

ICREA

International
Center for Research and
Education in Agriculture

Nagoya University
Japan



Greetings from Director

The International Center for Research and Education in Agriculture (ICREA) was founded with the aim to educate and train people capable of offering practical solutions to issues related to the development of agricultural sciences. Since its foundation, ICREA has been encouraging basic research and overseas field research by creating an international network of researchers. Focus has also been placed on research and education activities aimed at educating and training individuals from both inside and outside the country to solve problems encountered at the actual sites of agricultural production. ICREA obtained its current name 18 years after its foundation, i.e. in April 2018. In the meantime, several new research departments were created, namely "Tropical Bioresources" and "Genetic Information for Bioresources" under the Research and Application Division, and "Practical Studies in Africa" and "Practical Studies in Asia" under the Rural Development Division. The Research and Application Division has the ultimate goal to promote sustainable growth through the development and utilization of local resources and the preservation of the environment that is key to securing such resources. In order to promote mission-oriented international research activities in agriculture and forestry and to focus our efforts on educational activities that are informed by findings from joint international research endeavors, the Research and Application Division has been actively engaged in research efforts to address climate change and rapidly changing social conditions, including the search for and characteristic evaluation of agricultural and forest resources in the tropics, genetic analysis of some useful traits found in biological resources, and research into sustainable agricultural/forest production and effective utilization of resources. The Rural Development Division, on the other hand, works on the development of sustainable and good agricultural/forest production practices in tropical regions of Asia and Africa as well as on the adaptation and dissemination of new resources and technologies, and is focused on research that specializes in the social implementation of research findings. The recently established International Coordination Office, tasked with building an international network of researchers and managing various projects, is focused on promoting collaborations with various organizations within and outside the country, including the Food and Agriculture Organization of the United Nations (FAO), the Japan International Cooperation Agency (JICA), and the Japan International Research Center for Agricultural Sciences (JIRCAS), as well as enhancing our communication capabilities to more effectively reach our audience.

In recent years, an increasing number of people in emerging countries have been seeking variety in food. In line with this, and as an approach to sustainable food production based on the principles of food security and environmental preservation, Field Science plays an increasingly important role in establishing a new technology by integrating the basic findings that have accumulated in developed countries and adapting it for use in emerging countries. We continue encouraging joint international research efforts in the field of international agricultural development. We appreciate your kind understanding and support for our activities, and we invite all aspiring individuals and organizations to join us in our endeavor.



Prof. Hiroshi EHARA
Director
Graduate School of
Bioagricultural Sciences

Background

Many developing countries are still suffering from food shortages, poor agricultural production, poverty, environmental destruction, infectious diseases affecting domestic animals, and other agricultural problems, which are regarded today as serious global issues that need to be addressed. To solve these issues, we need to develop appropriate agricultural techniques by undertaking socio-economic impact assessment and ensuring effective use of natural resources and harmony with the natural environment. In addition, it is equally important to produce high-quality human resources. International cooperation is essential for this endeavor, and Japan is expected to take an active part in it.

This trend was especially strong in the 1990s, when the Ministry of Education, Science, Sports and Culture (equivalent to today's Ministry of Education, Culture, Sports, Science and Technology) set up the Council for Understanding the Latest Forms of International Educational Collaboration. In its report published in June 1996, the Council presented new policies relating to international educational collaboration, highlighting the importance of actively responding to the increasing demand for international cooperation in education, clarifying the important roles played by universities and other related institutions in educational collaboration, and emphasizing the importance of not only promoting collaboration among businesses/institutions but also encouraging educational institutions to take voluntary and organized action to effectively promote educational collaboration.

In April 1999, as part of the governmental efforts to realize these policies, the ICREA (reorganized from the International Cooperation Center for Agricultural Education (ICCAE) in April of 2018) was established at Nagoya University as a center that takes an initiative in training individuals to acquire the ability to find practical solutions to the developmental issues in the field of agriculture, under the supervision of the Ministry of Education, Science, Sports and Culture.

The ICREA has put together the expertise of agricultural universities and other related educational and research institutions in Japan and used integrated multidisciplinary approaches to contribute to the resolution of various agricultural issues in developing countries. Furthermore, the ICREA has been promoting international research and education activities based on the belief that human development efforts should be undertaken both inside and outside the country.

Graduate education

The ICREA is involved in the graduate education programs at the Department of Plant Production Sciences of the Graduate School of Bioagricultural Sciences, Nagoya University. We have instructors with extensive international experience who are committed to preparing individuals for career paths in academia or business where an international perspective is needed. If you wish to study at the ICREA, you should first consult with a faculty member in charge of the laboratory in which you wish to study, and then take the entrance examination for the Graduate School of Bioagricultural Sciences, Nagoya University. Individual consultations for graduate school admissions are available at any time. If interested, please contact us using the email address provided on the last page of this brochure.

Organization and Staff



Research activities

Tropical Bioresources Lab.

International Sago Palm Project for food security improvement

Agricultural food production must increase by 70% globally to feed the world's population that is projected to reach 9 billion by 2050. Faced with increasingly serious challenges to food security, including climate change and diminishing underground resources such as oil and phosphorus, it is more important than ever to improve agricultural production and productivity in a sustainable manner while minimizing post-harvest biomass losses. Our research group is focusing on sago palms that grow naturally in the Southeast Asian and South Pacific regions.

This palm adapts well to infertile, acid soils or brackish-water regions that are generally unsuited for crop cultivation. Additionally, it can store about 300 kg of starch in its trunk. Sago is a staple food for local residents, and is also used in food products like biscuits and noodles. In Japan, sago starch is used for dusting when making udon, as an ingredient in allergen-free or hypoallergenic foods, and as a substance capable of suppressing post-meal glucose spikes. With only 10% of wild and semi-cultivated sago palm stands currently harvested, there is significant potential for further exploitation of this economically valuable plant.

Our laboratory is committed to developing stable cultivation techniques for sago palm by elucidating the mechanisms underlying its environmental stress tolerance, enabling efficient seedling production, and utilizing useful microorganisms such as nitrogen-fixing fungi and mycorrhizal fungi.

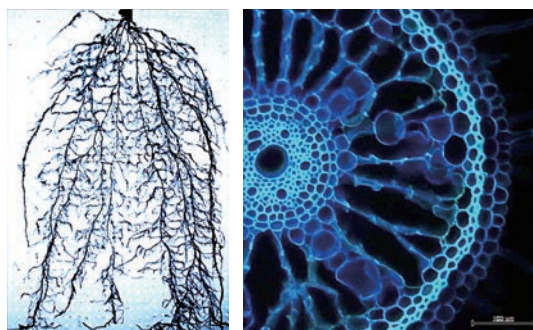


Survey conducted at the Sago Palm Pilot Farm located in Southeast Sulawesi, Indonesia.
(Hiroshi EHAHRA)

Evaluation of root adaption to soil environments with water and nutrient stress in rice

To establish stable and sustainable crop production under unfavorable soil environments is an important issue. As a trait related to crop stress tolerance, in recent years attention has been focused on root traits, which have been retrenched requiring a great deal of time and effort. The root system architecture and anatomy change in response to changing soil environments. We are undertaking research on root system structure and its physiological function for adaption to soil environmental stress such as drought and nitrogen deficiency, mainly focusing on rice. We are also investigating the methods for evaluating root traits from hydroponic conditions to soil culture conditions using root box and tubes.

(Mana KANO-NAKATA)

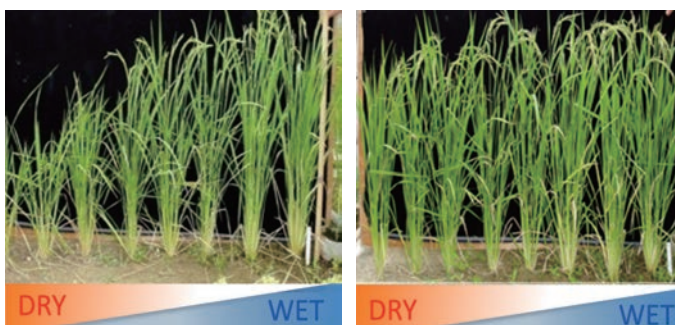


Overall view of the rice plant's root structure (left) and microscopic view of the transverse section of a rice plant's root.

Genetic Information for Bioresources Lab.

Elucidating the environmental stress avoidance mechanism in plants

Under drought stress conditions, plants expand their root zones to increase water absorption in an attempt to maintain their above-ground growth. However, the capability to maintain the above-ground growth in drought conditions varies significantly across different plant varieties. For example, some rice varieties experience significantly compromised growth, while others maintain relatively better growth of their above-ground parts, as shown in the photographs to the right. We have initiated research to elucidate the genetic mechanisms underlying the variation in drought avoidance capabilities among different rice varieties and are, albeit gradually, beginning to discover some of the loci that may be key to developing drought-resistant varieties.

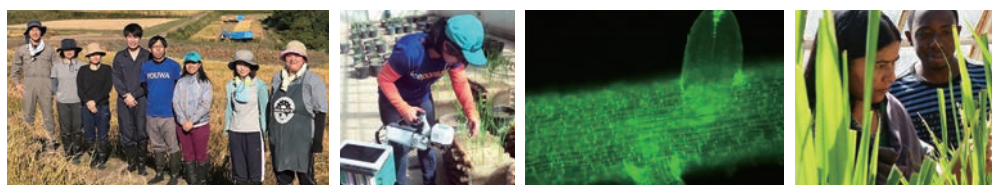


Differing drought avoidance capabilities observed in different rice varieties.
(Left) Variety with lower drought avoidance capability,
(Right) Variety with higher drought avoidance capability.

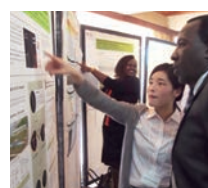
Genetic improvement of rice to secure stable rice production in unfavorable environments.

In addition to the conventional cross breeding and mutation breeding technologies, novel breeding techniques, such as quantitative trait locus (QTL) analysis (which identifies QTLs associated with stress tolerance) and marker-assisted selection (MAS) (which can quickly and accurately identify the presence of a specific quantitative trait locus) are now available to breed improved rice varieties with a greater efficiency, thanks to the recent research advancements in the field of agricultural sciences. Novel techniques, such as next generation sequencing (NGS) (which quickly and inexpensively provides genome-wide genetic information on living organisms) and new plant breeding techniques (NBT) (new approach to genome editing) have also been developed. We are using these technologies to achieve genetic improvement of rice with the goal of securing stable rice production in unfavorable environments.

(Yoshiaki INUKAI)



Growth inhibition of rice under unfavorable environments



Research activities for development of new rice varieties with tolerance to environmental stresses

Practical Studies in Africa Lab.

Improvement of rice productivity under environmental stress conditions in Africa

In many sub-Saharan African countries, it is fundamental to boost rice production because the increased rice consumption exceeds the growth in domestic rice production. However, rice yields in sub-Saharan Africa have remained low due to various biotic and abiotic stresses. The Laboratory of Practical Studies in Africa is making comprehensive efforts to increase and stabilize rice yield under such unfavorable environments. Our research activities include development of new varieties suitable for the local environments, evaluation of gene-expression and local adaptability of rice varieties carrying useful genes/QTL, development of cultivation technologies to maximize the potential of rice varieties, elucidation of socio-economic conditions for technology dissemination.

<https://rice-africa.agr.nagoya-u.ac.jp/>



Cold weather damage on rice panicles (Mwea, Kenya)



Photosynthesis measurement in a paddy field (Mwea, Kenya)

Combatting root-parasitic weed Striga using suicide germination stimulant in Africa

The root-parasitic weed *Striga hermonthica* has been causing huge problems on cereal production in sub-Saharan Africa. *Striga* seeds germinate in response to plant hormones called strigolactones released from the roots of host plants, and then infest the host. In the absence of host plants, *Striga* dies within 4 days after germination. Recently, our collaborators developed a *Striga*-selective suicide germination stimulant called Sphinolactone-7 (SPL7). It can induce germination of *Striga* without host plants. The Laboratory of Practical Studies in Africa is working with researchers inside and outside our university to develop a *Striga* control method using SPL7. Our research activities include verification of the effects of SPL7, evaluation of the genetic diversity of *Striga*, and elucidation of socio-economic conditions for technology dissemination.

(Daigo MAKIHARA)



Maize infested with *Striga* (a plant with purple flowers) in Kenya

Research activities

Practical Studies in Asia Lab.

Problem-oriented research conducted in rural Cambodia

Rural Cambodia fell into extreme poverty during the Pol Pot regime (1975-1979) and the subsequent period of turmoil. Even today, the country struggles with low agricultural productivity and poor income. The genocide that occurred during the regime's rule left local universities short-staffed. Consequently, they are unable to adequately fulfill their responsibility to inform local policy by identifying and addressing the country's current agricultural conditions and challenges.

Since 2000, the ICREA has been supporting the Royal University of Agriculture (RUA) in Cambodia. This support aims to strengthen their educational and research capabilities, helping to reform their educational system and establish master's and doctoral programs in agricultural sciences. Additionally, an international collaborative project between the ICREA and the RUA, launched in 2008 in rural Cambodia, serves as a research and education platform for RUA faculty and students, providing vital opportunities for human resource development in the country. Some individuals trained in this project have recently found careers in government and academia, leading to multiple other joint research projects involving other universities and government agencies.

We are particularly committed to action research, focusing on traditional food products that are vanishing from the market due to the impacts of the civil war and social transformations triggered by recent rapid economic growth. Action research allows us to identify and address current conditions and challenges, test and implement solutions in real-world settings, and promote their broader application to resolve or mitigate these challenges.



Local staff providing instructions to a brewing farmer.

Study of the impact of using a small-scale biogas system for forest conservation in Nepal's hilly region

Timber harvesting for firewood, used for everyday cooking, is one of the major contributors to deforestation in Nepal. Since the 1970s, the local government, non-governmental organizations (NGOs), and international organizations have been promoting the use of small-scale biogas systems utilizing livestock manure as an alternative to firewood. Our laboratory has been collaborating with a local NGO in Nepal since 2008 to analyze the effectiveness and impacts of using small-scale biogas systems as an alternative to firewood. This analysis has demonstrated their significant role in reducing firewood consumption. However, despite these advancements, the deterioration of community-managed forests and wildlife-related damages have occasionally been observed in the country. To clarify the current situation and make policy recommendations to government agencies, we are currently conducting quantitative and qualitative analyses to understand the changes in local residents' livelihood activities and forest management practices.

(Kasumi ITO)



Deteriorated forests in Nepal.

Publications

Journal of International Cooperation for Agricultural Development

URL: <https://icrea.agr.nagoya-u.ac.jp/jpn/journal/backnumber.html>

The Journal of International Cooperation for Agricultural Development (JICAD) offers a platform to support individuals looking to apply their agricultural science expertise in the field of international cooperation. This journal publishes peer-reviewed articles that explore world affairs from agricultural perspectives, propose the potential of multinational agricultural research, and present case reports on how cutting-edge research findings can help address global issues. The Japan Intellectual Support Network in Agricultural Sciences (JISNAS) oversees the editing of articles submitted for publication. Beginning with Volume 14, issues will be available as electronic journals on the J-STAGE platform.



Japan Intellectual Support Network in Agricultural Sciences

Founded on November 30, 2009, the Japan Intellectual Support Network in Agricultural Sciences (JISNAS) serves as a bridge between the universities that are committed to playing a part in international cooperation activities in the field of agricultural sciences and the international institutions/organizations that specialize in agricultural research. The ICREA, which was one of the founding members of the JISNAS, has served as the secretariat for JISNAS with a clear mission and vision in mind.

There are various ways through which universities can contribute to international cooperation. They could, for example, provide advanced education and training programs to concerned parties in both developing countries and Japan, conduct academic research to investigate the problems that exist in developing countries, carry out international development studies, or actually take part in international cooperation. Since its foundation, the JISNAS has shared its knowledge and experience with the international community through various activities (e.g., educational/research activities, social contribution activities, etc.) in the field of agricultural sciences. With the recent advancement of social and economic globalization in advanced as well as developing/emerging countries throughout the world, the needs for international cooperation are becoming increasingly diversified and complicated. It is therefore important more than ever to expand the network of international agricultural cooperation that brings together the wisdom of personal insights.

Through promotion of international cooperation in agricultural education and research activities, the JISNAS has not only contributed to successful human resources development in developing countries but also offered high-quality learning opportunities to aspiring individuals in Japan who are willing to take part in international education, joint international research programs, and international cooperation. This success is expected to strengthen the roles of academic and research institutions in the international community. In 2015, the Economic Development Department of JICA and the JIRCAS have also joined the JISNAS. As of October, 2023, the JISNAS has 60 group members and 143 individual members, and is funded by the Ministry of Education, Culture, Sports, Science and Technology, the Ministry of Agriculture, Forestry and Fisheries of Japan.

Committees of JISNAS

Committees name	Contents of the activities
Seminar and Symposium	Planning and management of those such as JICA-JISNAS Forum, JISNAS-FAO joint seminar.
Journal	Journal: Editorial Board of the academic journal "Journal of International Cooperation for Agricultural Development (JICAD)" (planning, editing, and publishing)
International Cooperation	Collaboration with JICA and the other International Organizations
International Research	Strengthening cooperation between the network and collaborators to promote international research programs
Human Resources Development	Promoting international career of young researchers and students, supporting recruit

Organization Chart

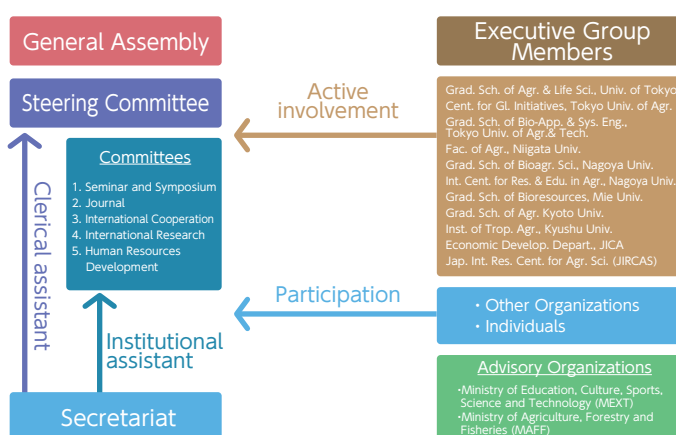
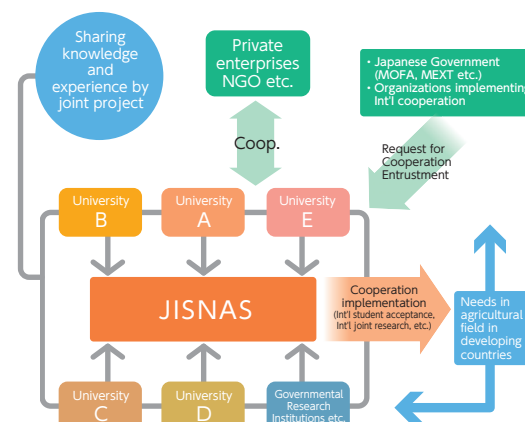


Image of JISNAS



Open forums, seminars, and email newsletters

The ICREA holds open forums to address important topics relating to international education, international joint research, and international cooperation in the field of agricultural sciences. Subject matter experts, including researchers and professionals, are invited from both within and outside the country to deliver lectures in these forums. Held periodically as relevant topics arise, these forums are open not only to people from academic institutions but also to the general public. Additionally, several times each year, seminars are held that are open to researchers, students, and the general public, where experts in agricultural research and international cooperation share insights to support the development of developing nations. The ICREA also disseminates quarterly email newsletters to its subscribers, reporting on its current research activities.



Group discussion during an open forum.



Speakers from various countries are invited to deliver lectures during an open seminar.

Advisors (Nagoya University) (AY2026-)

▶ KAWANO Asuka	Graduate School of Education and Human Development	Professor
▶ YAMAMOTO Eiko	Graduate School of Medicine	Professor
▶ NAKAZONO Mikio	Graduate School of Bioagricultural Sciences	Dean / Professor
▶ ASAKAWA Susumu	Graduate School of Bioagricultural Sciences	Professor
▶ NAKANO Hideo	Graduate School of Bioagricultural Sciences	Professor
▶ HARADA Kazuhiro	Graduate School of Bioagricultural Sciences	Professor
▶ FUKUSHIMA Kazuhiko	Graduate School of Bioagricultural Sciences	Professor
▶ MURASE Jun	Graduate School of Bioagricultural Sciences	Professor
▶ YAMAMOTO Hiroyuki	Graduate School of Bioagricultural Sciences	Professor
▶ WATANABE Akira	Graduate School of Bioagricultural Sciences	Professor
▶ DOI Kazuyuki	Graduate School of Bioagricultural Sciences	Associate Professor
▶ MITSUYA Shiro	Graduate School of Bioagricultural Sciences	Associate Professor
▶ MINAKUCHI Chieka	Graduate School of Bioagricultural Sciences	Associate Professor
▶ KITA Eisuke	Center for the Studies of Higher Education	Director / Professor
▶ MURAKAMI Masako	Center for Asian Legal Exchange	Director / Professor
▶ ASHKARI Motoyuki	Bioscience and Biotechnology Center	Professor
▶ TSUCHIYA Yuichiro	Institute of Transformative Bio-Molecules	Designated Professor
▶ ISHIZAKI Toshiko	Language Education Center, Japanese Language Education Division	Associate Professor

External Advisors (Other Organizations) (AY2026-)

▶ IIYAMA Miyuki	Strategic Coordination Office, Japan International Research Center for Agricultural Sciences (JIRCAS)	Director
▶ TAKARAGAWA Hiroo	Tropical Agriculture Research Front, JIRCAS	Researcher
▶ YAMAMOTO Mitsuo	Graduate School of Agricultural and Life Sciences, The University of Tokyo	Professor
▶ UCHIYAMA Tomohiro	Faculty of International Agriculture and Food Studies, Tokyo University of Agriculture	Professor
▶ MIYAUURA Rie	Faculty of International Agriculture and Food Studies, Tokyo University of Agriculture	Professor
▶ DAEMON Hiroyuki	Student Support Center, Toyohashi University of Technology	Professor
▶ ARAKAWA Masao	Faculty of Agriculture, Meijo University	Associate Professor
▶ BAN Mitsuaki	Aichi Agricultural Research Center	Director
▶ UEMACHI Toru	Japan International Cooperation Agency (JICA) Chubu Center	Director
▶ NAWATA Eiji	International Strategy Office ASEAN Center, Kyoto University	Director / Designated Professor
▶ ISHIKAWA Satoshi	Faculty of Agricultural and Food Sciences, Kyoto Prefectural University	Professor
▶ NISHIKAWA Yoshiaki	Faculty of Economics, Ryukoku University	Professor
▶ KUSAKABE Tatsuya	The IDEC Institute - CICE, Hiroshima University	Director / Professor
▶ OGAWA Masahiro	Faculty of Agriculture, Kagawa University	Dean / Professor



By Train

Subway: 5 min. on foot from Exit 2 of the Nagoya Daigaku station (Meijo Line)

Nagoya Station (JR, Meitetsu or Kintetsu Line):
Subway Higashiyama Line to Motoyama and change to Meijo Line (clockwise) (20 min.)

Kanayama Station (JR or Meitetsu Line):
Subway Meijo Line (counterclockwise) (20 min.)

By Air

Chubu International Airport:
Meitetsu Kuko Line to Kanayama Station and change to Meijo Line (counterclockwise) (50 min.)

(Aichi Prefectural) Nagoya Airport:
Express bus (Aoi Kotsu) to Nagoya Station and change to subway (50 min.)



Contact

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