ICREA
Nagoya University

ICREA

International Center for Research and Education in Agriculture

Nagoya University Japan

Greeting from Director

Prof. Hiroshi EHARA
Director
Applied Social System
Institute of Asia

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 Global Collaboration Office established in recent years is responsible for creating an international network of researchers and for running various projects with the goal to promote an efficient implementation of projects.

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.

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 ICCAE 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 ICCAE 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 ICCAE 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

ICREA provides the graduate education in the Department of Plant Production Science of the Graduate School of Bioagricultural Sciences, Nagoya University. Four faculties having lots of experiences abroad carry out researches standing on international viewpoints and make the best efforts for capacity development of graduate students seeking for various carrier path or track. Graduate students of ICREA can also study at the Japan International Research Center for Agricultural Sciences (JIRCAS).

Organization and Staff

ICREA Steering Committee

Director of ICREA
Akira Yamauchi

External Advisors (Other Organizations)/ Advisors (Nagoya University)

Research and ApplicationDivision

Tropical Bioresources Lab.

Professor Dr. Hiroshi Ehara

Background :

Tropical Plant Science, Economic Botany, Agroeclogy

Current interests :

- Genetic Variation and agronomic features of sago palm
- Growth and physiological response of rice varieties against climate change
- Mechanism of abiotic stress resistance in cow pea and related species

Assistant Professor Dr. Mana Kano-Nakata

Background :

Crop science, agronomy

Current interests :

- Morphological and physiological root characteristics for adaption to water stress in cereal crops
- Plant carbon partitioning under environmental stress

Genetic Information for Bioresources Lab.

Professor Dr. Yoshiaki Inukai

Background :

Plant Genetics and Breeding

Current interests :

- Molecular mechanism of root system formation and their application to breeding for stress avoidance such as shortages in water and nutrients in rice

Rural Development Division

Practical Studies in Africa

Associate Professor Dr. Daigo Makihara

Background :

Crop science, Agronomy

Current interests :

- Improvement of rice productivity under environmental stress conditions in Africa
- Interaction among crop productivity, cultivation environment, and management technology

Practical Studies in Asia Lab.

Associate Professor Dr. Kasumi Ito

Background :

Forest economics, forest management, agricultural and rural development,regional resources management

Current interests :

- Promotion of processed agricultural products for rural development
- Influence of household size biogas plant for forest resources utilization
- Capacity building of researchers for rural development in developing countries

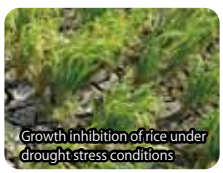
International Coordition Office Domestic and Foreign Networking and Business Operation.
Office of Japan Intellectual Support Network in Agricultural Sciences (JISNAS)

Research activities

■Research on improving rice productivity in the unfavorable environments of the tropics

To feed an ever-growing global population, it is important to increase food production and secure a stable food supply even in an environment not suited for agricultural production. In particular, demand for rice, which is a staple food for over half of the world's population, is expected to keep increasing in the coming decades, which makes it imperative to increase rice production. Rice fields in the tropical regions in Asia and Africa are faced with various environmental stresses that can cause a reduction in rice yields. At our research bases in Kenya, Indonesia, and Cambodia, we are undertaking the following activities with the goal of increasing rice production in unfavorable environments: evaluation of factors inhibiting rice productivity, assessment of adaptability of local rice varieties to stress, genetic analysis, genetic improvement of rice, and development of effective cultivation techniques.

1) Genetic improvement of rice to secure stable rice production in unfavorable environments


Growth inhibition of rice under drought stress conditions

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.


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

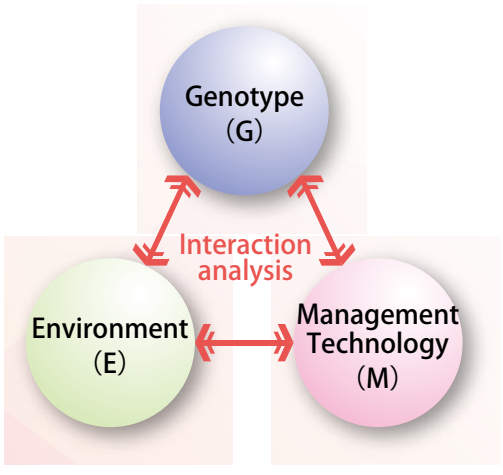
2) Development of cultivation techniques to increase rice productivity in unfavorable environments in Africa

Rice yields in Africa have remained low due to various biotic and abiotic stresses including drought, cold temperatures in highlands, high salinity, low-fertility soils, rice blast disease, and rice yellow mottle virus. To increase rice yields in such unfavorable environments, it is necessary to genetically improve rice crops to enhance adaptability to unfavorable conditions. The stress tolerance and crop productivity observed in the actual farm fields, however, are not only determined by the genetic traits of crop varieties but also affected by cultivation environments and the cultivation management strategies used.

Through collaboration with our research colleagues, we are carrying out field surveys to evaluate factors inhibiting rice productivity. Furthermore, we are growing rice lines into which we have incorporated the QTLs associated with improved adaptability to environmental stresses and improved rice yields. In addition, we are carrying out rice cultivation trials in a controlled artificial environment as well as in the actual farm fields to identify both the rice traits suitable for the cultivation environments in Africa and the QTLs that are associated with these traits, and to understand the cultivation conditions that enable the incorporated QTLs to function effectively.

- Identification of factors inhibiting rice productivity
- Evaluation of environmental stresses adaptability in rice
- DNA analysis
- Genetic improvement of rice
- Development of cultivation technologies

Improvement of rice productivity in unfavorable environments




Conducting cultivation trials in Kenya


Research under controlled environments in Nagoya University

3) Development of flood-adaptive rice cultivation technology

Since the late 1990s, the world has witnessed a rapid increase in major flooding events. Flood management approaches employed in Asian regions, which involve the use of newly developed or improved irrigation techniques, are not sufficient to avoid the damage of devastating floods that hit these regions, where vulnerability of crop cultivation to floods still poses a serious problem. In flood-prone regions, rice must be planted during the deepwater flood phase of the rainy season in order to prevent rice crops from sustaining damage from dryness during the late stage of growth. Inevitably, this puts the rice crops at risk of flood damage during the early stage of growth.


Uprooting of seedlings for the first transplanting

In addition to reevaluating the double-transplanting technique that has been used in the low-lying swamps along the east coast of Sumatra and the west coast of Peninsular Malaysia, we have been investigating the growth response of the locally grown rice varieties to floods to identify the traits associated with flood adaptation of rice varieties that are grown in several different regions with varying water depth levels and varying periods of deepwater flood phase. Our goal here is to ensure stable production of rice crops in flood-prone regions through the use of traditional techniques, and to improve cultivation technology by using fertility management strategies that not only help mitigate the harmful effects of submergence stress but also facilitate recovery from flood damage.


Rice seedlings growing on a raft for 2 weeks prior to the first transplanting


First transplanting (second transplanting will be done after 20 days)

■International Sago Palm Project for food security improvement

Agricultural production must increase by 70% globally to feed the world's population that is projected to reach 9 billion by 2050. Climate change and diminishing underground resources (including oil) also pose serious challenges to food security, and we need to focus on how we can enhance agricultural production/productivity in a sustainable way while minimizing post-harvest biomass losses. In view of this, our research group focused its attention on sago palms that grow naturally in 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. Furthermore, one palm can yield approximately 300 kg of starch. Sago is a staple food for local residents, and is used as an ingredient in biscuits, noodles, and other food products. Although it is not generally known, sago flour is used to knead buckwheat noodles and udon noodles in Japan. As an ingredient of choice for people with food allergies, sago has recently been used in a number of cosmetics as well. With only 10% of the wild and semi-cultivated sago palm stands believed to be harvested for use today, there is much room left for further exploitation of this economic plant.


Spineless type sago palm (East sepic, PNG)

In our laboratory, we are investigating the mechanism through which sago palms adapt to saline and acidic soils. Furthermore, we are carrying out field surveys to monitor the growth of sago palms to inform our efforts to develop an effective cultivation management strategy that enables stable growth of sago palms. We are also undertaking the following activities as part of a joint international research project: use remote sensing to estimate the area of the land on which sago palms are growing and to identify areas suitable for growing sago palms, develop technology to make sweeteners from the residue from sago starch extraction, and estimate the socioeconomic impact of the new technology.


Measurement of physiological parameters at the pilot farm of sago palm in Southeast Sulawesi, Indonesia


Sago palm field in Southeast Sulawesi, Indonesia

Research activities

■Joint research efforts to improve educational and research conditions in an agricultural university in Cambodia

After over 20 years of civil war, many farmers in Cambodia are still living in extreme poverty, which is exacerbated by low agricultural productivity and income. The genocide perpetrated by Pol Pot's regime in the 1970s and the subsequent civil war left the country with a severe shortage of labor. Furthermore, Cambodia's agricultural universities have been unable to fulfill its duty of identifying agricultural issues in the country and delivering good solutions for them. Since 2000, the ICREA has been assisting the Royal University of Agriculture (RUA) in Cambodia improve its educational and research conditions, reform the education system, and establish both master's and doctoral programs in agricultural sciences. We have been committed since 2008 to lead the movement towards the introduction of the practical training and research approaches that offer the opportunity for hands-on experience and practice in the local farming communities.

Our focus is on the traditional agricultural products and vegetable production that, if handled properly, should yield good profits. Through our research activities, we have identified the current agricultural issues and challenges in Cambodia, proposed and tested several solutions to them, and put our research findings into practice by taking part in the JICA (Japan International Cooperation Agency) Partnership Program. By combining research and on-site support activities, we have been able to undertake a wide variety of basic research studies and offer university instructors and students the chance to not only get hands-on experience of investigating and solving the problems that are actually occurring in the local farming communities but also understand how research and education can contribute to identifying and solving the agricultural issues in the country.

By building on the experience we have gained through our research and support activities with the RUA, we have started gradually a human resources development assistance through a series of basic research studies with other universities in Cambodia.


Rice liquor producer in Takeo Province: A step-by-step guide from a Japanese expert.

■Empirical research exploring how biogas production from livestock manure may help preserve forests in Nepal


Degraded forests in hilly areas of Nepal

Timber harvesting to supply fuelwood used for cooking every day is one of the major factors contributing to deforestation in many developing countries. Nongovernmental organizations (NGOs) and international institutions are accelerating their efforts to encourage developing countries to use biogas produced from livestock manure to replace wood fuel sources. Although the use of biogas can clearly reduce fuelwood consumption, little is known about other desirable and undesirable effects of biogas use. This research uses data obtained from field surveys conducted in a hilly district in Nepal where biogas technology was introduced nearly 20 years ago to analyze (both quantitatively and qualitatively) the positive and negative impacts of biogas production on fuelwood consumption, forest vegetation, livelihood of local residents, and forest management schemes.

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) provides a human development platform for training individuals who aspire to plunge into the field of international cooperation to make use of their expertise in agricultural sciences. This journal publishes peer-reviewed articles that examine world affairs from the agricultural perspectives, explore the possibility of conducting multinational agricultural research, or present a case report describing how leading-edge research findings can be applied to solve global issues. Articles submitted for publication are edited by the Japan Intellectual Support Network in Agricultural Sciences (JISNAS). Vol. 14 and later issues of the journal are published in online version.

ICREA News

This is a periodical published twice a year by the ICREA. It provides an update on ICREA's current research activities.

Japan Intellectual Support Network in Agricultural Sciences

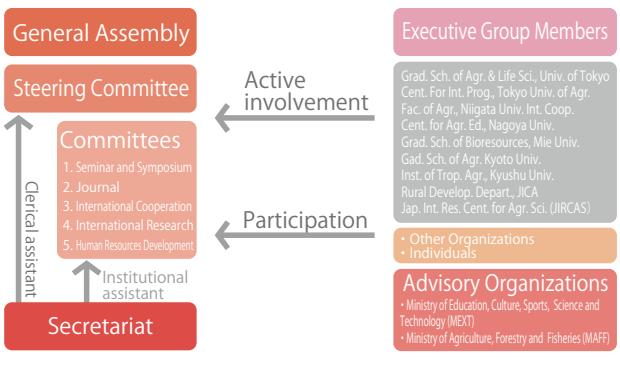
Founded on November 30, 2009, the Japan Intellectual Support Network in Agricultural Sciences (JISNAS) serves as a bridge between the universities that are committed to playing a part in international cooperation activities in the field of agricultural sciences and the international institutions/organizations 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 Rural Development Department of JICA and the JIRCAS have also joined the JISNAS. As of July 2019, the JISNAS has 53 group members and 120 individual members, and is funded by the Ministry of Education, Culture, Sports, Science and Technology, the Ministry of Agriculture, Forestry and Fisheries of Japan, and the JICA.

■Committees of JISNAS

Committees name	Contents of the activities
Seminar and Symposium	Planning and management of those such as JICA-JISNAS Forum
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

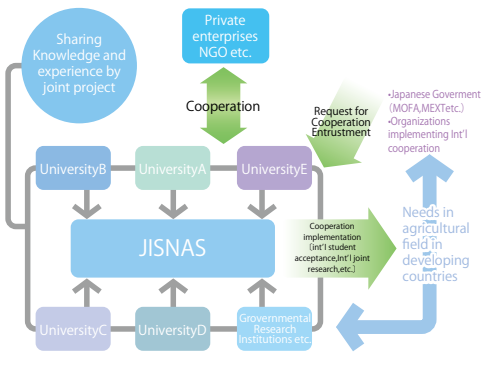


Image of JISNAS

Open forums and seminars

The ICREA holds a forum every year to address important topics relating to the fields of agricultural education and international cooperation. Researchers and other professionals from both inside and outside the country who are experts on the subject matter are invited to give lectures in this forum. The forum is open not only to people from academic institutions but also to the general public. Furthermore, several times a year, a subject matter expert (e.g., an agricultural expert with practical experience in international cooperation activities in developing countries) is invited to conduct an open seminar for researchers, students, and the general public who may be interested in international agricultural cooperation.


Lecture by lecturers from various countries at Open Seminar


Group discussion at Open Forum

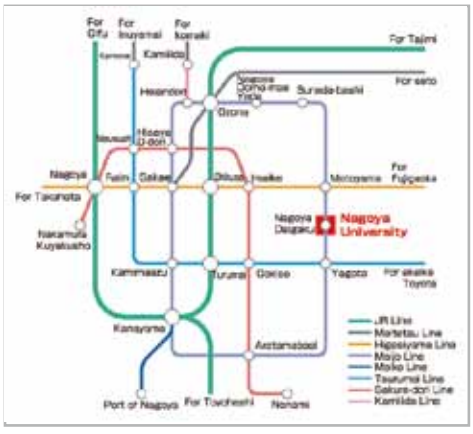
●ICREA appoints internal and external advisors from inside and outside the university who support our activities.

Advisors (Nagoya University) (April 2019-)

Susumu Asakawa	Soil Biology and Chemistry
Motoyuki Ashikari	Laboratory of Plant Gene Function
Toshiko Ishizaki	Japanese Language Education
Koichi Usami	Agricultural Economics
Asuka Kawano	Adult and Lifelong Education
Mayumi Kikuta	Crop Science, Tropical Useful Botany
Chisato Takenaka	Forest Environment and Resources
Satoru Tsuchikawa	System Engineering for Biological Resources
Yuichiro Tsuchiya	Chemical Biology in Plants
Kazuyuki Doi	Plant Genetics and Breeding
Hideo Nakano	Molecular Bioengineering
Tatsuya Natsume	Higher Education / Vocational Education
Nobuyuki Hamajima	Young Leaders' Program/Healthcare Administration
Kazuhiro Harada	Forest Resources and Society
Kazuhiko Fukushima	Forest Chemistry
Ryo Fujimoto	Fundamental Legal Studies
Chieka Minakuchi	Applied Entomology
Shiro Mitsuya	Crop Physiology
Jun Murase	Soil Biology and Chemistry
Hiroyuki Yamamoto	Bio-material Physics
Akira Watanabe	Resources Cycling in Pedosphere

External Advisors (Other organizations) (April 2019-)

Kazuo OGATA	Institute of T ropical Agriculture, Kyushu University
Masami ISODA	Center for Research on International Cooperation in Educational Development, University of T sukuba
Tomohiro UCHIYAMA	Faculty of International Agriculture and Food Studies, T okyo University of Agriculture
Masahiro OGAWA	Faculty of Agriculture, Kagawa University
Yasutaka KUBO	Graduate School of Natural Science and T echnology, Okayama University
Osamu KOYAMA	Japan International Research Center for Agricultural Sciences
Takeshi SAKURAI	Graduate School of Agriculture and Life Sciences, The Universit y of T okyo
Akira SUDA	Aichi Agricultural Research Center
Eiichiro CHO	Japan International Cooperation Agency , Chubu International Center
Eiji NAWATA	Graduate School of Agriculture, Kyoto University
Yoshiaki NISHIKAWA	Faculty of Economics, Ryukoku University
Naohiro HOZUMI	Institute for Global Network Innovation in T echnology Education, T oyohashi University of T echnology
Rie MIYAURA	Faculty of International Agriculture and Food Studies, T okyo University of Agriculture
Koichi MIYOSHI	Graduate School of Asia Pacific Studies, Ritsumeikan Asia Pacifi c University
Kazuhiro YOSHIDA	Center for the Study of International Cooperation in Education, Hiroshima University

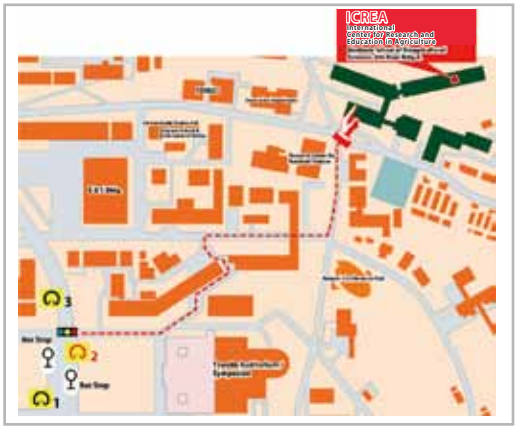


By Train

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.)



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