to the area of open space of the canopy but not to the reflectance or transmission in a leaf. This fact suggests that the light conditions under the canopy mainly depend on the structure of the stand's canopy. These results suggest that it is possible to estimate the changes of the light conditions under a canopy with tree growth and that it is also possible to control the conditions.

* Kasetsart University

Intercropping of maize between Eucalyptus camaldulensis planted at 2 × 8m spacing in Pak Chong, Thailand.

Light conditions under the canopy of a five-year-old Acacia leptocarpa stand planted at 2 × 4m spacing.

≪Plant Disease≫

Procedure for the evaluation of field resistance and identification of genotypes for true resistance of rice varieties to blast disease in Yunnan Province, China

Y. Fujita, J. Li, C. Li**

In Yunnan Province, japonica rice is cultivated in the paddy fields located at an elevation of less than 1,500m above the sea level. Rice blast disease severely affects japonica rice in Yunnan Province, China. Basic and reliable measures to control this disease consist of the development and use of resistant varieties. Varietal resistance to blast disease is divided into true resistance and field resistance. The former is determined by the all-or-none disease response of a certain variety to a certain race of the fungus, and the latter is determined by the severity of the disease on a certain variety caused by a compatible race of the fungus. Use and development of resistant varieties with true resistance genes and a high level of field resistance are the most effective measures to control blast disease. Field resistance of rice varieties harbouring true resistance genes can not be assessed in test fields in the absence of compatible races. Seedlings of the japonica rice varieties were inoculated at the fourth leaf stage by spraying with a spore suspension of compatible races. Inoculated seedlings were heated with an electric heater at night in the greenhouse. These inoculation and heating procedures have resulted in such a successful infection that it has become possible to determine with accuracy the relative resistance of the japonica rice varieties to blast disease.

Out of eighty-one indica rice varieties tested, nineteen varieties were resistant to all the isolates collected in the japonica rice-growing area in Yunnan Province. These indica varieties were divided into nine groups, on the basis of the reaction patterns to the Japanese isolates or the Yunnan isolates collected in the indica rice-growing area in Yunnan Province. It is assumed that these indica varieties harbour at least five true resistance genes to be identified.

* Yunnan Academy of Agricultural Sciences.

Classification of indica rice varieties based on reaction patterns to nine isolates of blast fungus.

Group	Unknown gene	Isolate (Race) Y90-13 (037)	Y90-9 (007)	Y90-71 (102)	Y90-48 (001)	Y90-73 (114t)	TH740-9 (177)	TH81-02-3 (137b)	88A (433)	TH81-04 (437)	Variety
1.		S	S	–	–	–	–	–	–	–	Xihonggu
2.	A	–	S	–	–	–	–	–	–	–	Shanyanggu, Lazagu, Jiuyuehuangpigu, Jiuyuegu (1)
3.	A	–	S	–	–	S	–	–	–	–	Shanhuagu
4.	B, C	S	–	–	–	–	–	–	–	–	Jinchigu, Lazigu (2)
5.	B	S	–	–	–	–	–	–	–	S	Haodonglang
6.	C	S	–	–	–	–	S	–	–	–	Xiajiubaigu
7.	E	S	S	–	–	–	–	–	–	–	Yuanjiangbaigu, Jianchigu, Luopinger, Matigu, Landigu, Xiaomangzhong
8.	D	S	–	S	–	–	–	–	–	–	Haomenglai, Taixuanyibao
9.	E	S	S	S	–	–	–	–	–	–	Hongzaogu

S: Susceptible reaction, –: Resistant reaction

Profile of New Director

Dr. Shoji Miyazaki, Director of Eco-Physiology Research Division

Plant Breeder: Born in Tokyo in 1943. Graduated from the Faculty of Agriculture, Tokyo University. After working at the National Agriculture Experimental Station (1966-70), he carried out research on the introduction to Japan of tropical legumes at the Okinawa Branch of TARC (1970-75) and also on the phylogenetic relationships and classification of the Vigna radiata-mungo complex at the National Institute of Agricultural Sciences(1976-81). During the period 1972-73, he was dispatched to Brazil by TARC on a long-term assignment and carried out research on Mucuna pruriens, a tropical legume for green manure and medicinal purposes, at Instituto Agronomico de Campinas. He was appointed principal researcher for the soybean breeding program at Nagano Agriculture Experiment Station where he was able to release three varieties registered by the Ministry of Agriculture, Forestry and Fisheries as well as two recommended varieties for special use (1983-89). He was then appointed Chief of the Germplasm Storage Center, National Institute of Agrobiological Resources (1991-93) where he was in charge of the management of the genebank. In March 1993, he joined TARC as Director of the Eco-Physiology Research Division.

Retirement

Drs. N. Murata, T. Yamaguchi and M. Nara, former Directors of Eco-physiology Research Division, Research Division I and Okinawa Branch, respectively, left TARC to assume new responsibilities. Their addresses are as follows:

Dr. Nobuo Murata, JICA Project Leader, c/o Plant Genetic Resources Institutes, National Agri. Res. Center, Islamabad, PAKISTAN

Professor Takeo Yamaguchi, Faculty of Agr., Kyushu Tokai University, Kawayu, Choyo Village, Aso District, Kumamoto Prefecture, 869-14 JAPAN

Dr. Masao Nara
JICA Project Leader, c/o Henan Academy of Agr. Sci., No. 1, Nongye Road, Zhengzhou, Henan, P. R. CHINA

Letters to the Editor from TARC Visiting Scientists

(Part 1)

A New Avenue for International Collaboration in Agriculture

International collaboration in agriculture has helped many developing countries to substantially increase their food production over the last three decades. The Tropical Agriculture Research Center (TARC) has been promoting international collaboration for over 20 years. Recently it has implemented a Visiting Fellowship Program which enables scientists from the developing countries to undertake research in Japan on problems related to the conservation of the global environment and optimum utilization of bio-resources.

I am one of the first 10 scientists who have been selected to participate in the above Fellowship Program. I am working on the mechanisms of heat tolerance of pigeonpea, chickpea and groundnut. In particular, I am interested in investigating the role of cell membrane thermostability in conferring heat tolerance in these crops.

I arrived in Japan on 5 October 1992 from India where I have been working as Scientist at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Upon my arrival in Tsukuba city, I had the opportunity of meeting Dr. M. Kobayashi, Director General, TARC, the Directors of various Research Divisions of the TARC, and visit other Institutions. On 9 October, 1993, I arrived at the Okinawa Branch of the TARC on Ishigaki island where the fellowship is being implemented. The Okinawa Branch of the TARC is located in the sub-tropical zone and has advanced research facilities to carry out research on heat tolerance.

Living conditions on Ishigaki are fine and enjoyable. Housing facilities for the Visiting Fellows provided by the TARC are excellent. Dr. T. Senboku, Head, International Collaboration Section, together with the other Japanese staff has taken a good care of all the Visiting Fellows ever since we arrived in Ishigaki, besides providing very able professional leadership to the Fellowship Program.

I would like to express my sincere gratitude to the Director General, TARC, for giving me this opportunity and ICRISAT for approving the leave to work here, and thank the editorial committee of TARC Newsletter for publishing this note.

Y. S. Chauhan
Scientist (Physiology)
ICRISAT, Patancheru,
Andhra Pradesh, India

Afforestation Programme for Environmental control at the Forestry Research Institute of Nigeria.

In Nigeria, forests cover an estimated area of 345,000 km^2 accounting for about 37% of the country's total land area. The area of reserved forest land represents about 9.8% of the country's total area. The forest ecosystems contain many valuable plant species which are of considerable importance in providing food, drugs, shelter, fibres, raw materials for industries and act as a buffer against ecological hazards.

With the rapid growth of the population and unprecedented expansion of economic activities severe pressure has been imposed on the country's forest resources whereby many useful trees and shrubs are being destroyed nearly to the point of extinction that is threatening lives and properties.

To overcome this problem, protection and conservation of the existing vegetation

Long-term preservation of yams by tissue culture.

complemented with large scale afforestation are being promoted by the Government of Nigeria through activities including afforestation of deforested areas, rehabilitation of degraded land, erosion control, shelterbelt establishment for protecting the environment from desertification and drought and management of the soils. Various silvicultural techniques for improved growth and yield are being adopted. The establishment of large scale plantations of *Pinus* spp. as raw material for the pulp and paper industries is one of the mandates of the Institute. One aspect of my research work at TARC is to analyze the responsiveness of tree species to mycorrhizal inoculation (*Pinus* spp.) in soils under different conditions of pH and fertility levels, in line with the theme which emphasizes the development of techniques for environmental control using plants and micro-organisms. These will go a long way in assisting the Institute to achieve some of the set objectives.

Dr. Ajibola P. Aluko
Principal Research Officer
Forestry Research Institute of Nigeria, Ibadan, Nigeria.

In vitro Conservation of Germplasm: Efforts at the Crops Research Institute, Ghana.

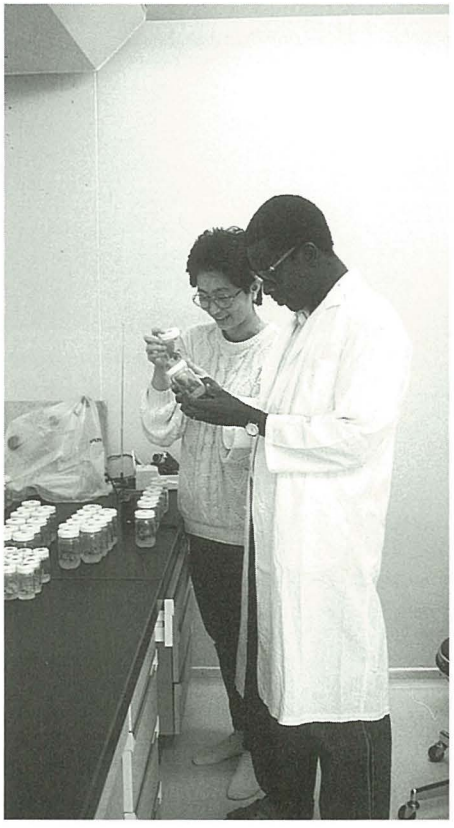
Germplasm collection, distribution and preservation have been very important components of the Institute's activities. Preservation work in the field is carried out at the Plant Genetic Resource Unit located at Bonsu.

In the past, the major emphasis of the Institute's work was placed on the improvement of maize and cowpeas and as a result, the country is now self-sufficient in maize production. Recent attention, therefore, has been focussed on soybeans, wetland rice, cassava, yams, plantains and pineapples. Already, the collection of the last four vegetatively propagated crops is being actively pursued, which requires *in vitro* preservation. Since these vegetatively propagated crops are being maintained in the field and are subject to unpredictable environmental conditions, invaluable germplasm may become lost. The need for a more reliable and safer means of preservation cannot be over-emphasized.

Efforts are therefore, being made to establish a Tissue Culture Laboratory within the Crop Physiology Division, primarily for studies on the *in vitro* preservation of germplasm of these vegetatively propagated crops.

Therefore, the opportunity of taking part in the TARC Visiting Research Program under the theme, Evaluation and Development of Techniques for Long-term Conservation of Genetic Resources of Vegetatively Propagated Crops in the Tropics and Sub-Tropics, will go a long way in helping us to achieve our goal of setting up an efficient *in vitro* preservation facility, through the experience that will be gained from the interaction with fellow researchers working in the field of tissue culture. I am currently, working on cryopreservation of yams.

Dr Ernest Otoo
Head, Crop Physiology Division
Crops Research Institute
Kumasi, Ghana



(left)
Spectrophotometric estimation of chloride content (salinity group).

(right)
Measurement of rice plant height in a vinyl house.

Cryopreservation of Garlic, Pineapple, and Sweet Potato

Some reports have indicated that cryopreservation can be applied for long-term storage. However, its practical use for a wide range of genotypes may need a large number of experiments. Through this visiting fellowship program I am interested in studying the cryopreservation of garlic, pineapple, and sweet potato.

Development of agri-business and agro-industry is the priority of the Government of Indonesia's latest Five-Year Plan (REPELITA VI). Therefore, most research programs are directed toward the increase of agricultural productivity that can support the development of agro-industry. Agro-industry demands have challenged breeders to create superior varieties that can meet market standards. Germplasm as a source of genetic materials needs to be maintained and to be made available for the breeding program.

Garlic ranks first among imported vegetables. LEHRI has collected 142 accessions, and those collections have been maintained in the field. Pineapple is a potential crop for agro- industry and the Central Research Institute for Horticultural Crops maintains 46 accessions of this crop. On the other hand, sweet potato contributes to the production of carbohydrates and the Central Research Institute for Food Crops is maintaining 403 accessions of this crop.

The following objectives had been planned for the current development of plant materials *in vitro* for experiments, protocols for cryopreservation of the respective crops, and protocols for re-culture and micropropagation. However, the experiments were delayed due to the difficulty in collecting plant materials. It may be difficult to achieve all the objectives identified for the remaining period, but at least some protocols for some genotypes will be developed. It would be a good follow-up of this collaboration if I could continue this work at my Institute in Indonesia with some technical aid or grant through this program, which could be beneficial to both countries.

Iteu M. Hidayat
Lembang Horticultural Research Institute (LEHRI)
Jl. Tangkuban Parahu No. 517
Lembang 40391
INDONESIA

TARC in the Philippines

Cooperative Research Program with UPLB in the field of Soil Science

Kenzo Miura

The University of the Philippines at Los Baños (UPLB) is located at about 60 km southeast of Manila. The Department of Soil Science, College of Agriculture, UPLB carries out research into seven specialized areas of Soil Science as follows: Soil Fertility, Soil Chemistry and Mineralogy, Soil Survey and Classification, Land Use Planning, Soil Conservation and Management, Soil Microbiology, and Soil Physics.

The Tropical Agriculture Research Center (TARC) has sent 3 long-term scientists to the Department of Soil Science, UPLB since 1982. The collaborative research programs between TARC and the Department of Soil Science, UPLB have been focussed on pedological aspects.

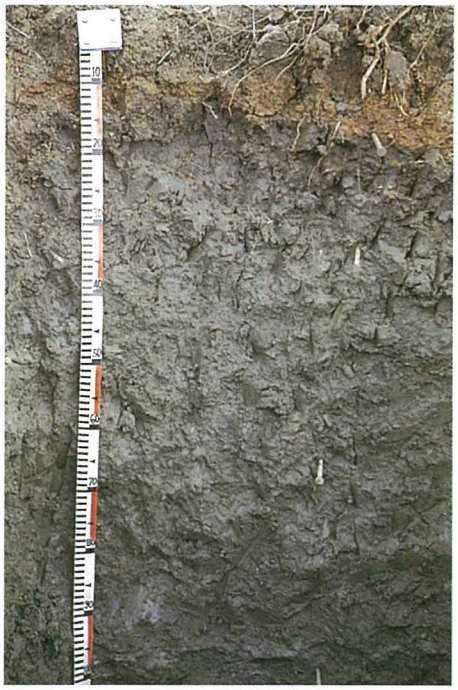
The first research project entitled, "Studies on Characteristics and Genesis of Volcanic Ash Soils in the Philippines" was carried out from 1982 to 1986. These investigations revealed that there were two types of volcanic ash soils in the Philippines; one type dominated by allophane (Allo type), displayed a relatively high phosphate absorption and relatively low base saturation, as in the case of the Japanese volcanic ash soils, and another type dominated by halloysite (Ht type), showed a lower phosphate absorption and higher base saturation. The significance of climatic conditions in pedogenesis was also clarified. The Ht type soils were formed under climatic conditions characterized by a distinct dry season, while the Allo type soils were formed in the absence of a dry season. In addition, these types of volcanic ash soils appeared to have undergone a transition through weathering processes.

Secondly, "Studies on Genesis, Characteristics and Productivity of Red-Yellow and Related Soils in the Philippines" were conducted from 1986 to 1990. In these investigations, the distribution and characteristics of various soils were studied in terms of climate, parent materials and topography. Red-Yellow soils in the Philippines could be classified into Ultisols and not Oxisols based on reliable data. The data base on the sampled soils which was developed during the study was also utilized for land classification, land use and soil management. Furthermore, two valuable manuals on the procedures for soil description and soil sampling, and for soil analysis were published.

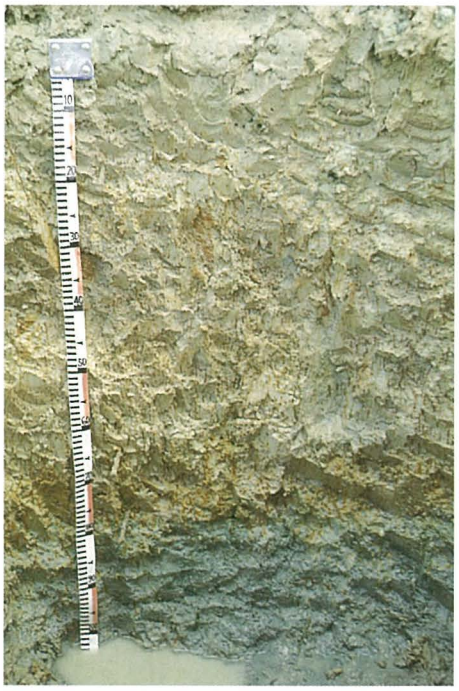
The ongoing research project initiated since October, 1991, is entitled "Studies on Pedological Characterization of Lowland Areas in the Philippines". The target shifted from upland soils to lowland soils, which are used mainly for rice cultivation. In the Philippines, the increase in rice production is the main objective. The harvested area has significantly decreased for the past two decades due to population pressure. In addition, the yield has not increased since 1986. The present study aims to characterize the major lowland soils in the Philippines with emphasis placed on pedological aspects, including morphological, physical, chemical and mineralogical properties, and to analyze the pedogenetic characteristics in terms of climate, parent materials and topography. The information that can be derived from these studies may provide guidelines for efficient land use and proper soil management, which could in turn contribute to a substantial increase in rice production.

The harmonious relations between the Department of Soil Science, UPLB and TARC have been fostered through the collaborative studies which have been carried out so far. The friendship must be sustained not only in the field of Soil Science, but also in other subjects. It is also anticipated that the outcome of these cooperative research programs between UPLB and TARC will contribute to the promotion of agriculture and forestry development in the Philippines.

(Senior Researcher, Research Division I)



Vertisol from Nueva Ecija in the Central Plain of Luzon.



Gleysol from Sorsogon in the southeastern part of Luzon.

Frontal view of UPLB building (Photo by K. Miura)

Tropical Agriculture Research Center (TARC)
Ministry of Agriculture, Forestry and Fisheries
Editor: *Yoshikazu Ohno*
Address: 1-2, Ohwashi, Tsukuba, Ibaraki, 305 JAPAN
Telephone 0298-38-6304
Telefax 0298-38-6316
Telex 3652456 TARCJP J
Cable TARC TSUKUBA