

# BioResource Now!

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Introduction to  
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## Education and Regional Innovation Using Resources derived from *Lotus corniculatus* and *Glycine max*

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## Education and Regional Innovation Using Resources derived from *Lotus corniculatus* and *Glycine max*

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As a core institution of NBRP Legume Base, the University of Miyazaki has created new bioresources derived from *Lotus corniculatus* and *Glycine max* (soybean), and has cooperated with foreign universities that specialize in biological resources to develop human resources who are aligned with global needs. The University of Miyazaki is committed to making an important regional contribution, enhancing Japan's soybean production through the use of soybean resources. We are now introducing a program of educational and regional innovation, developed in association with the *L. corniculatus* and *G. max* resource project at the University of Miyazaki.

### Human Resource Development Using Bioresources

To support the rapid advancement of life sciences research, model plants and animals used in research must be systematically preserved and managed. To accomplish this, techniques for scientific handling of plants and animals must be established; the NBRP plays an important role in the establishment process. The Nagoya Protocol was adopted during the tenth meeting of the Conference of the Parties to the Convention on Biological Diversity (COP10) in 2010, and the protocol came into effect on October 12, 2014. Since that time, the approach to handling overseas genetic resources has changed a great deal. As we do not yet have enough trained researchers and technicians to implement the necessary changes, we need to cultivate a new generation of specialists who can manage environmental issues from a legal point of view, while regulating the use of natural populations of plant and animal species, in accordance with various international treaties and laws related to biodiversity. In Japan, the National Strategy for the Conservation and Sustainable Use of Biological Diversity (2010 Version), the first national strategy based on the 2008 Basic Act on Biodiversity, was adopted at a Cabinet meeting in March 2010. The National Strategy specifically mentions the need to cultivate human resources who are aligned with global needs.

In particular, the strategy calls for the establishment and promotion of the Vision for Environmental Leadership Initiatives for Asian Sustainability in Higher Education, and notes that Japan must show international leadership in biodiversity-related fields. The Secretariat of the Convention on Biological Diversity has emphasized the importance of education, dissemination of information, and spreading awareness about the sustainable use of biodiversity. It is extremely important for Japan to show leadership in biodiversity-related fields in Asia.

The University of Miyazaki has carried out a project called the Genetic Resource Specialty Technician Training Model Curriculum Development initiative, in cooperation with Kyoto Institute of Technology, which has been a core NBRP institution for the study of *Drosophila* since 2006, funded through the Special Budget/Expenses of the Ministry of Education, Culture, Sports, Science and Technology (MEXT). The aim of this project is to develop scientific and legal resources trained to handle genetic resources in accordance with the Convention on Biological Diversity and its related laws and regulations. For this project, a core curriculum has been created using two species: *L. corniculatus* and *Drosophila*. Since 2010, the University of Miyazaki has been entirely responsible for carrying out the International Distribution of the Educational Curriculum for Genetic Resources program, funded by the MEXT's Special Budget/Expenses (<http://curator.brc.miyazaki-u.ac.jp/>). By using this core curriculum, the program aims to cultivate environmental leaders with an international perspective who can cooperate with overseas educational and research institutions.

The University of Miyazaki has implemented a human resource development program that uses various genetic resources in cooperation with the NBRP Medaka (of which the core institution is the National Institute for Basic Biology), in addition to the NBRP Legume Base and the NBRP *Drosophila* project. In this program, all lectures are offered in English during the month of August so that Japanese students, early-career teachers, and foreign students can benefit.

The program offers the following three lectures: "Biological genetic resources," in which participants acquire basic knowledge about various genetic resources; "Genetic resources to society," in which participants learn how to handle various genetic resources within legal guidelines, and "Bioinformatics," in which participants analyze various genetic resources using personal computers. This program includes an exercise entitled, "Practice and method of model genetic resource 1," which involves classification, diversity, and genetic recombination in the laboratory (Fig. 1).

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Fig. 1. Laboratory work during the summer intensive exercise  
a: A view of the whole laboratory  
b: Morphological observation using a microscope  
c: DNA extraction  
d: Exercise using medaka—*Oryzias latipes*)

In the past four years, a total of 60 people from 5 organizations in 3 foreign countries have completed the program. Japanese students are given the opportunity to take an overseas fieldwork course entitled "Practice and method of model genetic resource 2," which aims to instill an international perspective in participants. Participants of this course acquire both professional knowledge and world-class skills, learning to manage and prevent the misuse of genetic resources through hands-on, practical experience. Participants also develop their English communication skills by making presentations in English in foreign countries (Fig. 2).

These activities are expected to create a ripple effect, increasing the number of students who want to study at foreign research institutions and cultivating highly trained specialists to take an active part in international societies. Currently, one Japanese program participant has studied abroad for one year, and two foreign participants have undertaken graduate research at the University of Miyazaki. Now that students and teachers at foreign and domestic universities have begun to collaborate and exchange views, the University of Miyazaki's Faculty of Agriculture has opened satellite offices at both Kasetsart University in Thailand and Gadjah Mada University in Indonesia.



### Soybean Production and Regional Contribution in Miyazaki Prefecture

Following increases in the population and income of developing countries, the consumption of livestock products, oils, and fats has increased in recent years. As a result, the demand for feed cereals and soybeans has increased. Because demand for soybean as a raw material of biofuel has increased, the international price of soybeans has reached its highest level ever. Under these circumstances, Japanese soybean production plays an important role in maintaining a stable supply of soybeans. To achieve this stability, the productivity of soybean cultivation in Japan must be improved.

During the collection of genetic resources derived from soybeans, we discovered a native strain of soybean that had been cultivated and used by farmers in Miyazaki Prefecture for a long period of time. It is possible to harvest a sufficient yield using this strain, even if the seeds are planted in the middle of August, much later than the normal planting season.

This strain is therefore recommended as a second crop, following the harvest of the early paddy rice unique to Miyazaki Prefecture. In the second crop, all harmful effects of any wet injuries from the normal planting season or typhoon-related natural disasters are alleviated. A cropping system that exploits the natural features of Miyazaki Prefecture is expected to improve local agricultural productivity and to create a more stable supply of soybean. In cooperation with local companies, the University of Miyazaki has created Miyazaki Daigaku Miso (the university's own brand of soybean paste) made from native soybeans and rice at the University of Miyazaki. Using this miso, the University of Miyazaki has also created a version of "cold soup," a local traditional delicacy of Miyazaki Prefecture (Fig. 3).



Fig. 2. Overseas fieldwork course  
 a: Chanthaburi Horticultural Research Center in Thailand  
 b: Singapore Botanic Gardens in Singapore  
 c: Farm attached to Brawijaya University in Indonesia  
 d: Presentation at Brawijaya University

In recent years, participants have visited the Suncheon Bay Garden (South Korea), the Kung Krabaen Bay Royal Development Study Center (Thailand), the Chanthaburi Horticultural Research Center (Thailand), the Singapore Botanic Gardens (Singapore), Baluran National Park (Indonesia), and overseas partner universities.

Through these activities, we have attempted to train technicians with broad perspectives, professional knowledge, and sophisticated skills. Japan is expected to display international leadership in biodiversity-related fields providing a foundation for the education of global genetic resources based in Asia.



Fig. 3. Native soybeans and processed foods made in Miyazaki Prefecture  
 a: Seeds of the native soybean  
 b: Native soybeans cultivated after the early paddy rice has been harvested  
 c: Miyazaki Daigaku Miso made from native soybeans  
 d: "Cold soup," a local traditional delicacy created using Miyazaki Daigaku Miso

For the above-mentioned activities, including the discovery, cultivation, processing, and use of a native strain of soybean inherited by local farmers, the University of Miyazaki received a Food Action Nippon prize in 2014. In the future, we aim to make an even larger contribution to regional innovation through soybean-derived genetic resources.



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#### BioResource Information

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#### Editor's Note

The business of a resource center can be simply expressed as the "collection, preservation, and distribution of resources." However, resource centers must be carefully managed, as they face significant challenges every day. Those in charge of handling global genetic resources must pay close attention to international treaties and laws. A genetic resource that is mishandled in a foreign country can trigger an international crisis.

The University of Miyazaki's new Genetic Resource Specialty Technician Training Model Curriculum is Japan's first attempt to foster human resources involved in the handling of global genetic resources; this is an exciting initiative and excellent results are expected. Thank you very much for the opportunity to introduce this innovative program (Y. Y.).

