ISSN 0919-8822
February 2015
No.73

JIRCAS Newsletter for INTERNATIONAL COLLABORATION

Rural life in Burkina Faso, West Africa (Photos by S. Muranaka, S. Hirouchi and F. Nagumo)

In This Issue

JIRCAS
JAPAN INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES

Tight Collaboration with the Upright People of Burkina Faso

Burkina Faso in West Africa is a rather small country with a population of 17.5 million. It is one of several African countries comprising the Sahel Region — a flat, transitional zone bordered by the Sahara Desert to the north and the savannas to the south. With up to 80% of the population engaged in the agricultural sector, the government aims to accelerate economic growth through agriculture development.

"Burkina Faso" means "land of the upright people." As a nation, Burkina Faso is recognized as friendly for its supportive stance on Japan's policy positions in the international arena. As a people, the Burkinabe are diligent and hardworking, and the national cultural characteristics are somehow similar to that of the Japanese, as described in the embassy website by His Excellency Mr. Masato Futaishi, the Japanese Ambassador.

The country is the top cotton producer in Africa and the fourth biggest exporter of sesame to Japan. According to the aid policy for Burkina Faso prepared by the Ministry of Foreign Affairs of Japan, production of agricultural products with high export potential should be supported.

The importance of strengthening agricultural resilience in the Sahel was pointed out at the Fifth Tokyo International Conference on African Development (TICAD V) and JIRCAS, for its part, has been conducting several collaborative research studies in the region. Research activities in the neighboring countries of Burkina Faso, such as Niger, Mali, etc., however, have been restricted due to deteriorating public security situation. Consequently, Burkina Faso became an important and principal partner in conducting research on agricultural development in the Sahel. The number of duty travels to Ghana, where JIRCAS's overseas liaison office in Africa is located, is the highest among African countries. Reflecting these changes, Burkina Faso took over as the second most visited country since 2013. (It used to be Niger until 2012).

Currently, we have the following research projects in Burkina Faso: 1) Conservation agriculture in the African savanna, 2) Rural development through efficient utilization of local resources, 3) Improvement of cowpea quality for further value-addition, and 4) Improvement of micro reservoir technologies for the enhancement of rice production. Other than these, we are also conducting a feasibility study on the use of locally produced rock phosphate as fertilizer and a survey on the improvement of animal product value chain. In this context, the importance of Burkina Faso as a research partner is expected to increase further.

Under these circumstances, a symposium entitled "International Collaborative Research of Japan for Sustainable Agricultural Development in Burkina Faso" was held on Sept. 16, 2014 at Splendid Hotel, Ouagadougou, Burkina Faso, in order to promote JIRCAS's research activities and to discuss further collaboration with various stakeholders, with the strong support of the Institute of Environment and Agricultural Research (INERA), the Japan International Cooperation Agency (JICA) as well as the Embassy of Japan in Burkina Faso. From the Japanese side, Dr. Masa Iwanaga (JIRCAS President), Mr. Futaishi (Japanese Ambassador), and Mr. Takumichi Morishita (Chief Representative of JICA), and from the Burkina Faso side, Mr. Salif Ouédraogo (Minister of Environment and Sustainable Development), Dr. Compaore R. A. Maxime (Secretary General, Ministry of Scientific Research and Innovation), and Dr. Hamidou Traoré (Acting Director of INERA), participated in the symposium. The highlights of the symposium were televised in news programs and the story was picked up by several newspapers in the country.

Prior to the symposium, a Memorandum of Understanding aimed at expanding collaborative research between JIRCAS and INERA was signed by JIRCAS President Masa Iwanaga and INERA Director Francois Lompo.

Although the distance between the two countries is relatively far, international exchanges have developed and relations have deepened through research collaborations for agricultural development. It is said that the Sahel is vulnerable to climate change, thus stable food production in the region is imperative for the stabilization of regional security. JIRCAS would like to contribute through collaborative research so the upright people may achieve sustainable agricultural development and be able to cope with extreme weather events and desertification due to climate change.

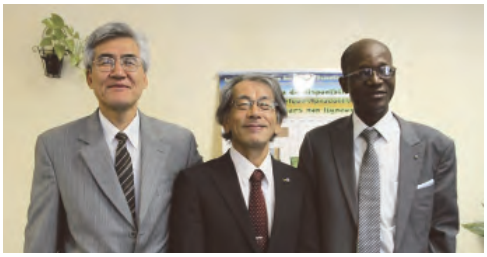

Photo 1. His Excellency Mr. Masato Futaishi (Japanese Ambassador to Burkina Faso), Dr. Masa Iwanaga (JIRCAS President), and Mr. Salif Ouédraogo (Minister of Environment and Sustainable Development, Burkina Faso)

Photo 2. Signing ceremony of MOU for research collaboration between the Institute of Environment and Agricultural Research (INERA), represented by Dr. Francois Lompo, Director of INERA, and JIRCAS, represented by Dr. Masa Iwanaga, President of JIRCAS

Tomoyuki Kawashima
Program Director
Environment and Natural Resource Management
JIRCAS

Development of a 'Conservation Agriculture'-based Cropping System in Burkina Faso, West Africa

Rainfed upland cropping is a major agricultural production system widely practiced by farmers around the world. However, crop yields vary according to rainfall; therefore, cropping techniques that can overcome unstable rainfall conditions are highly necessary. In view of the situation, the Food and Agriculture Organization of the United Nations (FAO) and several other international agricultural research organizations strive to promote conservation agriculture (CA) in developing countries.

According to FAO, CA is "a concept for achieving sustainable and profitable agriculture." It has three key principles: 1) cropping under non-till or minimum tillage to achieve minimum soil disturbance, 2) mulching the soil surface with crop residue or organic materials, and 3) diversifying cropping pattern by intercropping, crop rotation, or relay cropping. Through efficient rainfall use and soil conservation, this combination of technologies referred to as CA is expected to help improve agricultural production.

JIRCAS has launched a project (now on its fourth year) focusing on the development and evaluation of CA-based cropping systems in West African savannas (from Ghana to Burkina Faso) where climatic conditions are different. On the occasion of the signing of a Memorandum of Understanding with our partner, the Institute of Environment and Agricultural Research (INERA), I wish to present the project's current progress in Burkina Faso.

Burkina Faso is a small country located at the southern ridge of the Sahara desert, with a total land area of 274,200 km^2 and a population of 17.5 million, 80% of whom are engaged in agriculture. The annual rainfall in the study area is 800 mm, and the yields of main food crops such as sorghum and millet have remained low at under 1 ton ha^{-1} due to low inherent soil fertility as well as uneven rainfall distribution.

Adopting conservation agriculture in low rainfall areas is considered difficult because land cultivation is an important factor. Moreover, the soils in the study area are vulnerable to crust formation, which significantly reduces rainfall infiltration. Therefore, it is believed that tilling the topsoil makes it soft and increases the number of macropores, thus ensuring availability of soil moisture at least in the initial cropping period.

An assessment of cropping system history in the area revealed that, until the 1960s, most farmers sowed crops without cultivating the soil. But, in the 1960s, animal traction for plowing was introduced, making it easier to build ridges and increase the cropping area. This method has since become the most popular cropping practice. This historical information, however, also suggests that cultivation is not necessarily essential for cropping.

We are currently evaluating cultivation methods using combined treatment, i.e., partial tillage (furrowing along sowing line) + soil mulch by crop residue + intercropping of leguminous crops. First-year results showed that partial tillage + residual mulch treatment reduced rain water runoff to 72% while soil erosion decreased to 50% compared with conventional cultivation. In the second year of the experiment, sorghum growth by conventional cultivation worsened, especially upslope probably due to soil erosion, a phenomenon that we did not observe in the first year. Sorghum and pigeon pea intercropping (alley cropping) was highly effective in improving sorghum yield in the second year (yield survey is ongoing) through soil turnover. On the other hand, the high mortality rate at germination period was high due to insect damage probably caused by insects hiding under the residue mulch. This was identified as the most critical problem, and we are now looking for countermeasures.

We have also established an on-site demonstration plot so the farmers can evaluate the proposed cropping system and give their opinions on how to improve it. Evaluation after the first year revealed that the farmers preferred hole planting (planting seeds in a hole provided with compost -- locally called "Zai"), followed by partial tillage planting with residue mulch (+ pigeon pea intercrop), and lastly, conventional planting with tillage. They opined that since hole planting is labor-intensive, partial planting may also be applied if there are no other problems. Since it was only the first year of trial, the effects of pigeon pea alley were not yet observed. I look forward to hearing the farmers' evaluation next year.

Meanwhile, I have realized the limitations of this kind of research. The actual research aims to improve crop yield, reduce rainwater runoff, and control soil erosion in the field. However, there are lands whose surrounding areas have different characteristics, and the proposed cropping system is not always adaptable to all land types. In the study area, a rainfall amount of 20 to 30 mm could generate overland flow. Water then flows along road ditches and gullies and into the river. Finally, turbid water flows uselessly downstream. This occurrence can be attributed to the high rainfall intensity, lower water storage capacity of the watershed as a whole, and to higher rainwater runoff rate because of soil crust formation. This tends to shorten the life of dams downstream. We are also concerned that extreme events (droughts as well as heavy rainfall) related to climate change may occur more frequently, accelerating this trend. Consequently, we will continue our efforts on conservation agriculture research for extension. I

believe that we need to scale up the target area to include the whole watershed and to establish an optimal land use system so we can devise ways to increase rainwater use efficiency.

Fujio Nagumo
Crop, Livestock and Environment Division

Photo 1. Soil erosion experiment on sloping plots (left: partial tillage + residue mulch; right: full tillage + residue removal). Lower plant growth is obvious at upslope full tillage treatment plot probably due to higher soil erosion rates.

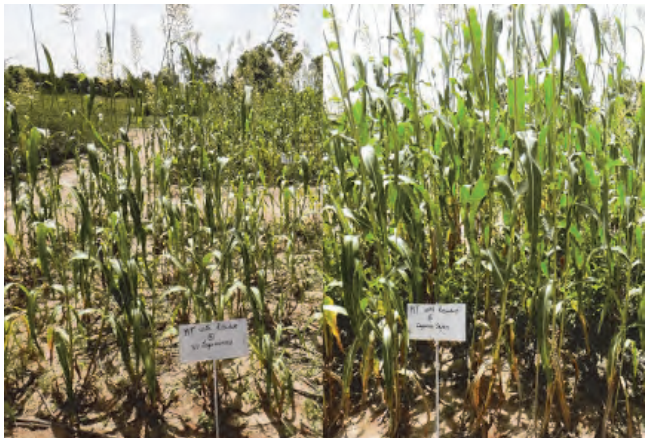

Photo 2. Leguminous intercrop experiment (left: sorghum monocropping; right: pigeon pea intercropping). Growth at pigeon pea intercrop plot is remarkably higher.

Photo 3. Exchange of opinion with farmers

Photo 4. Floodwaters inundate roads and lowlands after a rainfall event (July 2012)

Establishment of Methodologies for Low-Carbon Rural Development through Efficient Utilization of Local Resources

Introduction

Life is tough in Burkina Faso. Nearly half (44.6%) of the people live on less than USD1.25 a day, and 80% of the whole population remain in rural areas. The nation's key industry is agriculture, and although more than 80% of the labor force is engaged in agriculture, it only contributes 33% of gross domestic product (GDP). On the other hand, agricultural activities constitute 72% of GHG emissions in Burkina Faso.

In this regard, a project aimed at solving constraints in rural areas through effective use of local resources is being developed. Efforts are being made to ensure that it will be as climate-friendly as possible.

Methods

In line with the project objectives, the following activities were outlined.

(1) Identification of constraints in the village and selection of research activities

(2) Verification surveys on the research activities

(3) Monitoring and evaluation through estimation of emission reductions

Results

Farmer participation through workshops in selected villages enabled the identification of main constraints and the formulation of possible countermeasures. One of the main constraints was decreasing vegetation, and the project addressed this by setting three activities: 1) the use of improved cook stoves (ICS), 2) reforestation and agro-forestry, and 3) water use and photovoltaic power generation. Verification studies have been conducted and the results and progress are detailed as follows.

1) Use of improved cook stoves

International aid agencies have been distributing earthen ICS for thirty years, but actual data related to ICS dissemination were not available. The appropriateness of the selection standard for earthen ICS was unclear when it was introduced in the rural areas, and it was assumed to be the reason why the use of earthen ICS was not popular. The activity, therefore, attempts to establish a new selection standard and verify the possibility of implementing an effective ICS dissemination method using this new guide.

Results of a fact-finding survey showed that earthen ICS do not last long. It also revealed that earthen ICS make up less than seven percent of current cooking appliance use, confirming that ICS use was not popular.

Disincentives of ICS dissemination were analyzed using information gathered from user surveys. Results showed that the use of earthen ICS was not widespread, and that the strongest disincentive to ICS dissemination (a bigger factor than ICS durability and maintenance issues) was its acceptability to women, who regarded earthen ICS as unclean and not easy to use.

Consequently, a new selection standard will be provided, incorporating the survey findings and emphasizing the reasons for the poor dissemination of earthen ICS. It will also recommend the use of ceramic ICS, which were found to be clearly better at reducing firewood consumption compared with traditional cook stoves.

2) Reforestation and agro-forestry

A reforestation activity aimed at vegetation recovery has been carried out, but reforestation initiatives by the rural population have not yet been launched. On the other hand, there is an indigenous fruit called Nere, which is intimately connected with life in rural areas. It has been used since ancient times, and is processed to produce local traditional food, thus supporting the people's daily lives. With this knowledge, this activity assumes that the utilization of Nere will be able to help motivate the locals to conduct reforestation.

A preliminary survey has shown that planting Nere can serve as an incentive for the population, but its true impacts will only be known after the verification survey.

3) Water use / photovoltaic power generation

Groundwater, a renewable resource, is not easily affected by climate change. However, these water resources are not fully utilized in Sub-Saharan Africa. The volume of extracted groundwater accounts for only two percent of potential or available water, and deep wells have been developed solely for domestic water use.

Accordingly, ways to obtain water under harsh conditions during dry season have been investigated, with water from existing deep wells being considered for multiple purposes. The aim of this activity, therefore, is to develop a stable and sustainable water use system.

It is expected that the results obtained through the implementation of this project will contribute to solving constraints to rural development in areas in Burkina Faso.

※ This project is funded by the Ministry of Agriculture, Forestry and Fisheries of Japan.

Photo 1. Women are preparing firewood as fuel for the ceramic ICS.

Photo 2. Nere seedlings and Burkinabe farmers

Mamoru Watanabe
Rural Development Division

Improving the Livelihoods of Farmers in Dry Regions of Africa via Development of High-Value Cowpea Varieties

There are various challenges facing agricultural development in Africa. One way of overcoming these challenges is through "value addition," which in turn could bolster the livelihoods of small-scale farmers and local consumers as well as activate local economies. Value addition amplifies the key characteristics or features of agricultural products, especially of locally and traditionally important crops that are well rooted in the regional culture, while retaining its role in activating production, marketing, and utilization. We at JIRCAS are focusing on cowpea, one of the most important traditional leguminous crops, for its tremendous potential to enhance food production and economic development especially in drier regions in Africa.

Like legumes in general, cowpea -- with its rich protein and micronutrient content -- can supplement staple crops (cereals and tubers) in providing more nutritionally balanced diets in the region especially because of its high resilience to extremely unstable rainfall and low soil fertility conditions in the drier regions of Africa. It contributes greatly to food security and diet diversity of the African people. Cowpea plays an important role not only as a food crop and nutritional source, but also as a cash income source for the regions' small-scale farmers. According to FAO (2007-2009 data), cowpea generated an estimated 2 billion USD in annual revenue.

JIRCAS, together with the International Institute of Tropical Agriculture (IITA), is implementing a collaborative research project in Nigeria (the world's largest producer and consumer of cowpea) to maximize cowpea's great potential to reduce regional poverty by enhancing the income of farmers and improving the quality of food and nutrition. The Evaluation and Utilization of Diverse Genetic Materials in Tropical Field Crops (EDITS) project, as we call it, will gather basic information and develop technologies to improve cowpea through value addition (EDITS-Cowpea project). To achieve this aim, we need to do the following: 1) identify key characteristics for value addition, 2) select appropriate breeding materials for further improvement, 3) evaluate environmental factors affecting grain quality and its nutritional values, and 4) develop useful techniques for rapid and simple evaluations of grain quality. We also have started collaborative activities and surveys with the Institut de l'Environment et Recerches Agricoles (INERA) in Burkina Faso to further utilize the project outputs.

Cowpea is one of the major export items and source of foreign exchange for Burkina Faso. Large quantities of cowpea grains produced in Burkina Faso are exported to neighboring countries such as Ghana, Côte d'Ivoire and Mali, and even further to Central African countries. Based on our survey at Burkina Faso, each country applies different criteria for selecting varieties to be purchased. For example, cowpea traders in Ghana tend to prefer large white grains while Malian traders have little interest on grain quality. In the near future, along with the expected market expansion and economic growth in Africa, suitable high-value cowpea varieties that meet various demands and preferences of consumers will be required. Therefore, it is quite important to understand existing consumers' preferences in order to develop appropriate and stable production and supply systems that meet the diverse requirements of various import destinations as well as local consumers in Burkina Faso.

In Burkina Faso, activities related to the cowpea breeding program of INERA are carried out to develop improved varieties and crop management techniques. IITA, on the other hand, operates the Appropriate Varieties of Early Maturing Cowpea for Burkina Faso (AVEC-BF) project (funded by the Ministry of Agriculture, Forestry and Fisheries of Japan), which facilitates closer linkage between farmers and breeding program researchers to enhance further development of appropriate cowpea varieties.

Using these existing collaborative frameworks, the knowledge gained from our activities to improve cowpea by value addition under the EDITS-cowpea project will boost the development of varieties that meet both local and international preferences and utilization.

Through multi-party collaboration between JIRCAS, IITA, and INERA, we expect to develop suitable cowpea varieties with better productivity and in accordance with the required quality. We hope that the research outcomes will help promote rural livelihood improvement through enhanced food safety and income generation especially among poor farm households in the regions.

Photo 1.Cowpea field ready for harvesting (Pobe Mengao, Burkina Faso)

Photo 2. Variety of cowpea grains found in farmers' fields (Yako, Burkina Faso)

Photo 3. Cowpea traders packing cowpea grains for export to Côte d'Ivoire (Tifora, Burkina Faso)

Satoru Muranaka
Tropical Agriculture Research Front

Possibility of Rice Dissemination Utilizing Reservoirs in Sub-Saharan Africa -Improvement of Micro Reservoir Technologies for Enhancement of Rice Production in Africa (IMRT for Rice)-

The need for small-scale irrigation facilities

Rice consumption has suddenly increased in Sub-Saharan Africa (SSA). Production, however, has not been able to keep up even as import volume expands every year. Thus, there is an urgent need to plan and expand rice production in the medium and long term.

Rice cultivation in many parts of SSA is rain-fed, but the yields are low and the cultivation areas are not expanding. Moreover, it is predicted that precipitation will decrease and become unstable in the long term (CGIAR). Hence, small-scale irrigation facilities (such as reservoirs) that are not complicated to manage and can flexibly adapt to environmental changes are needed. However, existing reservoirs have not been utilized effectively because of the immaturity of the construction technology, the high cost of maintenance, and the dysfunctional water management organizations tasked to supervise by water user associations.

Current status of reservoirs

Annual rainfall in Northern Region, Ghana is about 1100 mm, most of it occurring from May to October. The remaining months (half of the year) are dry (no rain). Typically, dams are constructed by damming valleys, but not in Northern Region where the topography is flat. Many reservoirs (called dugouts) were introduced in the 1970s. These were constructed by digging the ground and piling up the excavated soil downstream, allowing water to be impounded and secured in the dry season.

Dugouts provide water for drinking, domestic, and livestock purposes. If water disappears in the dry season due to agriculture use, it could turn into a life-or-death situation for the people in the community. Therefore, the use of dugout water for agriculture has been restricted.

(Note) In Burkina Faso, a neighboring country of Ghana, dugout water cannot be used as potable water because there is a bug (Guinean worm) in the reservoir water. Therefore, wells are being developed for drinking purposes. There are some cases, however, where dugout water is used for agriculture.

Possibility of using dugout water for agriculture

Water is a limited resource in SSA; therefore, water from small-scale reservoirs such as dugouts is being considered for supplemental irrigation to increase rice production. Consequently, a study is being conducted in Northern Region where rice production is highest. This study is anchored on 5 pillars, namely:

(1) Selection of appropriate sites for paddy fields: to establish a selection standard or criteria for reservoir size and location

(2) Development of micro reservoir construction technologies: to apply easier and shorter term construction technologies for farmers

(3) Development of water management and maintenance methods: to consider water management techniques with high sustainability

(4) Technology adoption for diffusion: to consider technology adoption taking the socio-economic aspects into account

(5) Verification studies: to confirm the effectiveness of the technology and proposed measures related to water resources development and water management

Conclusion

The study had just commenced in the previous fiscal year. It would be deemed successful if the outcome contributes to the increase of rice production in SSA.

※ This project is funded by the Ministry of Agriculture, Forestry and Fisheries (MAFF, Japan).

Shinji Hirouchi
Rural Development Division

Photo 1. Dugout (Northern Region, Ghana)

Photo 2. Water drawing (Northern Region, Ghana)

JIRCAS TODAY

Prime Minister Abe witnesses signing of MOU on joint research between JIRCAS and INIFAP

Prime Minister Shinzo Abe and Mexican President Enrique Peña Nieto witnessed the signing of a Memorandum of Understanding (MOU) on joint research between JIRCAS and Mexico's National Institute of Forestry, Agriculture and Livestock Research (INIFAP) on 25 July 2014 (Friday) at the Courtyard of Honor of the National Palace in Mexico City. The signing of the comprehensive cooperative agreement on agricultural research was performed by JIRCAS President Masa Iwanaga and Agriculture Secretary Enrique Martinez y Martinez (of the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food or SAGARPA), in accordance with PM Abe's visit to Latin America. Additionally, PM Abe and his delegation, which included JIRCAS President Iwanaga, held a discussion on economic affairs over coffee the following morning.

MOU signing at the Palacio Nacional in Mexico City. (From left: JIRCAS President Masa Iwanaga, Prime Minister Shinzo Abe, Mexican President Enrique Peña Nieto, and Agriculture Secretary Enrique Martinez y Martinez.)

Agricultural Research Institute of Mozambique (IIAM) officials visit JIRCAS

Four executives from the Agricultural Research Institute of Mozambique (IIAM), led by Director General Inácio Calvino Maposse, visited Japan on 17-25 September 2014. Their visit was part of the feasibility study related to the conduct of a joint research, based on a "Memorandum of Understanding" that was signed with JIRCAS on 12 January 2014. The IIAM officials went to Hokkaido and Tsukuba to examine Japanese agriculture and the livestock industry as well as observe ongoing research activities. A seminar titled "Mozambique agriculture and agricultural research by IIAM" was held at JIRCAS on the 22nd, and a discussion setting the joint research agenda was conducted on the 24th. A survey mission to Mozambique is planned as part of future activities.

JIRCAS and JICA officials pose with IIAM executives for a group photo after the seminar.

JIRCAS receives visitors from Vietnam

On 30 July 2014, a representative director of a private Vietnamese company, along with two others, visited JIRCAS. They were shown the introduction video outlining JIRCAS's research activities as well as ongoing projects in Vietnam. They were also given a tour of the shrimp research facility.

National Science and Technology Fair 2014 (Thailand)

On 12-28 August 2014, JIRCAS showcased its research results at the National Science and Technology Fair 2014, organized by the Ministry of Science and Technology of Thailand and held at Chiang Mai International Convention and Exhibition Center (CMICE) in Chiang Mai City, Thailand. The event, whose main activities included product exhibits and seminars, was expected to attract one million visitors. Aside from poster presentations, JIRCAS's display booth at the Japan Pavilion also featured "fragrant rice" varieties (2AP).

Global Festa JAPAN 2014

Global Festa Japan is the country's largest annual international cooperation event. It commemorates the government's designation of October 6th as "International Cooperation Day."

JIRCAS, the sole national institute to undertake comprehensive research on agriculture, forestry and fisheries in developing regions, participated at this year's event, themed "Smile Earth! Planting Seeds for the Future." A display booth was set up, with JIRCAS's research activities and outcomes shown in poster panels. Mini-lectures were delivered and "communication time" allotted to encourage audience participation and exchange of views.

Global Festa JAPAN 2014 took place at Hibiya Park on 4-5 October (Fri-Sat); however, it was cut short on the second day due to stormy weather.

Communication time (Oct 4)

JIRCAS Newsletter
Japan International Research Center for Agricultural Sciences (JIRCAS)

February 2015 No.73
Information and Public Relations Office

1-1 Ohwashi, Tsukuba, Ibaraki 305-8686, JAPAN
Phone: +81-29-838-6708 Fax: +81-29-838-6337 http://www.jircas.affrc.go.jp/