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# Newsletter

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Mangrove Forest in Langkawi island, Malaysia.
(Photo by K. Ito)

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FOR INTERNATIONAL COLLABORATION

TARC
TROPICAL AGRICULTURE RESEARCH CENTER

# TARC's Global Role in the 21st Century

*Kunio TAKASE*

*Dr. TAKASE, Kunio, Executive Director, International Development Center of Japan (IDCJ), since 1986*

*Born in 1926*
*Graduated from Irrigation Faculty, Kyoto University in 1949*
*Ministry of Agriculture and Forestry (1949-1967)*
*Irrigation Dam Construction, Design, Planning*
*Aichi Irrigation Project, Chicago Representative (1957-59)*
*Dr. of Agriculture from Kyoto University (1969)*
*Asian Development Bank (1967-1986)*
*Director, Irrigation and Rural Development Department*
*Overseas Economic Cooperation Fund (1974-1978)*
*Director, Economic Research and Technical Appraisal Department*
*ADB Representative to CGIAR (1982-1986)*
*Governing Board, International Irrigation Management Institute (1982-1989)*
*TAC Member, CGIAR (1988-today)*

**Changing Global Scene**

Nobody predicted, even only one year ago, that the Soviet Union would collapse so quickly and that the third world's voices on environment and development would become so strong. At the G-7 Meeting held on 26 April 1992 in Washington D.C., Japan's special role in sustaining global economic development was emphasized. Are these events not related to TARC's activities at all? The answer from the majority of Japanese agricultural researchers would be "no" or "very little". But I feel differently. The time has come when Japan's role in international agricultural research (IAR) should be seriously reviewed in the light of such dynamic global changes.

**CGIAR's New Strategy**

The Consultative Group on International Agricultural Research (CGIAR), an informal but the most competent group of IAR established in 1971 under the auspices of the World Bank, FAO and UNDP, has recently adopted a new strategy of overall agricultural research, in response to the changing global needs, as follows:

(i) The purpose of the CGIAR had been to "increase food production" in the developing countries technically to achieve self-sufficiency in food. Its purpose was broadened to "increase food reliance", to obtain sufficient food economically through more efficient distribution/trade system.

(ii) Research focus was reoriented from biological innovation (new varieties) to ecological preservation, or from monoculture crops to multi-culture farming, toward agro-silvo-pastoral-fishery integration. A new concept of four ecoregions was introduced to focus on more specific problems in various parts of the world.

(iii) In order to cope with changing priorities and broadened scope of the research, additional IAR Centers should be allowed to become members of the CGIAR. Three IAR Centers, namely, IIMI (irrigation management), ICRAF (agroforestry) and INIBAP (banana), were admitted to the CGIAR as of November 1991 and a few other IAR Centers including ICLARM(aquaculture), AVRDC(vegetables) and another (tropical forestry) will be considered soon.

(iv) Closer relationship between CGIAR and NARS (National Agricultural Research System) should be encouraged to enhance local capability of adaptive research which contributes more directly to efficient production, environmental conservation and resource management.

During my recent two trips around the world in 1990 and 1991, in relation to the IDCJ Study Mission on "Global Environment and Agricultural Resource Management", I visited 6 CGIAR Centers (IITA, ICARDA, ICRAF, ILRAD, ILCA and CIAT) and confirmed that all of them had quickly adopted the CGIAR's new strategy within their own mandate.

**TARC's Limitations**

The TARC started its operation in 1970, one year earlier than the CGIAR's establishment. It is an IAR Center funded by the Japanese Government to undertake collaborative agricultural research with other countries in tropical and sub-tropical areas. It has achieved a considerable success within its limited scope of work. However, I believe that many people will agree that much has been left to be tackled by TARC, if the changing global scene and CGIAR's new strategy are taken into account seriously. At least, the following three aspects should be expanded and strengthened to fulfill the TARC's expected role.

(i) Areas to be covered by TARC should include not only tropical and sub-tropical (present), but also temperate, and sub-frigid zones in addition to the present mandate of TARC. Although Japan's international cooperation was focussed mainly on the tropical and sub-tropical zones of Asia in the past, it has recently been expanding to Africa, Middle East, Latin America, Central Asia, Mongolia, Siberia and Central and East European countries.

(ii) Socio-economic aspects were rather weak in TARC's research reflecting the heavy emphasis on technical aspects. Research on credit, marketing, farmers' organization, distribution systems of agricultural inputs and outputs, land ownership, agro-industry, storage, farm management, income generation, employment and indigenous culture should be included in the TARC programs. These aspects are very important for IAR to prevent the rural exodus to urban centers.

(iii) Integration with other systems of international cooperation is essential. TARC annual budget accounts for less than 1% of the Japanese ODA in the agricultural sector, whereas technical cooperation (mainly by JICA) accounts for more than 20% and the remainder is used for financial cooperation (mainly by OECF and JICA). In order to apply the outcome of research more effectively, utmost efforts should be made to promote integration with other systems of cooperation in addition to ODA, including trade and private investments in the developing countries. It is also important to strengthen the relations with other IAR Centers including CGIAR.

**Personnel Contribution to IAR**

Since the Gulf War ended a year ago, the international community has criticized Japan in stating that Japan's contribution to the world is limited to the distribution of money, and neglects human resources. Under the Japanese Constitution, it is prohibited to provide a military contribution. As an answer to this criticism, Japan could point to its achievements in economic and technical reconstruction after World War II.

However, so far Japan's personnel contribution to international organizations such as the World Bank, FAO and IAR Centers including CGIAR has not been significant. Personnel contribution accounts for only 1% compared to Japan's financial contribution which amounts to 5-10% of the total budget. The only exception is the Asian Development Bank (ADB), where Japanese staff have accounted for about 10% of the Bank staff during the 25 year period since its establishment in 1966.

Allow me to tell something about my own experience in ADB. As an irrigation engineer attached since 1949 to the Ministry of Agriculture and Forestry and engaged in the Aichi Irrigation Project, which borrowed money from the World Bank, I considered that my work in Japan had ended when self-sufficiency in rice was achieved in the 1960s. As soon as the ADB was established in Manila, I was recommended by the Ministry of Agriculture and Forestry and joined the Bank in 1967. (continues to p. 3)

FOCUS

# Identification, distribution, life cycle and control of Echinochloa weeds in Peninsular Malaysia

Kazuyuki Ito* (Tropical Agriculture Research Center, TARC), Azmi Man(Malaysian Agricultural Research and Development Institute, MARDI) and Nai-Kin Ho (Muda Agricultural Development Authority, MADA)

**Introduction**

In recent years, labour shortage and rising labour cost have motivated many rice farmers in the Muda area, Malaysia to switch from transplanting to direct seeding rice culture. The changes were closely related to the development of new cultivars and widespread adoption of combine harvesters. These changes have resulted in dramatic shifts in weed infestation and distribution.

Barnyardgrass (*Echinochloa* genus) which is an aggressive weed occurring in paddy fields worldwide, causes severe damage to rice under direct seeding culture.

The main observation sites were selected at the Muda irrigation scheme(about 100,000ha, rice double cropping, under wet or dry-seeding culture) and its adjacent rainfed areas, Seberang Perai (rice double cropping under wet-seeding culture or transplanting) and Kerian (deep water rice area, transplanting).

Direct seeding culture spread rapidly in the 1980s to the zone which is characterized by climatic conditions intermediate between those of tropical rain forest and tropical savanna. Mean annual temperature is approximately 27°C and the annual rainfall ranges from 1,500mm to 2,500mm.

**Identification**

Five species and one variety of *Echinochloa* weeds were identified in Peninsular Malaysia(Table 1). The *Echinochloa crus-galli* complex shows intraspecific morphological variations. The main differences between the two types are as follows: short awn, open panicles, shiny spikelets for *E. crus-galli* var. *formosensis* and long awn (sometimes awn is absent), closed panicles for *E. crus-galli* var. *crus-galli* (Figure 1).
(continues to P. 6)

Figure 1. A panicle of *Echinochloa crus-galli* var. *formosensis* (left), *E. crus-galli* var. *crus-galli* (center) and *E. oryzicola* in Malaysia
(See photo on page 8)

Table 1 Echinochloa species in Northern Peninsular Malaysia

| Common name | Species name | Synonyms | Life cycle & Main habitat |
|---|---|---|---|
| Tainubie(J)<br>Sambau(M)<br>2n=36 | *E. oryzicola* Vasing. | *Panicum oryzicola* Vasing.<br>*E. crus-galli*(L.) Beauv. var. *oryzicola* (Vasing.) Ohwi | Annual. Wet-seeded rice & transplanted rice fields |
| Himetainubie (J)<br>Sambau (M)<br>Barnyardgrass (E)<br>2n=54 | *E. crus-galli* (L.) Beauv. var. *formosensis* Ohwi | *E. glabrescens* Munro ex Hook f<br>*E. crus-galli* (L.) Beauv. var. *kasaharae* Ohwi<br>*E. micans* Koss. | Annual. Wet-seeded rice, dry-seeded rice & volunteer seedling culture |
| Inubie (J)<br>Sambau (M)<br>Barnyardgrass(E)<br>2n=54 | *E. crus-galli* (L.) Beauv. var. *crus-galli* | *Panicum crus-galli* L.<br>*E. oryzoides* (Ard.) Fritsch<br>*E. crus-galli* (L.) ssp. *hispidula* (Rets.) Honda | Annual. Wet-seeded rice, dry-seeded rice & volunteer seedling culture |
| Kohimebie (J)<br>Padi burung (M)<br>Jungle rice (E)<br>2n=54 | *E. colona* (L.) Link | *E. colonum* (L.) Link<br>*Oplismerus colonum* H. B. K.<br>*Panicum colonum* L. | Annual. Volunteer seedling culture, upland rice (hills, paddies) & dry-seeded rice |
| Sambau merah(M)<br>2n=54 | *E. stagnina* (Retz.) Beauv. | *Panicum stagninum* Retz. | Perennial. Wet-seeded rice, irrigation or drainage control |
| Sambau merah(M)<br>2n=126 | *E. picta* Mechel | *E. stagnina* (Retz.) Beauv. | Perennial. Wet-seeded rice |

(J): Japanese name (M): Malaysian name, (E): English name

**TARC's Global Role in the 21st Century**
(continued from p. 2)
Starting from the Asian Agricultural Survey, in which Dr. Noboru Yamada, first Director General of TARC, also participated, I really enjoyed the ADB activities, because they integrate research, technical and financial cooperation, which resulted in doubling of rice production in Asia within a period of 15 years. I am confident that a Japanese can feel comfortable in the international community, provided that he/she has adequate professional expertise, good command of English and a friendly personality.

**Asian Wisdom and Western Logic**

Finally, TARC's research should contribute to development. Average annual economic growth rate of the Asian developing countries for the past 10 years has been 7%, which is far higher than in any other parts of the world including developed countries. Where did this miracle come from? In my view, there are three major reasons which differentiate the Asian societies from those in other parts of the developing world including Africa, Latin America and the Middle East. Firstly, political stability and continuity of economic development policy tend to prevail. Secondly, technical innovation is translated into practical activities by a relatively high management capability. Thirdly, people's self-reliance is firmly supported by a sound ethics. Let's call these three characteristics "Asian wisdom".

There is no doubt that the CGIAR contribution to IAR has been outstanding(i.e. green revolution), but it remains to be determined whether the CGIAR alone can continue to bear the ever-increasing burden under its new strategy financially and spiritually. There are other competent IAR Centers, such as the Australian Centre for International Agricultural Research (ACIAR) and Royal Tropical Institute (KIT) in the Netherlands. Most of these IAR Centers are led by "Western logic". However, TARC may have the opportunity to make another breakthrough by integrating its "Asian wisdom" with "Western logic". TARC's immediate target should be to overcome the limitations enumerated above. If and when TARC becomes a full-fledged IAR Center along the line suggested in this paper, I believe that this should be the ultimate goal of TARC for the promotion of international agricultural research in the 21st century.

* Tohoku National Agricultural Experiment Station

TARC RESEAR

《Crop Production》

## Method for the evaluation of drought tolerance in cowpea

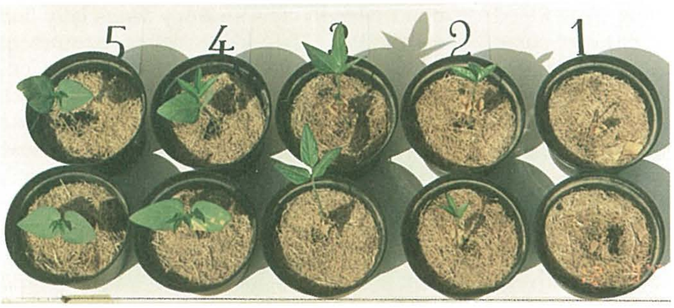
*Iwao Watanabe*

Since cowpea is one of the most drought-tolerant crops, it is widely intercropped with millet or sorghum in the Sudan Savanna of Nigeria. However, due to the erratic rainfall in the area, especially at the beginning and the end of the rainy season, a higher tolerance to drought is needed to secure stable yield and increase the area cultivated with the crop. The development of a convenient and efficient method of evaluation of drought tolerance is a prerequisite for the breeding of drought-tolerant varieties of cowpea. Two methods were tested at the IITA Kano-Substation which is located in the Sudan Savanna in Nigeria in cooperation with the IITA scientists. It was found that the tolerance which differed widely among the cowpea germplasm samples could be evaluated accurately by growing potted seedlings for about 2 weeks under water stress (3% soil moisture).

In the first step, about 900 cowpea accessions were planted in the field in the dry season for rough screening. To secure germination and early growth, the field was watered every morning as evenly as possible for about 2 weeks. Thereafter, the seedlings were left unwatered until the evaluation which took place at about 3 months after sowing. In this trial, a wide range of drought tolerance was observed suggesting the possibility of breeding tolerant cultivars. Some cultivars died soon after the discontinuation of watering while some were able to grow and develop pods. It was observed that the survival under water stress was largely affected by the comparative tolerance of adjacent lines, due to competition. It was also surmised that the amount of residual moisture may vary depending on the location in the field.

In the second step, therefore, seedlings were grown in small pots where the soil moisture was adjusted every morning and kept constant for some time.

The relationship between the transpiration rate and weight percentage of soil moisture was as follows: (1) The transpiration rate of cowpea leaves was not affected by the soil moisture above a level of about 6% in sandy soils which predominate in the Sudan Savanna. (2) Within a range of soil moisture between 2 and 6%, the transpiration rate showed a linear correlation with the level of soil moisture. (3) Transpiration stopped completely when the soil moisture level was about 2%. Based on this information 3 levels of soil moisture, i.e. 5,3 and 2% were selected for the evaluation of the drought tolerance of the crop. Based on the evaluation made in the previous field trial, 5 groups of cowpea germplasm were selected as experimental materials. The groups ranged from highly tolerant to highly susceptible ones. Each group consisted of 5 accessions, hence 25 accessions in all. Small pots about 10 cm in diameter with 600 g of dry soil were prepared. Each accession was sown in 9 pots and the seedlings were grown with enough water for about 2 weeks. Then they were subjected to water-stress for about 2 weeks under 3 levels of soil moisture, i.e. 5,3 and 2%. Each morning the soil moisture was adjusted using an electric balance so as to reach a fixed level of soil moisture. After the treatment, all the pots were supplied with enough water to enable the plants to recover from drought for 3 days. Then each plant was scored by observation based on the following criteria. Highly tolerant (5): not affected at all; tolerant (4): primary leaf (pl) slightly yellowish, first trifoliate leaf (ftl) not affected; medium (3) :pl. dead, ftl. actively recovering; susceptible (2): pl. dead, ftl. weakly recovering; highly susceptible (1): dead (Figure). The scores were averaged among 3 pots of the same treatment. The variance among the scores for 25 accessions was the largest when the soil moisture level was kept at 3%. The correlation coefficient between the evaluation in the field experiment and that in the pot experiment at a soil moisture level of 3% was highly significant ($r=0.663^{**}$). The highly tolerant accessions failed to develop new leaves under the stress, suggesting that some hormonal control was involved in the adaptation to the stress. The assistance provided by the IITA scientists, Drs. B.B. Singh, P. Claufurd and N.Q.Ng is deeply appreciated.




*Evaluation at a moisture level of 3%, treatment for 2 weeks, 3 days after the supply of enough water for recovery. (Photo by I. Watanabe)*

《Grassland》

## Analysis of rangeland vegetation using remote sensing

*Shigeru Takahata*

In West Asia and North Africa (WANA), many rainfed rangelands are grazed without technical control which results in their gradual degradation. Investigation of range vegetation is the most fundamental approach to the prevention of desertification. The current vegetation monitoring study was conducted on natural grasslands used for grazing trials at ICARDA in North Syria.

Satellite data, LANDSAT 5 TM, were used for this study and processed by the Steppe Information Processing System (STIPS) and ILWIS software produced by ITC (The Netherlands). The exact position of the test site was determined by a global positioning system (GPS) using a satellite signal. Large scale aerial photographs were taken from a balloon at a height of 200m using a radio-controlled camera beside a video-monitoring camera.

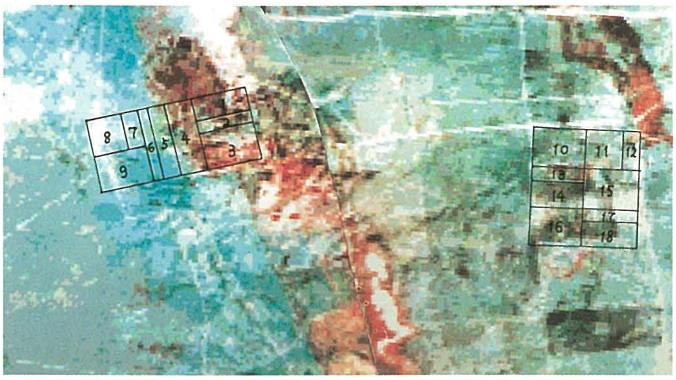
Satellite data were processed to different color imageries which reflected the seasonal and yearly changes of the vegetation. The vegetation index was calculated using the following formula:

$$[((\text{Band } 4 - \text{Band } 3)/(\text{Band } 4 + \text{Band } 3)) + 1] \times 127$$

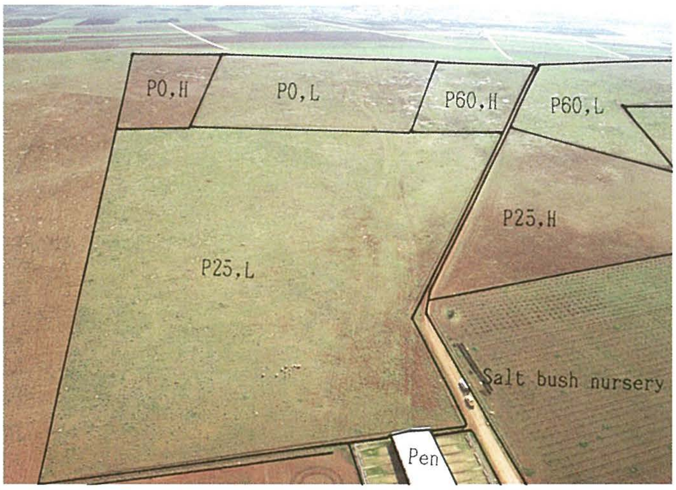
Where Band 4 is the reflectance of near infra-red rays and Band 3 is one of the visible red rays. The vegetation index of the test site was very high in March-April 1990 and in April 1991 and very low in July 1990, reflecting the amount and time of rainfall in the season.

Balloon aerial photographs were taken in the test site to record the distribution of range vegetation. The photographs were analyzed in three primary colors, and the vegetation distribution was derived from the red band photograph using edge enhancement and density slice techniques. The details of the vegetation of the test site were obtained from the ground survey along a transect of 90m. The dominant genera were *Peganum*, *Hordeum*, *Carex* and *Plantago*. The summed dominance ratio ($SDR_2$) was calculated for each genus using plant height and coverage. $SDR_2$ values were indicative of fine topography, where there were playa or depressed areas and hill or mound areas. *Hordeum* predominated on hill sides and *Peganum*, *Carex* and *Plantago* predominated in depressed areas.

Grazing capacity can be estimated from the amount of vegetation in April of the current year. Near infra-red color composite imageries are useful for this estimation. The other factors involved in the estimation of the grazing capacity are the



*Near infra-red color composite satellite imagery, Maragha natural plot. (Photo by S. Takahata)*




*Balloon photograph of the Tel Hadya Grassland Trial. Superphosphate was applied at 0, 25 and 60 kg $P_2O_5$/ha. Stocking rate: L: low (1.2ha/sheep) and H: high (0.65ha/sheep) (Photo by S. Takahata)*

nature of the soil, topography, climate and animal pressure. After acquisition of these data, a bio-mass map will be processed to obtain a grazing capacity map.

《Insect Pest》

## Biotype composition of the brown planthopper populations in and around the Muda area, West Malaysia

K. Ito, T. Wada, A. Takahashi, N. S. Nik Mohd. Noor[1] and H. Habibuddin[2]

The development of host plant resistance is one of the most efficient measures to alleviate insect pest problems in the integrated pest management strategy. The use of insect-resistant rice varieties is an attractive method for farmers to control the brown planthopper (abbr. BPH), *Nilaparvata lugens*, one of the major insect pests of rice, because it is simple and inexpensive in comparison with other methods of control. A large number of BPH-resistant varieties have been bred and distributed in South and Southeast Asia mainly by IRRI. However, some of these varieties lost their resistance within a few years after the introduction due to the appearance of virulent BPH biotypes, or never showed field resistance from the beginning of introduction. This is a serious problem for the use or distribution of

*Honeydew spots on the bromocresol green-treated filter paper. When the honeydew drops on the filter paper, since blue spots appear, it can be distinguished from the plant sap (bottom, extreme right). The excretion of honeydew increases with the increase of the amount of sap that the BPH sucks from the rice plant. (Photo by K. Ito)*

resistant varieties, because it takes a long time (several years or more) to breed a new resistant variety. It is, therefore, important to determine what kinds of biotypes occur in the area before resistant varieties are introduced or what kinds of biotypes are likely to appear after the introduction of the resistant varieties.

Under the collaborative research project entitled "Studies on the Incidence and Ecology of Major Insect Pests in Relation to the Implementation of Rice Double-cropping in Malaysia" between TARC and Malaysian Agricultural Research and Development Institute (MARDI), we analyzed the biotype composition of BPH populations collected in and around the Muda area by comparing the amount of honeydew excreted by the female adults on 5 standard resistant rice varieties; Mudgo (harbouring the resistance gene Bph 1), ASD7 (bph 2), Rathu Heenati (Bph 3), Babawee (bph 4) and TNI (lacking resistance genes). We adopted the bromocresol green treatment method to detect the amount of honeydew. A total of 12 populations collected between July, 1989 and July, 1990 was examined.

Most populations showed a similar trend regardless of the collection sites or crop seasons. Average amount of honeydew excreted was the largest for TNI compared with other resistant varieties except for one case. Among the 4 resistant varieties tested, a relatively larger amount of honeydew was excreted on ASD7 followed by Mudgo, while the excretions on Rathu Heenati and Babawee were small. These results indicate that the BPH populations in and around the Muda area consist of a mixture of biotypes: some insects are able to attack the varieties harbouring Bph 1 and and/or bph 2 genes, though the extent of virulence is limited.

1) MARDI Alor Setar Station, Alor Setar, Kedah, Malaysia.
2) MARDI Rice Research Center, Seberang Perai, Penang, Malaysia.

*Adults and nymphs of the brown planthopper attacking rice (Photo by R. Kishimoto)*

**Identification, distribution, life cycle and control of Echinochloa weeds in Peninsular Malaysia**
(continued from p. 3)

One thousand seed weight of *E. oryzicola* was twice as large as that of the *E. crus-galli* complex. *E. oryzicola* can also be distinguished from the Malaysian populations of *E. crus-galli* by the shape of the first empty glume (see photo on page 8). All the Malaysian populations showed an F-form (in which the lower lemma is flat and coarse). The chromosome number of *E. oryzicola* is 2n=36. *E. colona* was observed in dry-seeded fields, levees and waste lands at higher elevations. One thousand seed weight of the species was lighter than 1.2g.

Differences between the following two species of perennial barnyardgrass had not been studied and the chromosome numbers have not yet been determined. Some external characters of the plants, such as stems, leaves, panicles and seeds were so similar that it was impossible to distinguish one from the other. Plants with large stems. leaves and panicles were designated as *E. stagnina*, while those with smaller corresponding characters were designated as *E. picta*. Seeds of *E. picta* were wider than those of *E. stagnina*. One specimen of *E. picta* collected from an experimental field in MARDI Alor Setar, Telok Chengai, Alor Setar did not have ligules or flag leaf but only basal leaves.

**Distribution and habitat**

The *E. crus-galli* complex is distributed in all the areas under direct seeding culture and seriously competes with rice especially in the Muda, Seberang Perai and Barat Laut Selangor areas. *E. crus-galli* var. *crus-galli* was dominant in the whole Muda area, while the var. *formosensis* was dominant in the Seberang Perai area. However, the two varieties were found in both areas in a field. The reasons for the difference in the distribution of the two varieties are unknown. *E. oryzicola* was distributed in Seberang Perai and the Muda area. *E. oryzicola* was first reported in Peninsular Malaysia. The two perennial species were distributed in a limited area and are not causing severe damage presently in the Muda area. *E. colona* is mainly distributed in fields with upland rice and dry-seeded rice.

**Ecological characteristics**

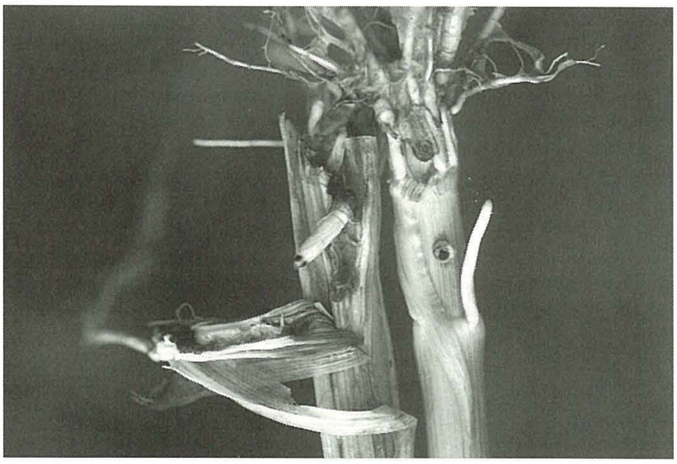
The heading time of *E. oryzicola* was later but that of *E. colona* was earlier than the heading time of both varieties of *E. crus-galli*. Seed longevity of the *E. crus-galli* complex in Malaysia may be shorter than that in the temperate region. *E. crus-galli* var. *crus-galli* showed a reduction in the germination rate when they remained buried in inundated soil up to three months. Untreated seeds of the var. *formosensis* showed a low percentage of germination. When the seeds were buried in inundated soils, a similar trend of germination was observed. The two perennial species responded weakly to short day.

**Control of weeds**

Annual barnyardgrasses can be controlled by timely application of herbicides to soil (ex. propanil, molinate, pretilachlor, benthiocarb). All the annual grassy weeds and some of the perennial grasses can be controlled by fenoxaprop-p-ethyl, which is highly toxic to rice plants if it is applied before 25 days after sowing or before the plant height reaches 20cm.

In Malaysia, the seeds of *E. stagnina* and *E. picta* are sterile, due to the lack of dehiscence of the anthers. Vegetative reproduction of both species depends on propagation by sprouting of the axillary buds from stolons and fragmented culms. A laboratory study revealed that the buds of *E. stagnina* sprouted readily on moist soil surface. However, the buds failed to sprout when they were fully submerged or buried in puddled soil. Hence, soil puddling after rotavation may enable to control the spread of *E. stagnina* under wet-seeding conditions.

A stemborer species (*Emmalocera* sp., Lepidoptera, Pyralidae) which feeds only on the *E. crus-galli* complex, *E. oryzicola*, *E. stagnina* and *E. picta* has been discovered. Also a planthopper (*Sagatodes pusana*) which feeds only on the *E. crus-galli* complex has been observed. Further studies on the use of these insects for the biological control of barnyardgrass should be carried out.



Larvae of a stemborer (*Emmalocera* sp.) attacked young stem of *Echinochloa crus-galli*.
(Photo by K. Ito)

## LETTER TO THE EDITOR

Dr. Ottmar Welker, Research Associate, University of Hohenheim, Stuttgart, Germany, who was awarded a one year fellowship by the Japan-German Center, Berlin, to carry out studies in Japan contributes a letter to the Editor, as follows:

I am currently carrying out studies entitled: "Surface Structure of Leaves in Heat-Tolerant Plants" which are closely associated with the research Project on the "Physiological Approach of Heat Tolerance of Plants", one of the research themes to be taken up in the TARC's Visiting Research Fellowship Program scheduled to start in October 1992 at the Okinawa Branch of the Tropical Agriculture Research Center (TARC) in Ishigaki island. My investigations deal with morphological and physiological characteristics of three cabbage varieties, including the Japanese heat-tolerant cultivar "Sousyu", growing at three different temperatures in growth chambers in collaboration with Dr. Furuya, Senior Researcher, Laboratory of Crop Introduction and Cultivation, Okinawa Branch of TARC.

I arrived in Japan on March 30,1992 and from April 1 until April 5, I stayed at Tsukuba. I had the opportunity of visiting the Headquarters of TARC in Tsukuba, where I met the Director General, Dr. Shinya Tsuru as well as Dr. Y. Ohno, Director of the Research Information Division, Dr. N. Murata, Director of the Eco-Physiology Research Division, Dr. T. Yamashita, Head of the International Relation Section and other members of the Center who introduced the major activities of the Center. Thereafter I visited various laboratories at the National Agriculture Research Center and National Institute of Agro-Environmental Sciences where I held fruitful discussions with scientists engaged in studies relevant to my field of research, including measurement of leaf transpiration, plant biomass, photosynthetic activity, breeding of crop varieties for heat tolerance, effect of water stress on crop growth and uptake of water and minerals, etc.

On April 5, I proceeded to Ishigaki and I was struck by the beauty of this subtropical island whose environment is suited to research on agriculture and horticulture under natural conditions.

The TARC Okinawa Branch is located in a plain on the island and it covers a large area. The research facilities are well developed and suitable for sophisticated research including biochemical studies requiring the use of Thin Layer Chromatography (TLC), High Performance Liquid Chromatography (HPLC), Mass Spectrometry, Nuclear magnetic Resonance Spectrometry or morphological investigations (transmission and scanning electron microscopy), experiments under controlled environments (growth chambers), etc. The equipment which I need for the studies I am carrying out is available, namely transmission and scanning electron microscopes as well as a porometer to measure stomatal conductance, stationary URAS and portable gas analyzer for the determination of gas metabolism.

I very much enjoy working at Ishigaki where the living conditions are pleasant and the people very friendly.

## TARC Annual Research Meeting 1991

The 1991 (fiscal year) Annual Research Promotion Meeting on Tropical Agriculture took place at TARC Headquarters in Tsukuba on 25-26 February, 1992, with the participation of the representatives from the Agriculture, Forestry and Fisheries Research Council Secretariat, Economics Bureau, National Agriculture Research Center, specialized institutes which are engaged in fundamental research for the development of agricultural technologies (Agro-biological resources, Agro-environmental sciences, Animal husbandry, Grasslands, Fruit trees, Vegetables & Tea, Agricultural engineering, Agricultural economics, Sericultural & Entomological sciences, Animal health, Food products, Forestry), Regional Agricultural Experimental Stations, and TARC staff members. At the meeting, TARC activities are elaborately reviewed each year, by exchanging information, evaluating the projects and proposals, etc.

(1) All the activities of the Tropical Agriculture Research Program were reported and evaluated, with emphasis placed this year on the eco-physiological studies and collaborative research on vegetables and rice improvement implemented at the Shanghai-Guangzhou and Yunnan Academies of Agricultural Sciences, China.

As for the eco-physiological studies, the promotion of cooperation with related institutes in Japan and developing countries, as well as International Research Centers under the CGIAR was discussed.

As for the research activities for vegetables and rice improvement in China, the results obtained during a period of 5 and 10 years, respectively, were given high marks and a revised outline of research projects pertaining to vegetables and rice improvement for 5 more years was approved.

(2) Among the research achievements, those deemed most important after detailed evaluation were as follows: ①Immunoassay of rice viruses, ②Tropical agriculture information system using optical disc, ③Bio-types of brown planthopper, ④ Cultural control of root-knot nematodes, ⑤Boron deficiency of garlic, ⑥Nitrogen dynamics of soil under no-tillage practice, ⑦ New technology for rice direct seeding, ⑧Ecology of barnyard grass, ⑨Soybean-rhizobium symbiosis, ⑩New virus diseases of sweet potato, ⑪Drought tolerance of cowpea, ⑫Decomposition of tropical peat, ⑬Remote sensing for tropical grasslands, ⑭ Green manure application to Okinawa soils, ⑮Use of seed pellets in Okinawa pastures.

(3) The initiation of 4 projects was approved: vegetables and rice improvement as mentioned above; development of a new breeding technology for wheat and environmental adaptation of *Vigna* crops. The TARC Visiting Research Fellowship Program scheduled to start at the Okinawa Branch of TARC in October 1992 was presented. The 4 research themes to be implemented were outlined along with the present situation of the preparations for the reception of the candidates (construction of new facilities, acquisition of new instruments, accommodation, etc.)

(4) The main research problems related to agricultural conditions in several developing countries were presented by 6 research coordinators for information in the presence of the directors of the Research Divisions and Director-General of TARC. It was decided that the information collected will be used for the planning of new projects by TARC.

(5) Security problems were discussed in relation to the countries where collaborative research projects are currently being implemented or for the selection of countries where new projects are scheduled to be initiated.

## Database Development in TARC — Research Information Division —

The Tropical Agriculture Research Center dispatched a total of 222 researchers to the tropical and subtropical countries last year on a long-term basis, short-term basis or for surveys. TARC also promotes exchanges of staff with other national agricultural experiment stations to upgrade its research capability.

Researchers transferred to TARC can obtain rapidly information pertaining to tropical agriculture by using databases stored at the Division.

To construct the databases, TARC's original information is collected and compiled for further uses:

The Research Information Division is responsible for the construction of the following data bases:

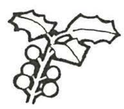
1. TROPIS (Tropical Bibliographic Information System) which refers to the following publications.

①JARQ (Japan Agricultural Research Quarterly), ②TARS (Tropical Agriculture Research Series; (Proceedings of International Symposium on Tropical Agriculture Research), ③Technical Bulletin of TARC, ④Technical Documents of TARC (In Japanese), ⑤Tropical Agriculture Technical Series (In Japanese), and ⑥Research Reports on Tropical Agriculture (In Japanese)

2. TROSIS (Tropical Slide Information System) which consists of a compilation of slides and slide information relating to tropical agriculture.
3. TRODIS (Tropical Agriculture Research Optical Disk Information System) which is a text-digitizing information system with higher filing capacity of laser disk especially on gray literature relating to tropical agriculture.
4. Others

These databases are constructed on personal computers using card type database software with continuous data input.

These databases have also been connected to EWS 4800/35 which is the host station of local area network (LAN) in TARC. Researchers can retrieve needed information through personal computers connected to the LAN station, by accessing to the databases by the network file system. Also, researchers from the Okinawa branch can access the databases using a telephone line. A digital data communication line with a higher speed will be available in two to three years.



**Japanese Working Days and Holidays**

1. Working Days: From Monday to Friday
2. Holidays: Saturday and Sunday, and the following National Holidays and Annual Events.

| Month / Day | Events |
|---|---|
| *Jan. 1 | New Year's Day (Shogatsu) |
| *Jan. 15 | Adult's Day (Seijin-no-hi) |
| *Feb. 11 | National Foundation Day (Kenkoku Kinenbi) |
| *Mar. 21 | Vernal Equinox (Shubun-no-hi) |
| *Apr. 29 | Green Day (Midori-no-hi) |
| *May 3 | Constitution Day (Kenpo Kinenbi) |
| *May 5 | Children's Day (Kodomo-no-hi) |
| *Sep. 15 | Respect for the Aged Day (Keiro-no-hi) |
| *Sep. 23 | Autumnal Equinox (Shubun-no-hi) |
| *Oct. 10 | Sports Day (Taiiku-no-hi) |
| *Nov. 3 | Culture Day (Bunka-no-hi) |
| *Nov. 23 | Labor Thanksgiving Day (Kinro Kansha-no-hi) |
| *Dec. 23 | The Emperor's Birthday (Tenno Tanjobi) |
| Dec. 29 – Jan. 3 | New Year's Holiday |

(Remarks)
1. *: National Holiday
2. When a national holiday falls on Sunday, the next day is a holiday.

## Collaborative Research Programs of TARC and IRRI

*Ryoichi Ikeda*

The International Rice Research Institute (IRRI) is close to the University of the Philippines at Los Banos, about 60 km southeast of Manila. IRRI is one of the 17 international research and training centers supported by the Consultative Group on International Agricultural Research. The goal of IRRI is to improve the well-being of present and future generations of rice farmers and consumers, particularly those with low incomes. The objectives are to generate and disseminate rice-related knowledge and technology of short and long-term environmental, social, and economic benefit, and to enhance national rice research systems.

The Tropical Agriculture Research Center (TARC) has sent 17 Japanese scientists to IRRI since 1968, including one scientist before it was offically established as such. Six were IRRI international recruited staff (IRS) and 11 were visiting scientists. Three scientists are currently IRS at IRRI.

As an important example of the collaborative research program between TARC and IRRI, the studies on cultivar resistance to rice bacterial blight (BB), were initiated in 1979. At that time, since the rice cultivars and BB races used as differentials in Japan and at IRRI were different, the two groups of scientists found it difficult to identify resistance gene(s). To define the relationship between the virulence of the BB races and the resistance of rice cultivars to the races, it was necessary to compare and analyze the results of both sets of studies.

The IRRI-MAFF joint program for research on BB resistance started in September 1982. Since December 1984, the program has been included in the IRRI-Japan Special Collaborative Research Project "Low-input Cultivation Technology under Irrigated Conditons". Japanese and IRRI differentials were tested for BB resistance to Japanese races and isolates collected from Asian countries at TARC, and to Philippine races at IRRI.

Three TARC scientists joined the project: a plant breeder and a plant pathologist at IRRI and a plant pathologist at TARC. Races from Japan and other Asian countries were inoculated in an isolation greenhouse at TARC.

The BB resistance genes identified separately in Japan and at IRRI were analyzed, and rearranged as Xa-1 to Xa-2 genes. Near-isogenic lines for developing international differentials for BB resistance were bred with three genetic backgrounds: IR24, Toyonishiki, and Milyang 23.

A plant physiologist, – also through the IRRI-Japan Special Collaborative Research Project – worked as an IRS at IRRI on the nutritional aspects of rice grain yield emphasizing nitrogen (N) research in topics such as N absorption pattern in the tropics and varietal differences in N response in relation to growth duration and in N absorption at early growth stage. He showed that direct seeding of early maturing varieties is a prerequisite for increasing the N use efficiency of rice in the tropics.

The IRRI-Japan Special Collaborative Research Project was completed on 30 Nov. 1989. The second project, entitled "The Development of Stabilization Technology for Rice Double-Cropping in the Tropics", began on 1 Dec. 1989. Two TARC scientists are working under this project as IRS. A plant physiologist conducts morphological, physiological, and ecological studies on irrigated rice for direct seeding cultivation. Research topics include screening for suitable germplasm under anaerobic conditions, effect of seed vigor on yield potential of direct-seeded varieties with very early maturity, yield potential of new rice plant type characterized by low tillering and panicle weight type, and hybrid rice with special reference to root growth and adaptability to direct seeding.

*Kenzo Hemmi Laboratory. (Photo by R. Ikeda)*

A breeder is studying the genetics of resistance to tungro disease under the same project. Tungro is one of the main factors responsible for the instability of rice yield in the tropics. Research objectives aim at the following: analysis of the inheritance of resistance to tungro, development of isogenic lines with resistance genes, selective screening of the wild rice accessions at the International Rice Germplasm Center for resistance to tungro, and identification of useful genes for tungro resistance in rice subjected to mutation treatment.

Another TARC scientist, working as an IRRI plant pathologist, is trying to solve the problem of rice virus diseases – particularly tungro. His research focuses on general aspects of tungro, including virus strain diagnostic techniques, host plant resistance, and the virus-vector relationship.

Other IRRI-Japan collaborative projects include the IRRI Office and Library branch in Japan, IRRI-Japan seminar, and shuttle research. The IRRI-Japan Office and Library Branch are located at TARC headquarters, Tsukuba. Dr. Himeda, director of the Japan Office, is in charge of communication liaison between IRRI and research institutions and universities across Japan. The Library Branch was set up soon after IRRI's establishment to collect the rice literature published by Japanese scientists. The Library issues a biannual listing of the Japanese rice literature in Japanese and English.

*Crop establishment of variety (left) tolerant to submergence is better than that of nonresistant variety (right) when ten germinated seeds were sown in soil at a 1.5 cm depth. (Photo by R. Ikeda)*

Seven IRRI-Japan seminars have been held in Japan since 1980 to exchange information and discuss research topics of common interest. Topics included Japan's role in tropical rice research, biotechnology and plant breeding, collection and utilization of rice germplasm for insect and disease resistance, rice insect pest control, role of organic matter in paddy soils, development of physiological characters for high-yielding rice varieties, and rice grain quality.

Japanese scientists study rice under tropical conditions at IRRI – using IRRI facilities and human resources – through the Shuttle Research Project. IRRI scientists use advanced research facilities and technology at collaborating Japanese research institutions. The project includes Ph. D. dissertation works at IRRI for Japanese graduate students. Eight activities are under way in this project. Of these, "Indexing rice yellow dwarf pathogen by nucleic acid hybridization based assay" has been carried out in collaboration between a TARC scientist and an IRRI Japanese scientist.

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*Echinochloa oryzicola (large seeds) and E. crus-galli var. formosensis (small seeds). (Photo by K. Ito)*

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