



**NARO**

# NARO Aims to Support Japan's Agriculture and Food Industry

President KYUMA Kazuo

The situation surrounding the agriculture and food industry is changing drastically. The new coronavirus pandemic exposed the vulnerability of the food chain and reaffirmed the importance of food security. In addition, there is an urgent need to address the shortage of workers, the decline of local communities, the frequent occurrence of natural disasters, and the progress of global warming. Looking at the world, the global food market is expected to grow along with the huge increase in human population, and we are now facing a huge business opportunity to expand exports of agricultural and food products.

I believe that the agriculture and food industry is a growth industry with huge potential, which will contribute to the economic growth of our country as well as promote regional revitalization. Also, greenhouse gas emissions from agriculture, livestock, and land use reached 24% of the global total. Therefore, it is important to both increase productivity of agricultural and food products and reduce greenhouse gas emissions. Since I assumed the position of President in April 2018, NARO have been committed to achieving (1) stable supply of agricultural products and food, and raising food self-sufficiency rate, (2) strengthening the global competitiveness of Japan's agriculture and food industry, and (3) improving agricultural productivity while conserving the global environment toward realizing "Society 5.0" in the agri-food sector.

We have also made improvements in R&D strategy, the practical application of research results, organizational collaboration, introduction of ICT such as AI, intellectual property and international standardization, public relations, and human resource development. For example, the integration of agricultural research and AI research, collaboration with private entities, and the dissemination of research results have been expanded.



From April 2021, we will accelerate research and development toward the realization of "Society 5.0" in the agriculture and food industry through the organization and management methods of our newly formulated 5th Medium- to Long-Term Plan. Specifically, we will carry out R&D under the four pillars of Agri food business, Smart production system, Agri-bio system, and Robust agricultural system.



Autopilot rice transplanter developed by NARO through a national project "Cross-ministerial Strategic Innovation Promotion Program (SIP)" and is ready to go to market in February 2022

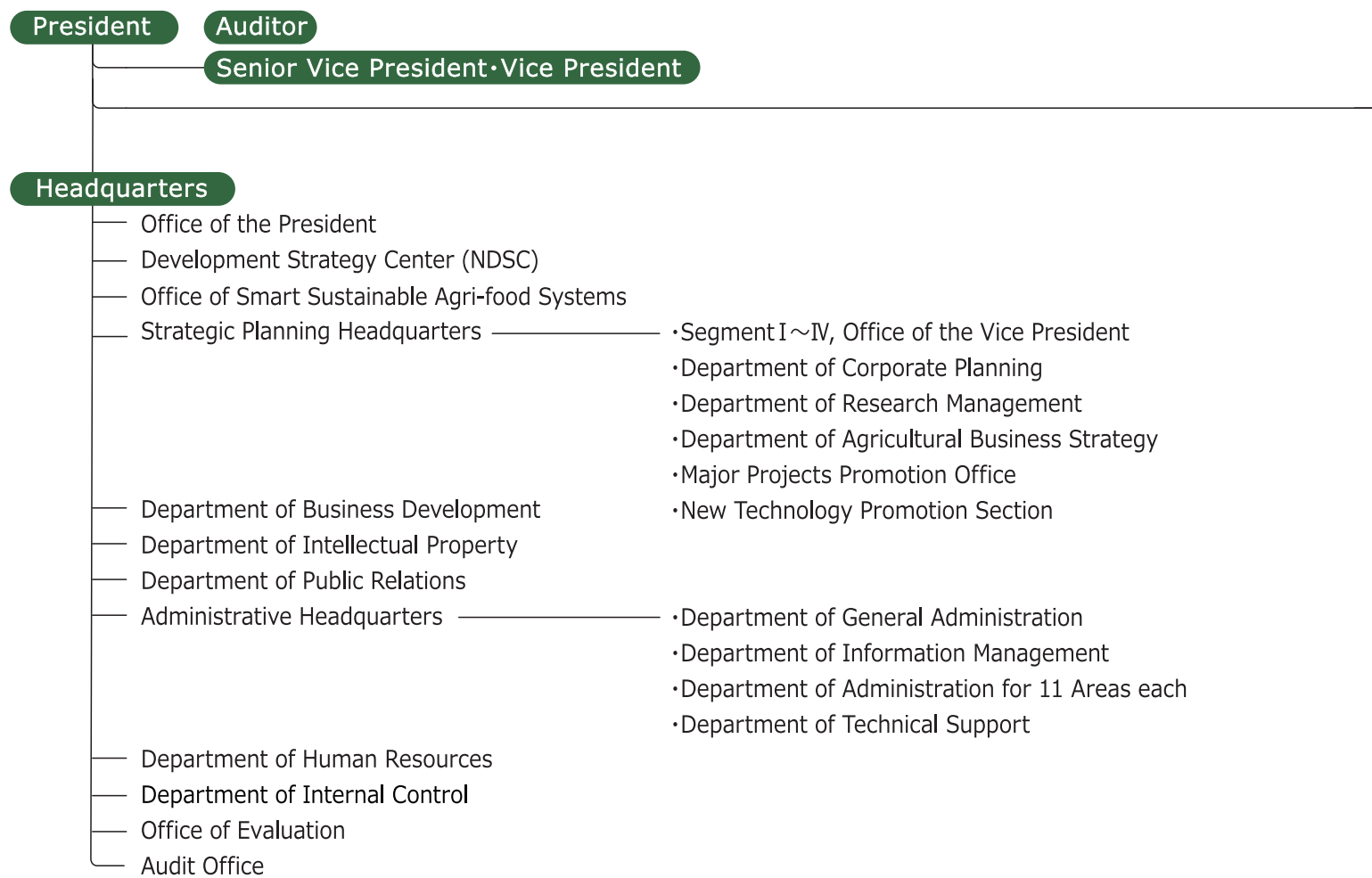
We will also establish the Core Technology Research Headquarters to strengthen basic research technologies such as AI, robotics, biotechnology, and precision analysis, as well as common infrastructure such as integrated databases and genetic resources, in order to improve the R&D capabilities of all of NARO and our country as a whole.

In the 5th Medium- to Long-Term Plan, NARO aims to become one of the world's top-notch research organizations, producing one-of-a-kind achievements seamlessly at each stage from basic research to practical application with a clarified exit strategy. We appreciate the strong support and cooperation of all related organizations.

## History

- 1893 "Agricultural Experimental Station" was founded as the national research organization in Japan. Later, each inner research organization was respectively established as a national experimental research institute.
- 2001 Twelve national experimental and research organizations that were in charge of agricultural technology research were integrated and reorganized as the "National Agriculture Research Organization, Independent Administrative Agency".
- 2003 Integrated with the "Specially Authorized Bio-oriented Technology Research Advancement Institution" and became the "National Agriculture and Bio-oriented Research Organization, Independent Administrative Agency".
- 2006 Integrated with the "National Institute for Rural Engineering", "National Food Research Institute", and "National Farmers Academy" (closed at the end of 2011) to form the "National Agriculture and Food Research Organization, Independent Administrative Agency".
- 2015 Reformed as the National R&D Agency and renamed the "National Agriculture and Food Research Organization".
- 2016 Integrated with the "National Institute of Agrobiological Sciences", "National Institute for Agro-Environmental Sciences", and "National Center for Seeds and Seedlings" to form the National R&D Agency "National Agriculture and Food Research Organization".

# NARO Organization Chart



as of April 1, 2023



NARO Headquarters

## Core Technology Research Headquarters, National Agriculture and Food Research Organization

- Research Center for Agricultural Information Technology, National Agriculture and Food Research Organization (RCAIT/NARO)
- Research Center for Agricultural Robotics, National Agriculture and Food Research Organization (RCAR/NARO)
- Research Center of Genetic Resources, National Agriculture and Food Research Organization (NGRC)
- Research Center for Advanced Analysis, National Agriculture and Food Research Organization (NAAC)

## Segment I

- Institute of Food Research, National Agriculture and Food Research Organization (NFRI)
- Institute of Livestock and Grassland Science, National Agriculture and Food Research Organization (NILGS)
- National Institute of Animal Health, National Agriculture and Food Research Organization (NIAH)

## Segment II

- Hokkaido Agricultural Research Center, National Agriculture and Food Research Organization (HARC/NARO)
- Tohoku Agricultural Research Center, National Agriculture and Food Research Organization (TARC/NARO)
- Central Region Agricultural Research Center (Kanto, Tokai and Hokuriku Regions), National Agriculture and Food Research Organization (CARC/NARO)
- Western Region Agricultural Research Center (Kinki, Chugoku and Shikoku Regions), National Agriculture and Food Research Organization (WARC/NARO)
- Kyushu-Okinawa Agricultural Research Center, National Agriculture and Food Research Organization (KARC/NARO)
- Institute of Agricultural Machinery, National Agriculture and Food Research Organization (IAM/NARO)

## Segment III

- Institute of Crop Science, National Agriculture and Food Research Organization (NICS)
- Institute of Fruit Tree and Tea Science, National Agriculture and Food Research Organization (NIFTS)
- Institute of Vegetable and Floriculture Science, National Agriculture and Food Research Organization (NIVFS)
- Institute of Agrobiological Sciences, National Agriculture and Food Research Organization (NIAS)

## Segment IV

- Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization (NIAES)
- Institute for Rural Engineering, National Agriculture and Food Research Organization (NIRE)
- Institute for Plant Protection, National Agriculture and Food Research Organization (NIPP)

Center for Seeds and Seedlings, National Agriculture and Food Research Organization (NCSS)

Bio-oriented Technology Research Advancement Institution, National Agriculture and Food Research Organization (BRAIN)

### Key points of the organization renewal in April 2021

- Core Technology Research Headquarters is newly established to improve and fully utilize AI and ICT common in segmented research fields.
- We strengthen output-oriented R&D for optimization of all processes in the food value chain.
- The Institute for Plant Protection is newly established to flexibly carry out crop disease control research.

### Employees and Budget

- Number of employees (as of April 1, 2023) 3,266 (including 1,739 researchers)
- Annual budget (2021 fiscal year end) 74.2 billion JPY (including operating cost subsidy of 63.9 billion JPY)  
(Note) excluding carry-over from the previous fiscal year

## Research and development aimed at strengthening and dissemination of Society 5.0

The following lists the ideal forms of Japan's agriculture and food industry to be realized in the near future, by solving various socioeconomic issues facing Japan. We will contribute to the realization of sustainable agriculture, regional revitalization, and accordingly achievement of SDGs, by strengthening and disseminating Society 5.0 in the agriculture and food industry, and promoting the realization of the ideal forms from the aspect of science and technology.

1. Increasing food self-sufficiency rate and ensuring food security
2. Strengthening industrial competitiveness of agricultural products and food and expansion of exports
3. Achieving both increased production and environment conservation

### Research Segment I: Agri Food Business

We will thoroughly strengthen the industrial competitiveness of agricultural and livestock products by means of creating new delicious and healthy food, and promoting smart food chains using AI and ICT

- Creating new industries related to food using AI and constructing smart food chains (NFRI)
- Increasing production by implementing data-driven livestock farm management (NILGS)
- Developing and practically applying diagnostic/control technology for livestock diseases and zoonotic diseases (NIAH)



NARO Style® lunch box

### Research Segment II: Smart Production System

We will improve food self-sufficiency by smart production systems centered on AI, ICT, and robotics, and contribute to regional revitalization by increasing farmers' incomes through the new business model.

- Constructing a stable production system for high profits from agricultural and livestock products in cold regions using smart agricultural technologies (HARC/NARO)
- Creating innovation for combined farm management through smart production systems (TARC/NARO)
- Constructing smart production and distribution systems in suburban areas (CARC/NARO)
- Constructing a multi-purpose farming system utilizing local resources in hilly and mountainous areas (WARC/NARO)
- Increasing production of agricultural and livestock products and expanding exports from Kyushu region by fully utilizing farmland (KARC/NARO)
- Promoting highly efficient and safe smart agriculture and international standardization (IAM/NARO)



Robot tractor

### Core Technology Segment: Core Technology Research Headquarters



AI supercomputer "Shiho"

We will accelerate R&D in segments I to IV and then create science and technology innovation by improving and fully utilizing core research technologies such as AI, robotics, and precision analysis.

- Utilizing AI/informatics, developing agricultural information research infrastructure, realizing cutting-edge ICT agriculture by WAGRI, and staff education and training (RCAIT/NARO)
- Deploying cutting-edge technologies in robotics and information systems to all processes of smart food chains in agriculture and food industry (RCAR/NARO)
- Promoting effective utilization of genetic resources of the Genebank by expanding the collection and improving the information infrastructure (NGRC)
- Accelerating R&D by establishing an analysis platform with advanced high-precision analyzing equipment and by utilizing big data (NAAC)

### Research Segment III: Agri-Bio System

We will accelerate R&D in agriculture and food industry, and also create a novel Agri-Bio industry by optimizing AI and biotechnologies to offer the best solutions.

- Developing crop varieties to be competitive in industry by constructing a base system of smart breeding (NICS)
- Increasing production and strengthening international competitiveness of fruit and tea trees by smart breeding and smart production technologies (NIFTS)
- Strengthening industrial competitiveness of vegetables and flowers by smart breeding and smart production technologies (NIVFS)
- Creating a novel Agri-Bio industry by developing technologies for advanced usage of biological functions of organisms (NIAS)

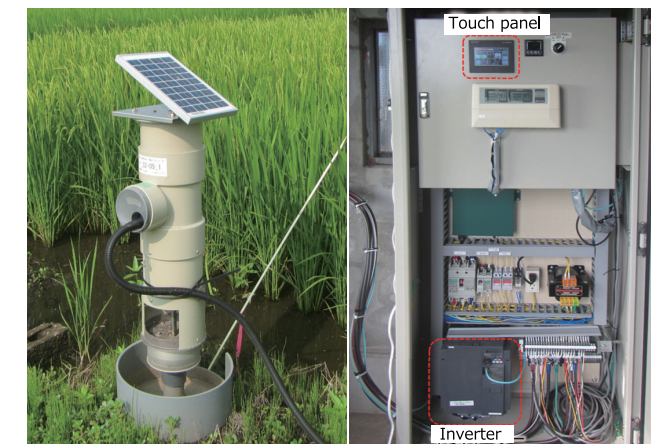


Genome analysis of crops

### Research Segment IV: Robust Agricultural System

We will achieve highly productive and robust agriculture in the face of climate change and the conservation of the global environment by developing a data-driven cultivation management system according to the production environment and by the resilience of the agricultural infrastructure.

- Achieving productivity improvement of agricultural crops and food products, while conserving the global environment by developing a smart management system according to the production environment (NIAES)
- Strengthening the production base by digitizing agricultural infrastructure (NIRE)
- Stabilizing crop production by developing data-driven technologies to control diseases, weeds and insect pests. (NIPP)



ICT water management

## NARO Project

NARO promotes inter-segment research via the “NARO Project”, beyond the framework of 16 subjects divided into five segments. The current themes as of April 2021 follow:

- Optimizing “from farm to table” supply chains of agricultural and livestock products to strengthen industrial competitiveness
- Data-driven design of personalized self-care diet aimed at improving well-being in the country
- Building and presenting new smart business models to improve and implement data-driven agriculture
- Developing leading crop varieties with high industrial competitiveness and improved productivity by smart cultivation technologies
- Contributing to zero-emission agriculture through cooperation between crop and livestock farming
- Accelerating R&D on advanced usage of biological functions by building a biotechnology-based information platform



## Center for Seeds and Seedlings (NCSS)

In order to protect new varieties and distribute quality seedlings, we set up a headquarters and 11 stations nationwide from Hokkaido to Okinawa prefectures. We carry out cultivation tests related to variety registration, breed protection support, inspection of seeds and seedlings based on the Plant Variety Protection and Seed Act, and production and distribution of foundation seeds and seedlings of potato and sugarcane.



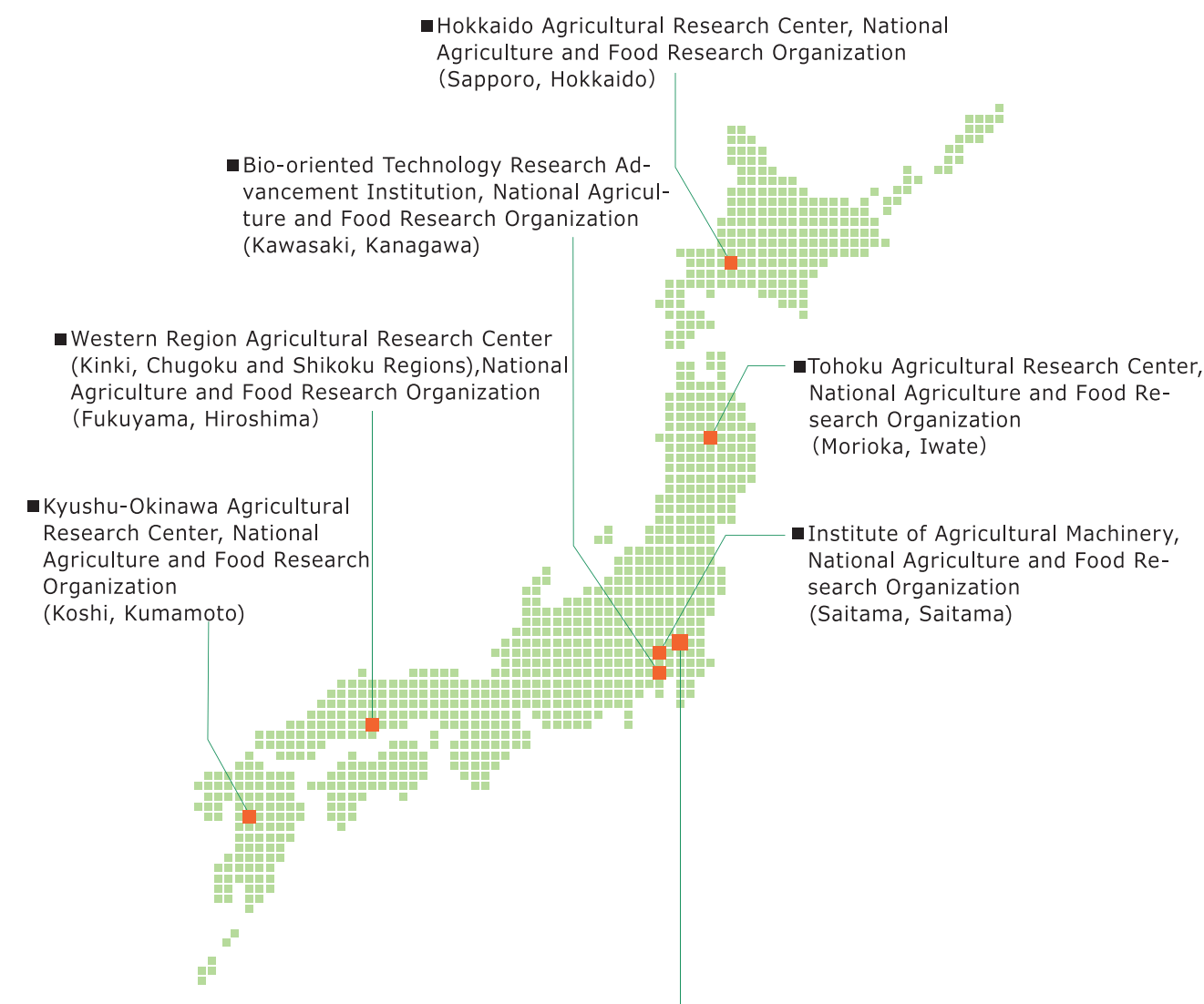
## Bio-oriented Technology Research Advancement Institution (BRAIN)

BRAIN opens calls for excellent research proposals in sectors of food, agriculture, forestry and fisheries, from private companies, universities, national R&D agencies, and other institutes. Once selected, BRAIN provides them with research funds, manages issues for achieving expected goals, and promote the social implementation of the achievements.



## Main Achievements

### Locations



- NARO Headquarter (Tsukuba, Ibaraki)
- Core Technology Research Headquarters, National Agriculture and Food Research Organization
  - Research Center for Agricultural Information Technology, National Agriculture and Food Research Organization
  - Research Center for Agricultural Robotics, National Agriculture and Food Research Organization
  - Research Center of Genetic Resources, National Agriculture and Food Research Organization
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- Institute for Plant Protection, National Agriculture and Food Research Organization
- Center for Seeds and Seedlings, National Agriculture and Food Research Organization

## Main Achievements

### Cultivars and Cultivation Technology



#### Cultivars

- "Shine Muscat" grape
- "Fuji" apple
- "Kosui" and "Hosui" pears
- Waxy barley cultivars
- Pod-shattering resistant soybean cultivars



#### Cultivation Technologies

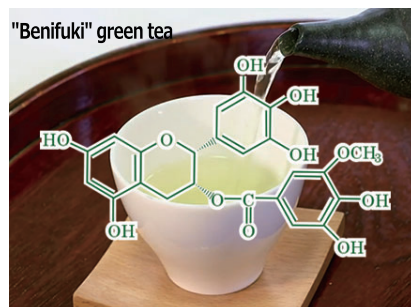
- Tomato growth prediction
- Direct seedling cultivation
- High-sugar content citrus production using drip fertigation and plastic sheet mulching
- FOEAS (Farm-Oriented Enhancing Aquatic System)

### Food Products



#### Processing and distribution

- 100% rice flour bread
- High quality long-term storage technology utilizing minimum heating process

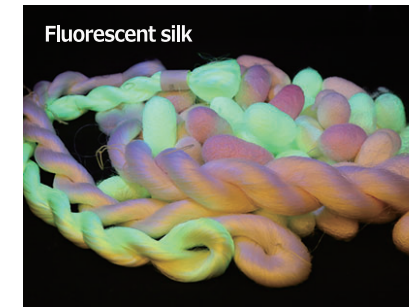


#### Functionality

- Food with functional claims
- "Benifuki" green tea; methylated catechins to alleviate eye and nose discomfort caused by pollen
- Apple; procyanidins to reduce visceral fat
- Citrus unshiu;  $\beta$ -cryptoxanthin to maintain bone health
- NARO Style<sup>®</sup> lunch box

For details of each research achievement, please visit the NARO website using the URL printed on the back cover.

### Biotechnology/Environment



#### Biotechnology

- Genetic modification of silkworm for production of new functional silk and useful materials
- Whole genome sequencing of crops, such as rice
- Plant genome editing technology



#### Environment

- Technology for reducing greenhouse gases derived from agricultural land
- Fruit and rice varieties resistant to global warming
- Technology for reducing greenhouse gas derived from manure management

### AI, ICT and Robot



#### Automation technology

- Agricultural data collaboration platform "WAGRI"
- AI Supercomputer "Shiho"
- ICT-based water management system
- Automatic rice transplanter

### Core Agricultural Technology



#### Disaster countermeasures

- Disaster prevention support system for irrigation ponds
- Reduction of flooding utilizing paddy fields' innate flood mitigation function
- Drought prediction method by visualizing the circulation of agricultural water

# Access Information

## Map



## Access

### Train & Bus

- **Tsukuba Express, Tsukuba Station**  
Tsuku-bus Nanbu Shuttle from Tsukuba station  
Take the bus for Kukizaki Madoguchi Center or Kukizaki Rojin Fukushi Center (approx. 18 minutes) → Get off at Norin Danchi Chuo → 5 minutes walk
- **Tsukuba Express, Midorino Station**  
Tsuku-bus Jiyugaoka Shuttle from Midorino station  
Take the bus for Fujimidai (approx. 20 minutes) → Get off at Norin Danchi Chuo → 5 minutes walk
- **JR Joban Line, Ushiku Station**  
Kanto Tetsudo bus from Ushiku station West Exit  
Take the bus bound for Tsukuba Daigaku Byoin, Yatabe Shako (approx. 20 minutes) → Get off at Norin Danchi Chuo → 5 minutes walk

### Car

Approx. 5 km from Yatabe Interchange of the Joban Expressway.  
Approx. 4 km from Tsukuba-Ushiku Interchange of the Ken-O Expressway.

## National Agriculture and Food Research Organization (NARO)

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