



KOBE UNIVERSITY 2021-2022

Graduate School of Agricultural Science

For Sustainable Agriculture and Human Health

– From Farm to Table –

Message from the Dean

Welcome to Graduate School of Agricultural Science, Kobe University



Yukio TOSA

Dean, Graduate School
of Agricultural Science

Agricultural science is a multidisciplinary field of applied science dealing with food production and processing. Its objective is to provide sufficient, safe, and nutritious food that meets the people's needs for an active and healthy life.

The Graduate School of Agricultural Science, Kobe University, consists of three departments: The Department of Agricultural Engineering and Socio-Economics aims to develop an integrated system for the production, distribution, and consumption of foods. The Department of Bioresource Science aims to develop, utilize, and improve animal and plant resources to ensure the production of high quality foods. The Department of Agro-bioscience aims to reveal the underlying mechanisms of complex agro-life systems to enhance food security and safety. In each department we carry out research and education to promote a deeper understanding of various specialized fields.

We also carry out interdisciplinary, integrated research that cuts across the boundaries of academic disciplines in cooperation with three centers: Food Resource Education and Research Center (the university farm), Center for Regional Partnership, and Research Center for Food Safety and Security. In the university farm we produce high-quality livestock products, such as the famous Kobe beef, and develop new varieties of crops.

We offer International Master's and Doctoral Programs (Kobe Global Graduate Program for Agricultural Science), in which all lectures and research activities are conducted in English. Kobe is a very beautiful city adjacent to Kobe Port, an international port with a long history. We hope that you will come to Kobe to enroll in our programs and enjoy the vibrant and stimulating academic and multicultural environment Kobe University offers.

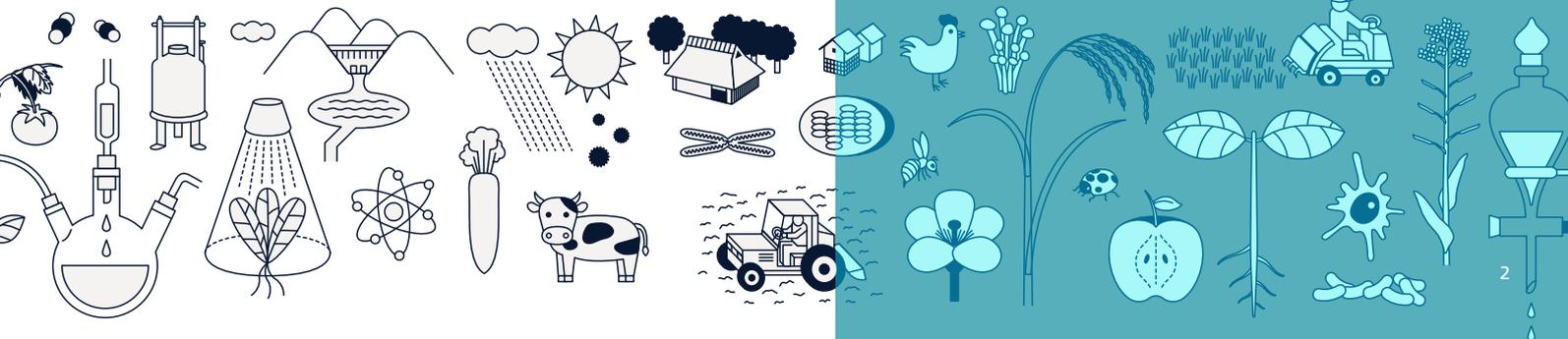


History

- April 1949 Hyogo Prefectural School of Agriculture was inaugurated in Sasayama.
- April 1952 Hyogo Prefectural School of Agriculture was renamed Hyogo University of Agriculture.
- April 1966 Hyogo University of Agriculture was transferred to Kobe University and became the Faculty of Agriculture.
- June 1967 The Experimental Farm was established.
- October 1967 The Faculty of Agriculture moved from Sasayama to Rokkodai Campus.
- March 1969 Hyogo University of Agriculture was disestablished.
- April 1972 The Graduate School of Agriculture (Master's degree program) was established.
- April 1981 The Graduate School of Science and Technology (Doctoral degree program) was established.
- April 1993 The Faculty of Agriculture was reorganized and 5 Departments and 12 divisions were established.
- April 1994 Master courses of the Graduate School of Agriculture, the Graduate School of Engineering and the Graduate School of Science were reorganized, and the Graduate School of Science and Technology (Master's degree program) was established.
- April 2003 Experimental Farm was upgraded to Food Resources, Education and Research Center.
- April 2004 Kobe University became a national university corporation.
- April 2007 Graduate School of Agricultural Science was established by reorganizing the Graduate School of Science and Technology.
- April 2008 The Faculty of Agriculture was reorganized and 3 Departments and 6 Divisions were established.

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Graduate School of Agricultural Science

Training Researchers to Develop Creative Scientific Research and Technologies

Kobe University Graduate School of Agricultural Science consists of the Department of Agricultural Engineering and Socio-Economics, the Department of Bioresource Science, and the Department of Agrobioscience. Focusing on topics from the farm to the table, we provide a world-class education on subjects related to food, environment, and health science. The faculty members are dedicated to promoting and expanding their expertise. Our education fosters an interdisciplinary and integrative approach, and our curriculum policy allows students to earn credits from other departments of the school. We train students to adopt a multifaceted research approach, encouraging them to exchange information and examine different viewpoints. We aim to cultivate researchers and educators who will develop creative scientific research and technologies, advanced professionals who will serve in leadership positions, and other experts who contribute to local and global communities.

Admission Policy

Master's Program

The Master's Program of the Graduate School of Agricultural Science aims to train individuals to gain a broad range of knowledge in their respective fields, as well as problem-solving skills and the ability to think creatively with an interdisciplinary perspective. For this reason, the Graduate School accepts people with solid fundamental academic ability in the field of agricultural science, people excelling in rational thinking, persons with a strong desire to study agricultural science, people with a passion for science and strong intellectual curiosity, as well as people who wish to utilize their knowledge in the sciences at public institutes and in the industrial sector.

Doctoral Program

The Doctoral Program of the Graduate School of Agricultural Science aims to train individuals to gain a high level of expertise and broad perspectives in their respective fields, as well as outstanding creativity and innovative thinking. For this reason, the School accepts persons with fundamental academic aptitude in agricultural science or related fields at the master's program level, persons with critical thinking and presentation skills, persons with intellectual curiosity and passion for agricultural science research, persons who wish to become researchers or educators and those who are already working in public institutes or in the industrial sector and wish to advance their careers as professionals with advanced specialized skills.



Degree Conferred

Program	Degree	Completion Requirements
Master's Program (2 years)	Master's degree in Agriculture	Obtain 30 credits or more in their major, and to pass the master's thesis screening and final examination.
Doctoral Program (3 years)	Doctor of Philosophy in Agricultural Science Doctor of Philosophy	Obtain 10 credits or more in their major, and to pass the doctoral dissertation screening and final examination.

Prospective Graduate Students (Admission Examination) for the Kobe Global Graduate Program for Agricultural Science

According to the educational principles presented in the admission policy statement above, the Graduate School of Agricultural Science explores agricultural topics, particularly those related to food, environment, and health science, and provides education and training to promote a sustainable symbiotic society and its underlying foundation of advanced technology and knowledge base. In order to enter degree programs, prospective students will participate in the evaluation process. They are selected by means of a comprehensive evaluation of application documents and interview through e-mails or skype. For detailed information, please check the following website; <http://www.ans.kobe-u.ac.jp/english/>

We require prospective students to find the academic supervisor prior to applying for the Graduate school.

※Global Graduate Program will be conducted in English.

We provide academic paths appropriate for students with different levels of skills and abilities:



Students may either move on to doctoral studies or seek nonacademic career paths.





Number of Faculty Members and Staff

(As of July 1, 2021)

Departments	Divisions	Fields	Prof.	Associate Prof.	Assistant Prof.
Agricultural Engineering and Socio-Economics	Agricultural Engineering	Water Resources and Environmental Engineering	3	7	3
		Geotechnical Engineering for Agriculture			
		Geo-Environmental Engineering for Agricultural Facilities			
		Rural Planning			
		Agri-Food Process Engineering			
		Mechanical Engineering of Bioproduction			
	Food and Environmental Economics	Information Engineering of Bioproduction	2	1	1
		Food Economics and Policy Studies			
		Farm and Rural Management			
Bioresource Science	Animal Science	International Agriculture and Food Studies	5	5	7
		Animal Breeding and Genetics			
		Reproductive Biology			
		Developmental Biotechnology			
		Animal Nutrition and Metabolism			
		Animal Molecular Morphology			
		Histophysiology			
		Microbiology and Immunology			
	Plant Science	Animal Genetic Resources	6	8	4
		Cell Signaling			
		Crop Science			
		Plant Breeding			
		Forest Resources			
		Horticultural Crop Propagation			
		Horticultural Crop Production			
Agrobioscience	Plant Germplasm Enhancement	6	8	4	
	Biological Chemistry				
	Food and Nutritional Chemistry				
	Natural Products Chemistry				
	Phytochemistry				
	Chemistry and Utilization of Animal Production Resources				
	Environmental Microbiology				
Plant Health, Environment and Biotechnology	Biochemistry Frontiers	9	4	3	
	Soil Science				
	Plant Nutrition				
	Plant Genetics				
	Crop Evolution				
	Cell Function and Structure				
	Environmental Chemistry				
	Cell Signaling and Regulation				
	Plant Pathology				
	Insect Molecular Biology				
Insect Biodiversity and Ecosystem Science					
Total			31	33	22

Administration

Staff

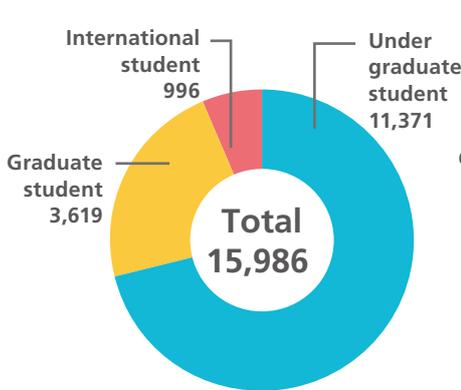
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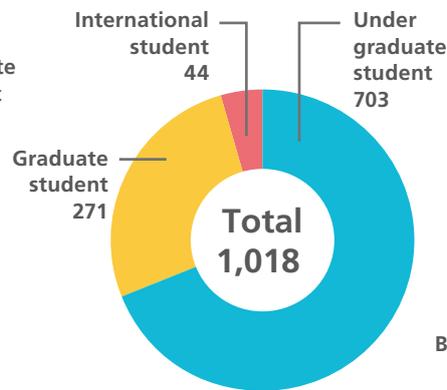
Number of Students

Number of Graduate and Undergraduate Students

(As of May 1, 2021)



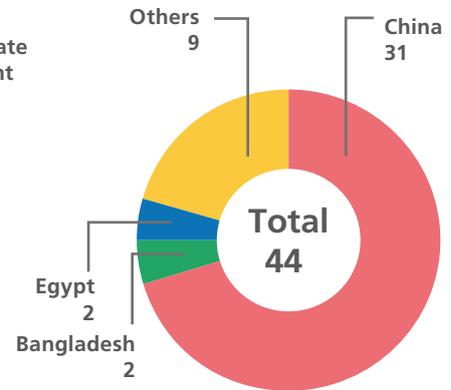
Kobe University



Faculty of Agriculture
Graduate School of Agricultural Science

Number of International Students by Countries of Origin

(As of May 1, 2021)



Academic Agreements

Inter-University Agreements (17 institutions)

(As of July 1, 2021)

Area	Country	Overseas University/Institute	Area	Country	Overseas University/Institute
Asia	Bangladesh	Bangladesh Agricultural University	Middle East	Turkey	Harran University
	China	China Agricultural University		Africa	Egypt
		Dalian University of Technology	Namibia		University of Namibia
		Inner Mongolia Agricultural University	North America	United States	University of Nebraska-Lincoln
	Indonesia	Europe		Belgium	Ghent University
	Korea			Sungkyunkwan University	Katholieke Universiteit Leuven
			Philippines	Bulgaria	Bulgarian Universities and Institutes of Bulgarian Academy of Sciences
	Vietnam		Hue University of Agriculture and Forestry	Germany	University of Hohenheim

Inter-Faculty/Graduate School Agreements (16 institutions)

(As of July 1, 2021)

Area	Country	Overseas University/Institute	Faculty/Graduate School
Asia	Indonesia	Andalas University	Faculty of Agricultural Technology
		Hasanuddin University	Faculty of Animal Science
	Sri Lanka	University of Ruhuna	Faculty of Agriculture
		Thailand	Chiang Mai University
	Suranaree University of Technology		Institute of Agricultural Technology
	Nong Lam University		
	Vietnam	International University-Vietnam National University Ho Chi Minh City	
Vietnam Academy of Agricultural Sciences			
Middle East	Turkey	University of Adiyaman	
Africa	Sudan	National Center for Research	
		Sudan Academy of Science	
Europe	Bulgaria	Trakia University	Faculty of Agriculture
		University of Food Technologies	
	Germany	University of Göttingen	Faculty of Biology and Psychology
		University of Siegen	School of Science and Technology
	Netherlands	University of Groningen	Groningen Biomolecular Sciences and Biotechnology Institute(GBB)



International Exchange Program

SAKURA Science Exchange Program

Under the SAKURA Science Exchange Program, funded by the Japan Science and Technology Agency, the Graduate School of Agricultural Sciences provides promising Asian students with learning and research opportunities. Participants will experience a short-term stay in Japan, where they will interact with Japanese students and experts in science and technology in order to gain new scientific knowledge.

Past Activities

Time in Japan	Country/Region	Activity Report
July 23 -August 1, 2017	Thailand	Two graduate students, six undergraduates , and one faculty member from Chiang Mai University, Thailand, were invited. The invitees attended lectures and visited facilities related tothe program's objective: "Characterization of thermotolerant soil microorganisms isolated in Thailand field and its enzymes."
July 30 -August 6, 2017	Thailand, Sri Lanka, Indonesia	Four graduate students, seventeen undergraduates, and three faculty members from Thammasat University, Thailand, University of Ruhuna, Sri Lanka, Bogor Agricultural University, Indonesia, were invited. The invitees attended lectures and visited facilities related to the program's objective: "Advanced technology of biosystems engineering for promoting sustainable agriculture."
July 23 -August 1, 2018	Thailand	Two graduate students, six undergraduates , and one facultymember from Chiang Mai University, Thailand, were invited.The invitees attended lectures and visited facilities related tothe program's objective: "Classification and characterization of thermotolerant soil microorganisms isolated in Thailand."
November 25 -December 2, 2018	Thailand, Sri Lanka, Indonesia	Seven graduate students, fourteen undergraduates, and three faculty members from Thammasat University, Thailand, University of Ruhuna, Sri Lanka, Bogor Agricultural University, Indonesia, were invited. The invitees attended lectures and visited facilities related to the program's objective: "Advanced technology of biosystems engineering for promoting sustainable agriculture."
November 17-24, 2019	Sri Lanka Indonesia	Three graduate students, five undergraduates, and four faculty members from University of Ruhuna, Sri Lanka, Bogor Agricultural University and Andalas University, Indonesia, were invited. The invitees attended lectures and visited facilities related to the program's objective: "Advanced technology of biosystems engineering for promoting sustainable agriculture."
November 19, 2020	Sri Lanka Indonesia	One hundred and sixteen people including professors, graduate and under graduate students from University of Ruhuna, Sri Lanka, Bogor Agricultural University and Andalas University, Indonesia, and Kobe University participated in the online exchange meeting using ZOOM. The participants attended lectures and discussions related to the program's objective: "Advanced technology of agricultural environmental engineering for achieving SDGs at the rim of the Indian Ocean."



Departments



Agricultural Engineering and Socio-Economics

With the advent of a population explosion and increasing global environmental problems there is a growing concern for the world food supply in the near future. In particular, the considerably low food self-sufficiency ratio of our country requires the establishment of a stable food supply system. In the Department of Agricultural Engineering and Socio-Economics educational research is carried out that aims at the systemization of all processes from agricultural infrastructure to distribution and consumption of foods so that producers and consumers alike may coexist in an environmentally sustainable society. The department has two divisions: the Division of Agricultural Engineering and the Division of Food and Environmental Economics which foster human resources and provide them with a broad knowledge with regards to food and the environment and skills so that they can play an active role in the public or private sector.



Bioresource Science

Animals and plants are essential as reproducible resources of food and various materials for our life. The Department of Bioresource Science provides education and research on animals, plants and microorganisms at the gene, molecule, cell, individual, group, species and ecosystem levels. The research and education also include the management and efficient utilization of bioresources for sustainable food production and safe food supply. Our goal is to develop outstanding bio-specialist with comprehensive knowledge and thinking power who can play an active role in a variety of fields ranging from food production to new biotechnology. To achieve the goal, this department has two divisions, the Division of Animal Science and the Division of Plant Science.



Agrobioscience

The Department of Agrobioscience nurtures human resources that have the ability to understand and analyze a variety of functions and phenomena of organisms related to food and agriculture from the molecular to the ecosystem level from various perspectives, and those who can support society leveraging applied biology in the 21st century by utilizing, developing, and controlling organisms and their functions such as in developing bioindustries related to agricultural crops, food, chemistry, medicine, etc. and cultivates excellent scientific powers for environmental conservation. The department has many fields that encompass food, chemistry, biology, etc. and cultivates excellent scientific powers of thinking, experimentation, and expression by providing students with a systematic lecture curriculum which takes actual career paths into consideration. To achieve these goals, the department has two divisions: the Division of Applied Chemistry in Bioscience and the Division of Applied Biology.





Agricultural Engineering

This Division promotes agricultural engineering research and education programs relating to use and control of water and land resources; maintenance of agricultural facilities; and development of machinery and equipment for crop cultivation, harvesting, and processing.

Water resources and environmental engineering

The research and educational topics include: the basin-wide hydrological cycle, evaluation of the aquatic environment from both water quantity and quality aspect, model development for water and material cycle, and its applications for water resource management.



V-notch weir for observation of river flow discharge



Auto sampler and turbidity meter for water quality observation

Geotechnical Engineering for Agriculture

The mission of this laboratory is to create safe and clean rural and agricultural environments. Its research and educational topics include: efficient design and construction methodologies for agricultural irrigation and drainage facilities (e.g., farming reservoirs, pipelines, and open channels) and mitigation of flooding and drought disasters.



Students conducting flood simulation experiments using dry sand



Field experiment for underground pipeline installation (courtesy of Ministry of Agriculture, Forestry and Fisheries)

Geo-Environmental Engineering for Agricultural Facilities

This laboratory aims to develop optimal regional agricultural infrastructure models that incorporate water and land resources and irrigation facilities. Its research and educational topics relate to groundwater dynamics; water-soil interactions; groundwater and soil pollution; and investigation, design, and maintenance of irrigation installations.



Compressive test of concrete



Groundwater contaminant behavior in laboratory experiments

Rural Planning

Agriculture and rural communities in Japan and in many parts of the world are undergoing rapid changes. This laboratory seeks to direct this change towards sustainable development with increased options. The state of the art remote sensing and GIS are key tools to monitor and visualize changes and to share information. Various types of models developed together with scenarios provide future projections. Conservation of biodiversity is also the key topic in this lab.



Conducting a dragonfly survey on a farm pond



Field survey of mountainous agricultural fields in Awaji Island

Agri-Food Process Engineering

This laboratory offers research and education programs related to physicochemical and functional characterization of agricultural resources and food products; theories and technologies for food processing and bioprocessing; and management of the food supply chain, from production to consumption to disposal.



Electrochemical degradation of antibiotics in food biomass



Methanogenic bacteria in biogas production

Mechanical Engineering of Bioproduction

With a primary interest in outdoor plant farming, this laboratory pursues research and education on crop production, leveraging cutting-edge cultivation methods, knowledge of plant characteristics, and optical techniques.



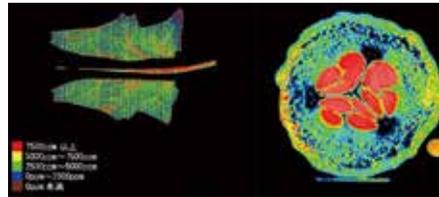
A spot pesticide applicator



A machine for removing weeds in rice paddies

Information Engineering of Bioproduction

This laboratory focuses on plant production system that links production in closed-system to post-harvest processing techniques. Its research and educational programs relate to non-destructive spectroscopic measurements and theoretical understanding of crop response during growth and storage, as well as development of an integrated production system to give research findings back to points of production.



Distribution of nitrate concentration in spinach leaves



Cultivation of Saffron in a growth chamber

MRI imaging of water distribution in a cucumber

Food and Environmental Economics

We conduct social scientific research and teaching on theories and policies for solving food, farming, and environmental issues; policies for revitalizing rural communities and developing farm management; and statistical procedures addressing the production, distribution, and consumption of food with an emphasis on the food and agriculture-related industries.

Food Economics and Policy Studies

We face a lot of dilemmas concerning food, such as food poverty, food waste and loss, and fluctuations in international prices of agricultural commodities mainly caused by climate change, globalism, and geopolitical risks. We conduct researches based on economic analyses with quantitative tools to clarify how food, agricultural and environmental policies should be.



Grocery store under globalism



Bazaar

Farm and Rural Management

Our program specializes in researching farm and regional resource management, food system, rural development, and the wellbeing of rural communities based on the theories of business administration and sociology. We place great importance on research which is responsive to social need and embedded in community action.



Field research in rural areas



Farmer's Market

International Agriculture and Food Studies

Our research and teachings are based on empirical and theoretical studies on eating behavior of children, adolescents, and the elderly; consumption behavior for domestic foods or agricultural brands; household food insecurity and malnutrition for the poor; rural development and poverty eradication; qualitative study for food systems; and survey and statistical methodologies with respect to rural, agricultural, and dietary issues in both developed and developing countries.



Threshing work in India



Rice terraces in Indonesia



Animal Science

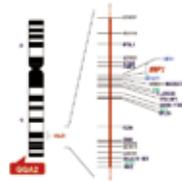
The Division of Animal Science is dedicated to promoting the safe, effective, and sustainable management of animal resources. To fulfill its mission, The Division conducts research and education on animal biology based on genetic, biochemical, morphological, and immunological approaches, with an emphasis on understanding various biological functions and their regulation at the molecular, cellular, individual, and population levels.

Animal Breeding and Genetics

The research and educational focus of this laboratory is on genetic breeding. By leveraging cutting-edge genomics methodologies, this laboratory searches for and identifies livestock genes useful for breed improvement. This laboratory also conducts genetic research on the origin and evolution of domesticated animals.



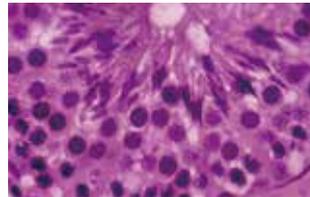
Some examples of cattle breeds from around the world



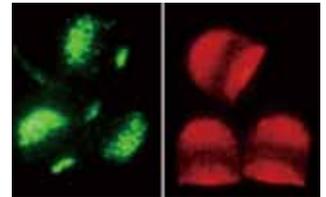
Chromosomal and genetic identification of useful breed traits

Reproductive Biology

The research and educational interests of this laboratory focus on improving reproductive techniques for the livestock (e.g., cattle and pigs) to achieve higher efficiency. For this purpose, this laboratory seeks to discover biomolecules engaged in the formation, maturation, fertilization, and freezability of male gametes (sperm). These biomolecules are used to develop novel molecular profiling protocols for gamete classification.



Microscopic image of stained porcine testis



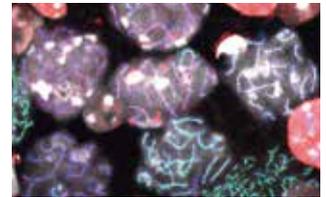
Immunofluorescence staining of bovine sperm acrosomal proteins

Developmental Biotechnology

Understanding the regulatory mechanisms of mammalian gametogenesis, fertilization, and embryonic development is key to effective livestock production and human reproductive medicine. This laboratory conducts research and education related to the elucidation of reproductive regulatory pathways at the molecular, cellular, and tissue levels, as well as the development of new technologies for in vitro culture and manipulation of oocytes and embryos.



Micromanipulation of a porcine oocyte



Immunofluorescence image of murine spermatocytes

Animal Nutrition and Metabolism

Research in this laboratory focuses on understanding the mechanisms underlying appetite regulation, adipogenesis, and myogenesis in chickens. The laboratory also has a major research interest in the development of functional ingredients to improve meat and egg production in chickens.



Development of the method for preventing excessive accumulation of body fat in broiler chickens



Characterization of skeletal muscles in chicken thigh meat



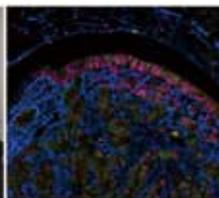
Development of functional eggs

Animal Molecular Morphology

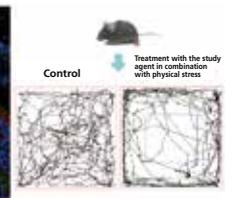
With our vast morphological findings and the latest knowledge of molecular biology, our laboratory aims to elucidate the sex determination and differentiation process of the vertebrates. We are also studying the biological effects and epigenetic alterations by environmental chemicals. Methodological approaches focus on morphology and vary from the molecular to the biological level.



Dissection of mouse embryo for gonadal culture



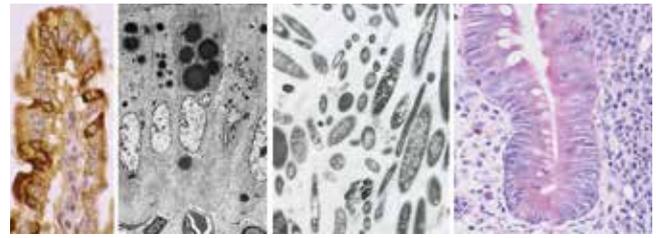
Immunofluorescence staining of gonadal tissue harvested during the developmental stage



Diagrams illustrating chemically induced changes in murine behavioral patterns

Histophysiology

This laboratory aims to understand the processes underlying animal cell and tissue formation, as well as their complex biological activities. For this purpose, this laboratory promotes research on host defense mechanisms against the microbes in the digestive and respiratory systems. In addition, taking advantage of the research outputs, the laboratory provides education related to histology and physiology.



Antibody uptake in small intestinal villi.

Transmission electron microscopic image of small intestinal epithelial cells

Transmission electron microscopic image of indigenous bacteria in the intestinal chyme

Follicle-associated intestinal crypt with a peculiar cellular composition

Microbiology and Immunology

Even now in 21st century, we-human beings, still fight against various infectious diseases with great effort. By adopting molecular biology approaches, the research and education of our laboratory address issues related to human and animal pathogens, specifically focusing on three key questions: "What are the current problems related to infectious diseases?" , "What caused these problems?" and "What should we do to overcome them?".



Differentiation induction of mouse embryonal carcinoma cells (P19C6 cells, left) to neuron (right)

Electron microscopic image of Ibaraki virus particles

Animal Genetic Resources

Research in this laboratory focuses on improving economically important traits and evaluating and maintaining genetic diversities of livestock by the methods based on population and statistical genetics. The laboratory also promotes farm-oriented research, such as studies on feeding and management of Japanese Black ("Wagyu") cattle.

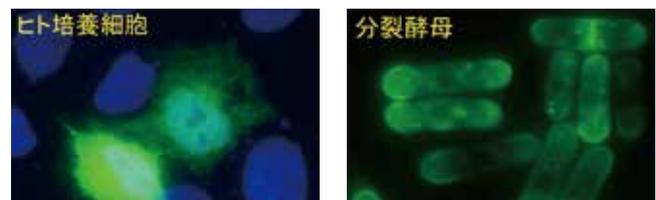


Feeding experiment on cattle

Improved Japanese Black cattle

Cell Signaling

This laboratory explores the life phenomena at the molecular and cellular level. Using fission yeast and mammalian cells as models, the researchers investigate the regulation mechanisms of cell functions in response to extracellular stimuli, such as physiologically active substances, stresses, and nutritional changes through the intracellular signal transduction pathways.



Cultured human cells

Fission yeast cells

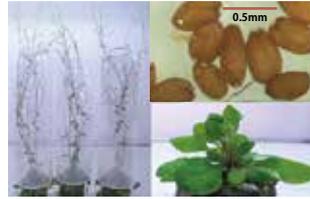


Plant Science

Provides students with research and education programs that aim at improving the productivity and quality of food crops, horticultural crops, industrial crops, and trees all as resource plants that support our daily life through studying their physiology, ecology, and genetic characteristics.

Crop Science

This laboratory aims to improve plant resource productivity, establish safe and sustainable cultivation methods, and identify new applications and usages of plant resources. The research and education specifically relate to physiological mechanisms underlying stress tolerance and lipid synthesis in food and industrial crops, weed control, as well as utilization of plant-derived materials for new purposes, e.g., as sources of renewable energy.



Genetically engineered *Arabidopsis thaliana* with increased seed oil content



Weed *Echinochloa* spp. overgrown in rice paddy field

Plant Breeding

The research of this laboratory is focused on developing new cultivars and improving breeding efficiency. Their research efforts include generation of novel breeding materials by exploiting genetic resources of local varieties and wild relatives, identification of agronomically important genes using molecular markers, and elucidation of the mechanisms underlying the phenotypic expression of those genes.



Cross-pollination in rice



Laboratory members with rice seedlings

Forest Resources

Our goal is to provide students with fundamental knowledge and experience in the forest sciences (tree physiology and functional anatomy, forest ecology and pathology), which are necessary for sustainable management of forests ecosystems. Our research sites include plantation forests, "Satoyama" (secondary forests used for fuel), primary forests, shrine/temple forests, and urban green space.



Old-growth *Sequoia* forest (California, USA)



Cross-sectional microscopic image of a fig stem (*Ficus carica*)

Horticultural Crop Propagation

Horticultural plants propagate either via seeds (sexually) or by vegetative reproduction (asexually). Seed propagation involves pollination, fertilization, and formation of seeds and fruit, whereas vegetative propagation proceeds in the absence of gametes. Seed formation plays a key role in fruit development. The research and educational activities of this laboratory are centered on the elucidation and control of these propagation mechanisms, with the goal of enhancing fruit, seed, and seedling productivity.



Compatible pollen tube growth

Incompatible pollen tube growth



Seed parent

F1

Pollen parent

Horticultural Crop Production

This laboratory aims to enhance the productivity and utility of horticultural products. We improve light use efficiency and the operability of cultivation facilities with the goal of launching effective production systems. This laboratory will develop the potential of plants by breeding of cultivars with improved stress tolerance and functionality.



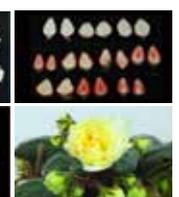
Lettuce grown under pulsed LED light



Dry-fog spray fertigation for growing strawberries



Flowering regulation of carnation (upper), Breeding of stress-tolerant Tg lettuce (lower)



Analysis of strawberry allergen and anti-allergic effect (upper), Anther culture of African violet (lower)

Horticultural Plant physiology and Biochemistry

Fresh fruits and vegetables enrich our diet. The goal of this laboratory is to optimize methods for management of cultivation, postharvest transportation, and storage. By applying biochemical and molecular biology techniques, we are engaged in analyzing the physiology of horticultural products in all stages from farm to table.



Pitaya fruit (*Hylocereus undatus*)



DNA sequencing analysis

Tropical Crop Science

There are a wide variety of plant species in tropical regions, which have a diversity of ecological environments, ranging from arid to humid. This laboratory promotes research and education concerning the adaptive mechanisms of tropical plants at the organismal and molecular levels, with the goal of ensuring a stable supply of valuable tropical plants.



Floating rice plants (right and left) and Amazonian wild rice plants (center) grown under deep water conditions



Images illustrating photosynthetic measurement (right) and gene expression analysis (left) of rice plants

Plant Germplasm Enhancement

This laboratory contributes to sustainable food production. With the goal of developing efficient breeding programs and novel breeding materials, this Laboratory provides also research and education on the collection, identification, preservation, evaluation, control, and utilization of plant genetic resources.



Wild pear germplasm collection



Laboratory members in Food Resources Education and Research Center

Field Science for Food Production (Cooperative division)

(This course is only for doctoral program students.)

Field Science for Food Production

This laboratory promotes research to enhance quality and productivity of crops (e.g., rice, wheat), horticultural products (e.g., vegetables, flowers, fruits), and livestock animals (e.g., cattle, chickens) and promote ecologically and human friendly agricultural practices. Their research projects are academically based and field-oriented.



UV-B lighting system in greenhouse strawberry



Captivate the world's tongue" kobe beef"





Applied Chemistry in Bioscience

Provides students with research and education programs that clarify the living organisms ingest and produce, the chemical structure and action in the environment around the organisms, and diverse life systems at the molecular level, and that leverage, synthesize, control and develop them.

Biological Chemistry

Our laboratory investigates the biological and biochemical activities of animals (eel, silkworm), plants (Arabidopsis, herbs), and microbes (*E. coli*, *koji*) on the basis of gene expression protein structure and function, and their molecular regulatory systems. Furthermore, our research and education are aimed to contribute the application of the biological enzymes and chemicals in the agricultural, food, and fine chemical industries.



Left: Fluorescence charts of qRT-PCR analysis.
Middle: Arabidopsis seedlings of wild type (upper left) and plastidic RNA polymerase-deficient mutants.
Right: Brain of *Bombyx mori*. Arrow; neural cells to express eclosion hormone.

Food and Nutritional Chemistry

Nutritional and non-nutritional components of food mediate, either directly or indirectly, the physiological functions of the human body via the signal transduction pathways. This laboratory focuses on the elucidation of regulatory mechanisms at the molecular and organismal levels. It also provides research and education concerning the development of functional foods.



Students actively engaged in experimentation with laboratory animals and cell cultures



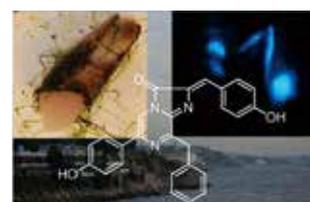
Discovery of the functions of food elements will contribute to disease prevention

Natural Products Chemistry

This laboratory is devoted to research and education for chemical synthesis of biologically active natural organic compounds and the identification of structure-activity relationships, leveraging organic synthetic approaches.



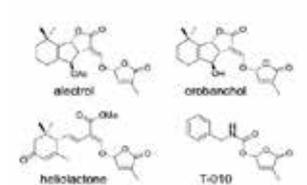
Parasitic plant *Strega hermonthica* at Sudan (center). Germination stimulant: stigolactone (Upper left). Nuclear Magnetic Resonance spectrometer (Upper right).



Glowing bivalve mollusk *Pholas dactylus* (Upper left). its blue bioluminescence (Upper right). Organic substance for the bioluminescence; dehydrocoelenterazine (Center).

Phytochemistry

This laboratory implements research and education aimed at promoting basic understanding and practical applications of plant functions. The interests of this laboratory include analysis and elucidation of the following topics: chemical structure, biosynthesis, and mechanisms of action of secondary metabolites of plant origin; interactions between plants and living organisms in their periphery; and plant responses to environmental stimuli.



Isolation, determination, and structural expansion of strigolactones (joint project with the Laboratory of Natural Products Chemistry)



Destruction of root parasitic weeds by induced suicidal germination

Chemistry and Utilization of Animal Production Resources

By investigating the biological functions of proteins and lipids of animal origin, the researchers of this laboratory seek to develop new food quality markers, functional foods, and medicinal products. In a separate line of research, they investigate the process of meat aging and the mechanisms affecting palatability. Their activities also include the development of methods for evaluating and improving the quality of meat and related products.



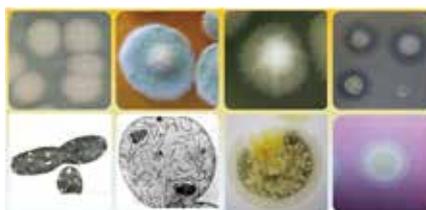
DGK β KO mouse, which shows impairment of memory and its neurons has less branches, indicating importance of DGK β in morphological change of neurons and higher brain function.



A photograph of myofibrils from chicken skeletal muscle. Myofibrils are an organellar developed for muscle contraction and have profound effects on meat quality due to the large mass in muscle fiber.

Environmental Microbiology

For the purpose of utilizing microbial resources, this laboratory isolated useful natural microorganisms and characterizes their enzymatic and genetic traits. The research and educational activities of this laboratory are aimed at applying microbial enzymes to selective useful compounds and extraction of biologically active substances from biomass residues. This laboratory also focuses on essential understandings of reaction mechanisms and structures of biologically functional proteins by utilizing methodologies of biophysical chemistry.



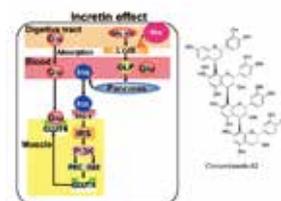
(Clockwise from upper left) Halotolerant hydrolytic enzymes producing *Bacillus* sp., *Aspergillus repens* and *A. glaucus* for Katsuo bonito fermentation, eggshell membrane degrading *Pseudomonas* sp., thermotolerant *Streptomyces* spp. isolated from Thai land, photosynthetic *Cyanobacterium*, thermophilic purple sulfur photosynthetic bacterium

Biochemistry Frontiers

The research and education interests of this laboratory relate to overcoming challenges concerning human health, food supply, and environmental conservation. For this purpose, researchers work to identify useful biological capabilities and functional biomolecules, and to clarify their mechanisms of action.



Estimation methods for functions of food components.



Prevention effects of food components on hyperglycemia.

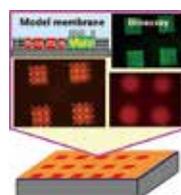


Plant Health, Environment and Biotechnology

This Division fosters scientists who contribute to plant health maintenance and promotion and biosphere conservation. Students learn clinical plant science and environmental science concerning plant stressors (e.g., climate change, soil salinities, low-level nutrients, pollutants, disease, insects) and plant stress responses (e.g., by changes in cell structure, signal transduction, gene expression).

Environmental Chemistry

Using a wide variety of techniques, including genetic engineering, biochemistry, precision measurements, nanotechnology, plant physiology, environmental plant science, and instrumental analysis, this laboratory investigates the safety and distribution of substances relevant to agriculture and food, such as pesticides, food constituents, and environmental pollutants.



Micro-patterned model biological membrane



Zucchini



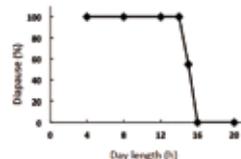
Evaluation of human safety of environmental chemicals

Insect Molecular Biology

This laboratory investigates the following topics with various species of insects: evolution of morphology and behavior, metamorphosis, diapause, endocrinology, neural transmission, sensory reception, biological clock, and photoperiodism. Molecular understanding of physiological characteristics and adaptation mechanisms of insects contributes to pest control and utilization of beneficial insects.



DNA microarray analysis of silkworm gene expression.



Photoperiodic response curve of silkworm.



Pupae: silkworm (left) and Chinese oak silkworm (right).

Insect Biodiversity and Ecosystem Science

Insects are the most diverse group of organisms on the planet, and they include pests, their natural enemies, and pollinators of crops. We study insect diversity, biology of insect pests and their natural enemies, and the ecological role of insects in agricultural and forest ecosystems.



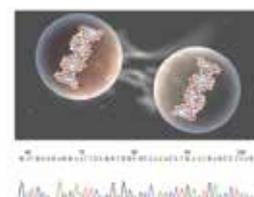
Insects are dissected with tweezers under a stereomicroscope.



A moth larva is being attacked by a parasitoid wasp.

Cell Function and Structure

This laboratory studies plant-microbe interactions with a particular interest in microscopic morphological changes and epigenetic modifications of the genomes during their interactions. The research and educational activities are aimed at elucidation of the underlying molecular mechanisms and application of research findings for human benefit.



Elucidation of plant-pathogen interactions by cytological and genomic approaches

Plant Genetics

Using crops and their wild relatives, this laboratory engages in identifying specific genes responsible for natural variations and genetic differentiation. We also analyze genetic factors involved in genome-genome interactions based on interspecific hybridization. Special attention is paid to the genetic mechanisms underlying speciation and allopolyploid establishment, as well as application of the research findings for crop breeding.



Scanning electron microscopic image of the cross-sectional surface of the grain of common wheat



Spikes of three wild wheat relatives



A ultra-high-density genetic linkage map of common wheat

Crop Evolution

Employing multifaceted approaches that combine genetics, ecology, and fieldwork, researchers of this laboratory identify the genes involved in crop plant domestication and investigate their roles, with the goal of elucidating the genetics of domestication and locating genes useful for agricultural applications.



DNA gel electrophoresis



Fieldwork in a crop market in South India

Plant Nutrition

Plants are frequently exposed to environmental stressors, in particular, reactive oxygen species resulting from photosynthesis, which may compromise plant growth and productivity. The research activities of this laboratory focus on helping plants acquire nutritional support in order to overcome stress crises, thereby allowing them to grow throughout their full life cycles.



Sunlight is very dangerous for chilled plants.



Plant Pathology

How have plant pathogens obtained their ability to parasitize particular hosts? How have certain crop individuals gained their disease resistance? This laboratory seeks to answer these questions at the genetic, chromosomal, and genomic levels with the goal of developing new cultivars with durable resistance. Fostering professionals capable of plant disease diagnosis is also a mission of this Laboratory.



Canidia of the rice blast fungus *Pyricularia oryzae*



Rice leaf infected with the blast fungus



Field study of white rust infection of Chinese cabbage

Soil Science

To address the problems of climate change and global warming, we investigate soil carbon dynamics and these processes in pedosphere around the world. Especially, we focus on roles of the soil organic matter which supports the plant productivity in forests and agricultural lands. In addition, we promote researches and educations directly linked to food supply and environmental problems.



A vertical soil profile to analyze relationships between the radioactive cesium and the plant root or the soil organic matter.



An analysis of various chemical elements in the pedosphere.





FACILITY



Food Resources Education and Research Center

The Food Resources Education and Research Center is located in the central area of Banshu Plains in Kasai City. It is approximately 70 km west of Rokko-dai campus where the Graduate School of Agricultural Science is located. The Center holds 40 ha land areas including 28.3 ha of field areas for cultivation (paddy rice fields, orchard, grass and forage field, etc.). There are three agricultural production sections: crop (e.g., rice, soybean, cabbage, onion, potato, and sweet potato), fruits (e.g., grape, pear, and kaki) and livestock (e.g., beef cattle along with forage crops and grasses). The Center engages in educational, research, and local-community activities based on the real-scale and high-quality agricultural production.

The importance of practical training never decreases because there are misunderstandings between food production and consumption nowadays. Our aim is to provide an opportunity to capture the essence of agriculture and to deepen the thoughts for agricultural science by experiencing real scale agriculture. The Center was approved as a Joint Usage/Education Center in Japan by the Ministry of Education, Culture, Sports, Science and Technology in 2014. The Center carries out the farming practices for undergraduates of other universities from the Kansai region as well as Kobe University.

To accomplish sustainable agriculture, researches are conducted primarily through genetic approaches such as genetic improvement in plants and prediction of genetic merits in animals. We research on exploration, collection, identification, preservation, evaluation, control, and utilization of plant genetic resources to find efficient breeding programs and develop new breeding materials for sustainable food strategies. More efficient and sustainable animal breeding systems are researched through the analyses of genetic evaluation and structure in animal resources. Two research fields "Animal Genetic Resources" and "Plant Germplasm Enhancement" of the Graduate School of Agricultural Science are stationed in the Center, which provide opportunities for undergraduate and graduate students to earn Bachelor's, Master's and PhD degrees.

Agricultural products as outcomes of education and research activities are sold at market, known as Kobe University's "Beef", "Potato", "Onion", "Pear", "Grape", etc. High quality Japanese sake with a brand name of "Kami-no-Manimani" was also produced by our collaboration with sake-brewing company.

For more details about the center, please access our website: <http://www.edu.kobe-u.ac.jp/ans-foodres/>.



Grass cutting for cattle feed



Sweet potato planting



Cattle barn



Greenhouse



Pear picking



Feeding to cattle



Japanese black cattle



Rice transplanting

Center for Regional Partnership

The Center for Regional Partnership was established to meet regional challenges, promote value creation and act as a hub of region. Our missions are to contribute solving regional issues using knowledge of the Graduate School of Agricultural Science, provide a field for learning to students and citizens based on experiences of local people, and contribute regional self-development in Japan and world creating new knowledge. The center is tackling the following topics with two field stations in Tamba-Sasayama and Higashi-Harima.

Cooperative Research: With the participation of members of the local government agencies, regional community groups, non-profit organizations, and cooperatives, faculty staff members lead research projects for sustainable local development. In addition, the center assists the researchers of the Graduate School of Agricultural Science to initiate cooperative research and provide logistical support for their implementation.

Collaborative Practical Activities: The center promotes practical activities for creating and sharing knowledge between region and university. Other activities of the center include: provision of support to student and group activities that implement community empowerment activities in rural areas, collection and publication of literature and materials relating to regional partnership, and social networking and learning opportunities, such as workshops and seminars.

Consultation and Information Dissemination Services: As a point of contact between the local community and Kobe University, the center provides consultation services for a diversity of clients. In addition, the center actively provides accessible information by hosting open workshops on the outcomes of cooperative research and collaborative practical activities, as well as community-oriented workshops. The center's website (<https://www.edu.kobe-u.ac.jp/ans-chiiki/>) presents a summary of past cooperative research, as well as information on past and upcoming collaborative practical activities.

Cooperative Education on Food and Agriculture: The educational program aims to learn regional situation from the standpoint of farm producers and local residents, and foster human resources who can contribute to practical problem-solving in the field of food and agriculture. The program consists of the following lectures: 'Introduction to Practical Agronomics', 'Practical Agronomics' supported by farmers in Tamba-Sasayama and 'Theory on Agricultural Environment in Hyogo Prefecture A and B' under cooperation with MAFF, JA and Hyogo prefecture.



Cooperative research



Collaborative practical activities



Consultation and information dissemination services



Cooperative education on food and agriculture

Research Center for Food Safety and Security (RCFSS)

Since its establishment in April 2006 as the first food safety orientated academic institution in Japan, the RCFSS has been pioneering a comprehensive research area for establishment of a global standard of scientific theory and technology which contributes to food safety and its security.

The RCFSS has recently developed Kobe University Human Intestinal Model (KUHIM) system, which consists of both in vitro cultured (1) immune intestinal model and (2) large intestine flora model in order to promote research and education to validate the function and safety of the food using KUHIM as a core technology. In addition we are going to put efforts on research and education for stable food supply through plant protection technology.

The RCFSS is engaged in not only stand-alone research and education programs that employ its own facilities and equipment but also various joint research and educational activities in cooperation with many laboratories within Kobe University and other universities. In addition, the RCFSS promotes food-safety research and social awareness campaigns in collaboration with local governments, national institutes, non-governmental organizations, food and drug manufactures and other universities who share the same food safety and security oriented discipline. The RCFSS provides the special lectures, 'Practical Seminar for Food Safety Technology', and 'Practical Inspection Technology for Food and Agricultural Materials Safety' in partnership with Food and Agricultural Materials Inspection Center (FAMIC).

For more details about the RCFSS, please visit our website: <http://www.research.kobe-u.ac.jp/ans-foodss/index.html>.



Multi-channel anaerobic fermenter



Real-time PCR system

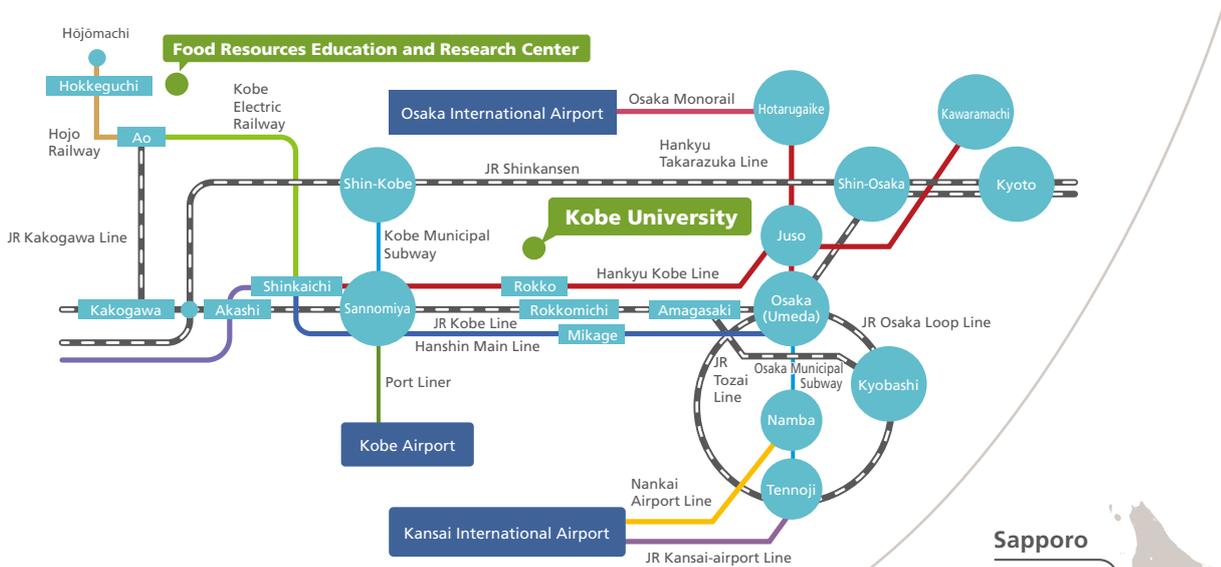


High performance liquid chromatograph



ACCESS

ROUTE MAP



KOBE UNIVERSITY

Kobe, Japan

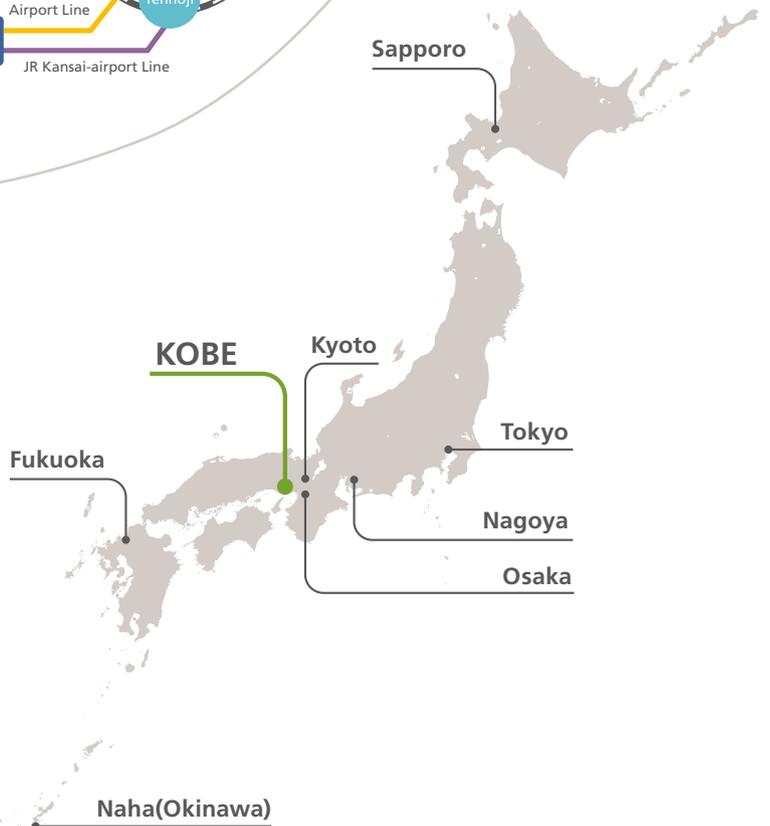
Graduate School of Agricultural Science in Rokko-dai Campus

1-1 Rokkodai-cho, Nada-ku, Kobe 657-8501 Japan
Phone: +81(0)78-803-5928

Food Resources Education and Research Center in Kasai City

70km west of Rokko-dai Campus

1348 Uzurano-cho, Kasai, 675-2103 Japan
Phone: +81(0)790-49-0341



Famous of Kobe



Ijinkan



Meriken Park



Akashi Kaikyo Bridge

Graduate School of Agricultural Science



Food Resources Education and Research Center



Web site



<http://www.ans.kobe-u.ac.jp/english/>





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