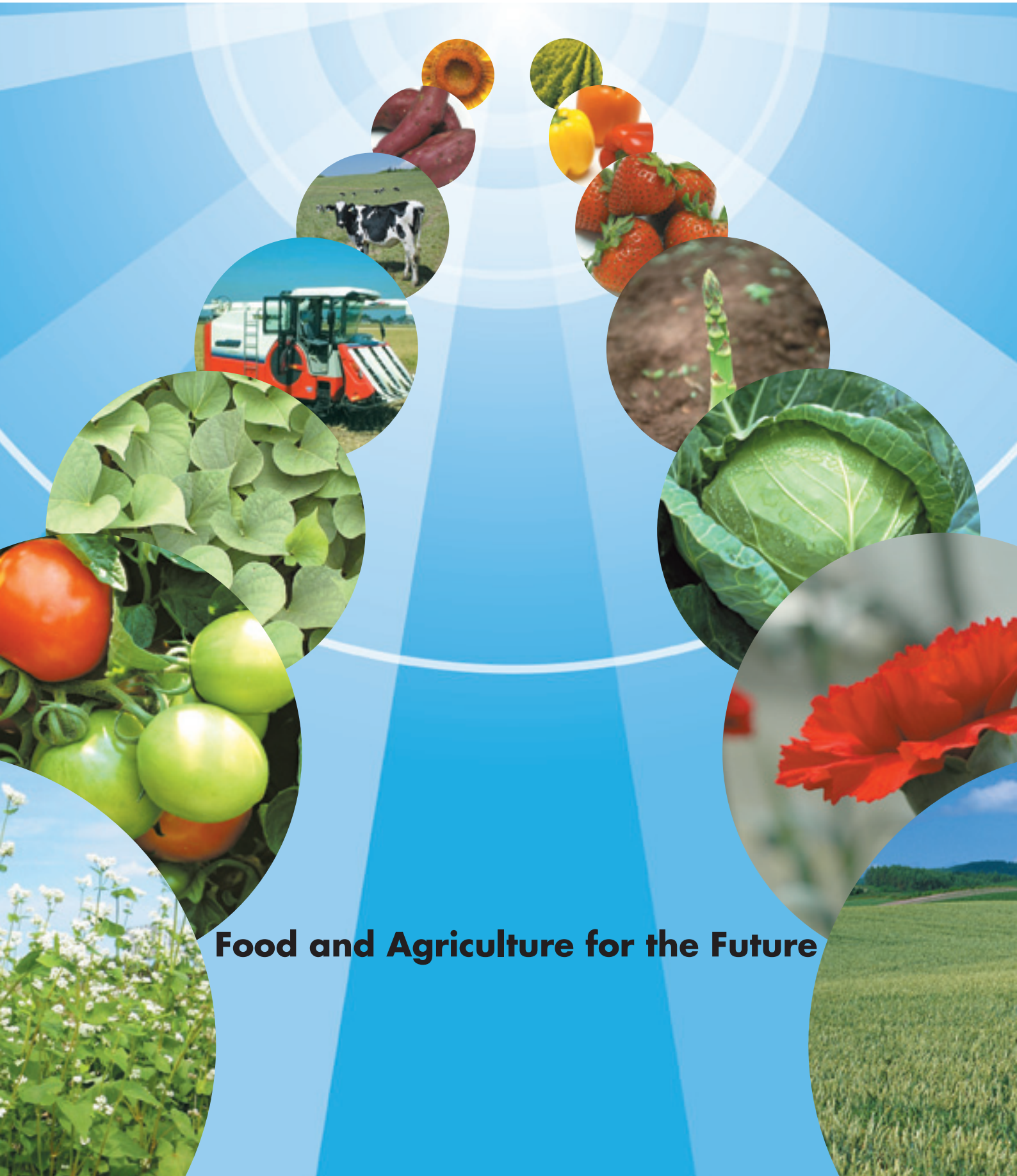
National Agriculture and Food Research Organization

NARO



Food and Agriculture for the Future

■ Mission of NARO

Our mission is closely related to people's lives, including disaster management, maintenance technology for production infrastructures in rural areas, crop and livestock breeding and raising, food processing technologies, food and animal safety, and biofuel production and its utilization technologies. Namely, our research covers the whole research area related to agriculture and food science in Japan. NARO's research products have already been extended to and utilized by the agricultural sector, food industry, agricultural machinery and materials industry, national and local government, and other organizations. This shows that our achievements have been undoubtedly contributing to a stable and high-quality food supply in Japan.

President,
Takeshi Horie (Ph.D.)

■ The third mid-term plan (from 2011 to 2015)

Starting from April 2011, NARO has launched a new third five-year mid-term plan. In this plan, we are focusing on research and development for the following purposes: (1) securing a stable food supply, (2) addressing global-scale issues such as climate change, (3) creating demand for new food products, and (4) utilizing local agricultural resources. We declare that NARO will take all possible measures to achieve these goals in this five-year term.

NARO has total 124 research projects and approximately 1,600 research staff across 14 research institutes throughout Japan, some of which contribute to regional innovations on in the field of agricultural research. In addition, the Bio-oriented Technology Research Advancement Institution (BRAIN), one of NARO's members, promotes research and development for biosciences and biotechnology in the fields of agriculture, forestry, fisheries, brewery and fermentation, and food processing. BRAIN conducts studies on the agricultural mechanization and development of agricultural machinery through cooperative work with the private sector.

■ Contributions to sustainable development of Japanese society with increased security and safety

Because uncertainty of environmental issues and food supply is thought to be increasing in the 21st century, development of innovative technology should be hastened to secure a stable food supply and preserve the environment in the future. NARO has to take responsibility as the agricultural research institute by achieving the abovementioned mid-term plan. In addition, we must work towards restoration of the agriculture industry and rural community in the earthquake-stricken area and contribute to sustainable development of the Japanese society with increased security and safety.

We look forward to your continuous support, understanding, and cooperation with NARO.

NARO: Food and Agriculture for the Future

NARO

National Agriculture and Food Research Organization

The National Agriculture and Food Research Organization is the largest research organization addressing "agriculture, food, and rural communities" in Japan.

NARO began in April 2006

April 1, 2001

As part of Japan's administrative reforms, the National Agricultural Research Organization was established along with three independent administrative agencies, the National Institute for Rural Engineering, the National Food Research Institute, and the National Farmers Academy. The National Agricultural Research Organization was a national research and experiment organization that integrated and reorganized 12 national experimental and research organizations addressing agriculture technology research.

October 1, 2003

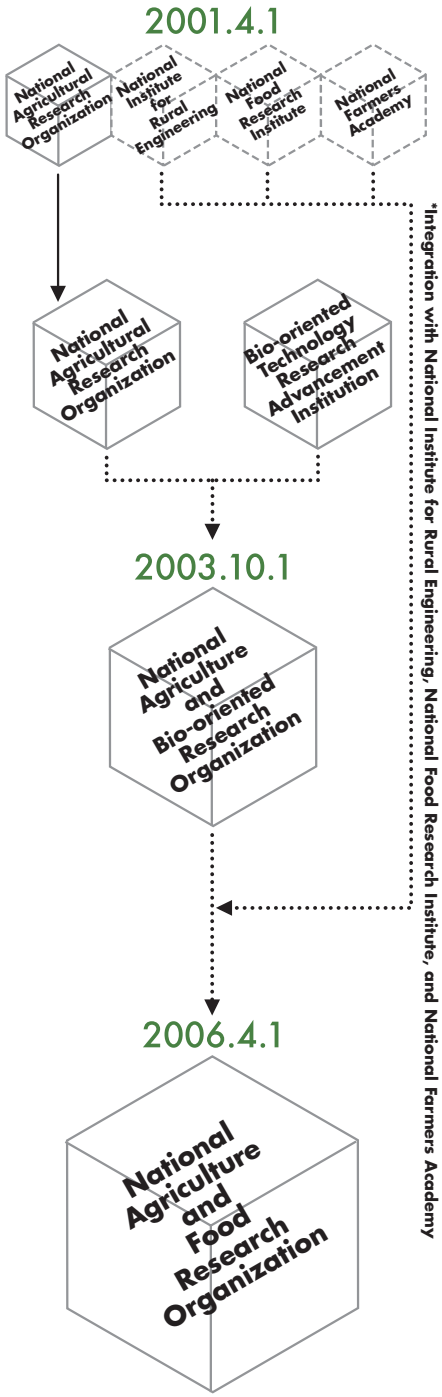
The National Agricultural Research Organization and the Bio-oriented Technology Research Advancement Institution integrated to form the National Agriculture and Bio-oriented Research Organization.

April 1, 2006

The National Agriculture and Bio-oriented Research Organization, National Institute for Rural Engineering, National Food Research Institute, and the National Farmers Academy were integrated to form the National Agriculture and Food Research Organization while retaining the NARO designation.

April 1, 2011

Starting from April 2011, NARO has launched the third mid-term plan (from 2011 to 2015)



Research and Development (R&D) Activities

- The overall R&D objectives are to achieve a Japanese agricultural industry that boasts a high degree of food self-sufficiency and to establish technologies and systems for sustainable, overall growth of agriculture in Japan. R&D to improve productivity and quality of products such as efficient and effective crop rotation for rice production, domestic fodder production for livestock feed, improvement of animal health, and development of high margin horticulture crops.
- R&D for the farming infrastructure not only includes maintenance and improvement of irrigation and farmland, but also enhancement of the living conditions and the multiple benefits of farming communities in line with rural development.
- R&D to elevate consumer confidence in food and farm products is focused on food safety, healthy eating, functional foods, quality enhancement and food processing.
- Fostering and educating the next generation of farmers is based on programs of advanced agriculture technologies and management as well as field training.
- Managing support programs for applied research by private business as well as basic research by universities and public sector to innovate agriculture, forestry and fisheries.
- Integrated research to facilitate agricultural mechanization and approval inspection of machinery.

National Agricultural Research Center

National Agricultural Research Center (NARC)

3-1-1 Kannondai, Tsukuba, Ibaraki, 305-8666
Tel.+81-29-838-8481, Fax.+81-29-838-8484
Hokuriku Research Center : Inada 1-2-1, Joetsu, Niigata, 943-0193
Tel.+81-25-523-4131, Fax.+81-25-524-8578
http://www.naro.affrc.go.jp/

NARC develops basic technologies for innovation in agriculture for Kanto, Tokai, and Hokuriku areas.

Description of research

Development of a new method for converting vegetable oil and waste cooking oil into biodiesel fuel:

The use of biomass resources to replace petroleum as a way to curb to global warming is increasing in many countries. NARC has developed a new method to convert any kind of vegetable and animal oils and fats into biodiesel fuel. This method can even convert high melting point oil and fat into biodiesel. No glycerin is formed in this process which is an advantage for improving the conversion efficiency and simplifying pre-and post-processing. Small scale models are now in operation.

Supercritical methane-type STING-BDF manufacturing equipment

Description of research

Field Server: Monitoring robot

The Field Server is a monitoring robot equipped with a Wi-Fi mesh-network, Web server, LED lighting, a night-shot camera, a solar panel and sensors that allow it to continuously monitor and record environmental conditions such as air-temperature, humidity, solar-radiation and CO_2 concentration. The Field Server is installed like a solar garden light and monitors the environment for the long term as a fixed observation station. Data are sent to the Web through the Internet and can then be used for management of agricultural production and for studies of plant growth, long-term changes of ecosystems and global environment.

A Field Server working in Himalaya with a solar panel.

Description of research

Rotary tilling and ridge-forming implement for avoiding wet injury of soybean.

Damage due to poor field drainage is the most serious problem in cultivation of soybean grown on soils with high clay content. We developed a technology to form and simultaneously seed into a ridged seedbed as a way to improve drainage. A reverse-rotating rotary tiller was constructed by rearranging the rotary blades attached to a modified rotor shaft. This implement produces a ridge that reduces soil compaction and improves drainage. Tillage, ridging, fertilization and seeding can be performed in a single operation by using this all-in-one implement. The system also can be applied to barley, wheat, buckwheat, and vegetable production if the operator adjusts height of ridges by changing the direction of the blades of the rotary tiller.

Rotary tilling and ridge

National Institute of Crop Science

National Institute of Crop Science (NICS)

2-1-18 Kannondai, Tsukuba, Ibaraki, 305-8518
Tel.+81-29-838-8260, Fax.+81-29-838-7488

http://nics.naro.affrc.go.jp/

NICS carries out researches on breeding of rice, wheat, barley, soybean, sweetpotato, and industrial crops, and on the development of new technologies related to their cultivation and quality control.

Description of research

A new rice cultivar "Koshihikari Kanto HD1" - an isogenic line of Koshihikari with very early maturation

NICS has been breeding isogenic lines which show various heading dates to enhance the cropping potential of the rice cultivar. 'Koshihikari Kanto HD1' is a very early-maturing rice cultivar with the genetic background of Koshihikari. Its heading date is 12 days earlier than that of Koshihikari in Tsukuba City. It also shows earlier heading date than Koshihikari in Kochi and Miyazaki prefectures. Its grain quality is same as that of Koshihikari. Eating quality of boiled rice also is same as that of Koshihikari under the early planting cropping system in Kochi and Miyazaki Prefectures

Upper:Plant type of 'Koshihikari Kanto HD1' and 'Koshihikari'
Lower:Kernel and brown rice of 'Koshihikari Kanto HD1'

Description of research

A new soybean cultivar 'Nagomimaru' lacks one of the major allergenic proteins or α subunit of β-conglycin in seeds.

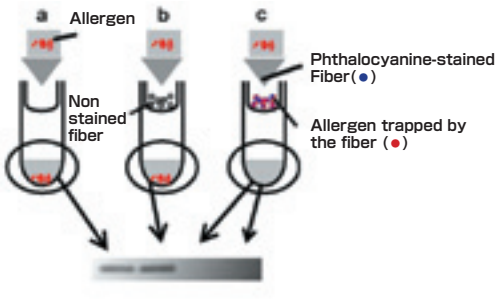
Soybeans and their derivatives commonly elicit allergic reactions in a large segment of the sensitive population. A new soybean cultivar 'Nagomimaru' lacks α subunit of β-conglycinin which is one of major allergic proteins in soybean seeds. By using 'Nagomimaru' with proper processing methods, allergic risks of soybean products could be reduced. Soybean cultivar 'Yumeminori' which also lacks α subunit had been released, but it was not grown practically due to its low yield. 'Nagomimaru' has a yield potential and a lodging resistance as high as those of 'Tachinagaha', a major cultivar in the Kanto district, which will leads the practical cultivation of 'Nagomimaru'

Seeds of 'Nagomimaru'

Description of research

Studies to detect and alleviate allergens

Because an increasing number of patients suffer from allergens, reduction of allergens is critical in processed food and other materials. We have developed a method to quantify adsorption of allergens on solid material. The technique is applied for the commercialization of a next-to-skin wear AllerCatcher AD (Daiwabo Neu), which has been clinically shown to alleviate atopic symptoms for some patients. We have also developed the disulfide proteome technique that can be applied to detect disulfide bonding of proteins. For many allergens, disulfide bonds are considered to contribute to their allergenicity.



Dual-column device is used to investigate adsorption of allergens on fiber.

National Institute of Fruit Tree Science

National Institute of Fruit Tree Science (NIFTS)

2-1 Fujimoto, Tsukuba, Ibaraki, 305-8605
Tel.+81-29-838-6416, Fax.+81-29-838-6437
http://fruit.naro.affrc.go.jp/

With 'Fruit in the diet' as a motto, NIFTS carries out technical development related to the breeding, cultivation, disease and pest control, quality, storage and processing of fruit trees and fruits, as well as basic and fundamental research in support of this effort.

Description of research

Breeding new fruit tree varieties

NIFTS has research bases in areas where each type of Japan's major fruit tree is cultivated, and works to develop new varieties. To date, NIFTS has supported Japan's fruit industry by breeding varieties such as 'Fuji' apple, 'Kosui' Japanese pear, 'Akatsuki' peach, 'Tsukuba' chestnut, and 'Kiyomi' tangor. Recently, it has developed 'Shine Muscat' yellow-green muscat-flavored grapes, 'Porotan' Japanese chestnuts (see photo) that have easily peeled kernels, and the citrus 'Harumi' which is seedless, easy to peel, and provides fresh, delicious and juicy fruit for the table.

'Porotan' Japanese chestnuts

Description of research

Estimation of present and future distribution areas for the Asian citrus psyllid that transmits citrus greening disease

The Asian citrus psyllid is an insect vector that transmits a bacterium causing citrus greening which is the most destructive disease of citrus in Asia. In the southern citrus production areas of Japan, the distribution of the disease and the insect vector have both increased. Global warning is expected to lead to further expansion of their distribution. To estimate the northern limit of distribution of the insect vector, the limiting factors for its reproduction and survival have been investigated. We estimated that the psyllid could now inhabit the southern coastal area of Satsuma peninsula and could spread over the peninsula and Nichinan Coast if the temperature increases by 2° C from global warming of the Kyushu mainland.

Died citrus tree by citrus greenig deasese

Straw-like stylet

Insect vector, Diaphorina citri

Description of research

Development of a tree training system for low tree-height cultivation of apples

As the average age of apple growers increases, so does their need for labor savings and easier work in their orchards. Use of vigorous varieties, such as 'Fuji' with a conventional slenders spindle tree, results in tall trees. NIFTS has successfully lowered tree height by developing a tree training method that distributes scaffold branches soon after permanent planting and controls scion growth so that fruit are borne below two meters. In the future, NIFTS will clarify the combinations of apple varieties and rootstocks that can make low-tree cultivation possible, as well as investigate training methods to maintain lower tree height and the best distribution of branches for ease of work.

Low-tree apple cultivation

National Institute of Floricultural Science

National Institute of Floricultural Science (NIFS)

2-1 Fujimoto, Tsukuba, Ibaraki, 305-8519
Tel.+81-29-838-6801, Fax.+81-29-838-6842
http://flower.naro.affrc.go.jp/

NIFS performs basic and fundamental research related to technical development for breeding, cultivation, environmental impact reduction, distribution, and use of flowers.

Description of research

Carotenoid cleavage dioxygenase contributes to white color formation in chrysanthemum petals

By comparison of genes expressed in white and yellow petals, we found that a gene encoding carotenoid cleavage dioxygenase (CmCCD4a) was specifically expressed in white petals. Petals of a white-flowered cultivar turned yellow after an RNAi construct of CmCCD4a was introduced. These results indicate that in white petals of chrysanthemum, carotenoids are synthesized but are subsequently degraded into colorless compounds.

Transgenic plants of Sei-Marine (white-flowered chrysanthemum cultivar) with their flowers changed to yellow.

Description of research

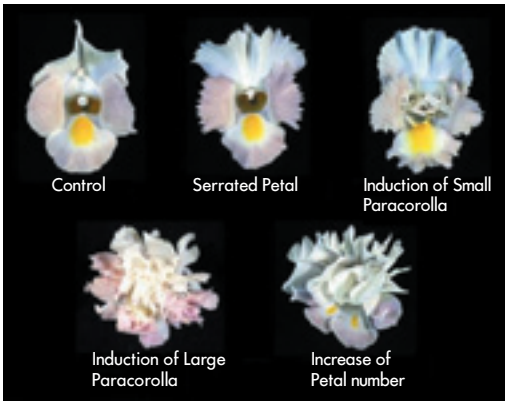
Improvement of flower traits by CRES-T system

CRES-T (Chimeric REpressor gene Silencing Technology) is a novel technology in which a chimeric repressor of a specific transcription factor suppresses the expression of its target gene dominantly even in multiploid plants. Using this procedure, we have succeeded in producing torenias and chrysanthemums with various petal color patterns, flower shapes and leaf shapes.

Description of research

Modification of plant hormone metabolism induces novel flower shapes in torenia

Application of forchlorfenuron, a cytokinin-metabolism inhibitor, induces various new flower shapes in torenia. Those shapes include serrated petal margin, paracorolla formation and increase in petal number. This phenomenon may be used to create new flower morphologies in floricultural crops.



Various Novel Flower Shapes of Torenia Induced by Forchlorfenuran Application

National Institute of Vegetable and Tea Science

National Institute of Vegetable and Tea Science (NIVTS)

360 Kusawa, Ano, Tsu, Mie, 514-2392
Tel.+81-59-268-1331, Fax.+81-59-268-1339
http://vegetea.naro.affrc.go.jp/

NIVTS carries out technical development related to the breeding, cultivation, environmental impact reduction, quality, and distribution of vegetables and tea, as well as supporting basic and fundamental research.

Description of research

Systemization research and testing of low-cost, energy-saving, high-yield production technology using large-scale facilities

In order to bring down the cost of greenhouses, which put financial pressure on management, NIVTS has designed and constructed a prototype tomato greenhouse (about 1,000 m^2) fundamentally different from conventional ones. It uses new thin, light-gauge steel materials, pipe-based foundation engineering, and unit roof construction. The cost and the time required for the construction could be dramatically low. Currently, NIVTS is researching systemization of additional low-cost, energy-saving, high-yield production technology, including autonomous distributed environmental control systems.

Super low-cost, high-eave, large greenhouse using new materials and construction methods

Description of research

'Benifuuki' green tea rich in *O-methylated* catechin with anti-allergic effects

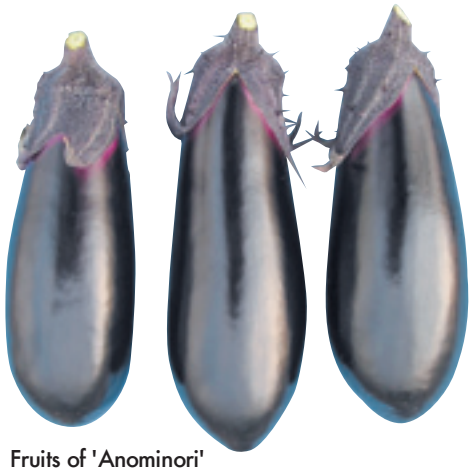
NIVTS found that the anti-allergic *O-methylated* catechin in 'Benifuuki' tea leaves is lost during processing to manufacture black tea, necessitating processing as green tea. *O-methylated* catechin is abundant in fully-mature leaves and in second- and third-crop seasons. The *O-methylated* catechin is easily absorbed in the digestive tract compared with major tea catechin EGCG, and is retained in the blood for long periods. Volunteer testing confirmed its effectiveness against a seasonal allergic disease (Japanese cedar pollinosis) and enhancement of the effect when combined with ginger extract. Further investigation addressed its optimal extraction method as a beverage and methods to reduce the bitterness and astringency of its flavor. The tea leaves are used in drink and snacks marketed by private sector corporations.

'Benifuuki' green tea

Description of research

'Anominori', a parthenocarpic eggplant variety

'Anominori', a parthenocarpic eggplant variety was developed at NIVTS, and was registered as 'Nasu Nourin Kou 4' in 2006. 'Anominori' is the F_1 hybrid. Set and growth of eggplant fruit are often improved by using pollinator insects or by treating flowers with phytohormones to trigger the development of the ovary into a fruit. These techniques are costly and/or labor-intensive. Parthenocarpic varieties are the most cost-effective solution to improve fruit set and growth under sub-optimal environmental conditions. 'Anominori' can produce marketable fruits without treating with phytohormones. The plant characteristics of 'Anominori' are: high plant height, long inter-node, thick stem and large leaves. The immature fruit of 'Anominori' is long egg-shaped, dark purple, glossy and dense.



Fruits of 'Anominori'

National Institute of Livestock and Grassland Science

National Institute of Livestock and Grassland Science (NILGS)

2 Ikenodai, Tsukuba, Ibaraki, 305-0901
Tel.+81-29-838-8600, Fax.+81-29-838-8606
http://nilgs.naro.affrc.go.jp/
Nasu Research Station : Senbonmatsu768, Nasushiobara, Tochigi, 329-2793
Tel.+81-287-36-0111, Fax.+81-287-36-6629

NILGS conducts research for feed and livestock production, animal products, and waste management.

Description of research

Low cholesterol Ibaraki natto eggs - powdered natto for chicken feed

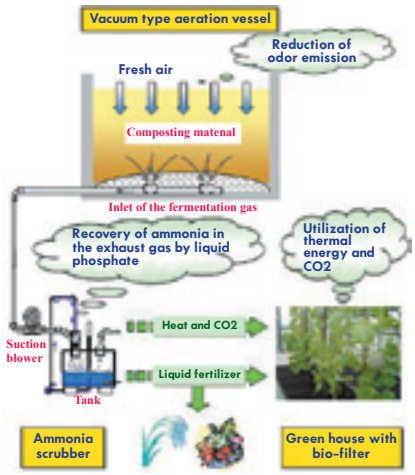
The traditional Japanese food, natto, fermented soybeans with Bacillus subtilis var natto, were dried and powdered. Egg yolk cholesterol contents were reduced more than 20% when the natto powder (1~3%) was added to the laying hens feed. This research is conducted with the Ibaraki prefectural livestock research center and Ibaraki University.

Ibaraki natto egg

Description of research

Composting System with Vacuum-Type Aeration for efficient collection of ammonia

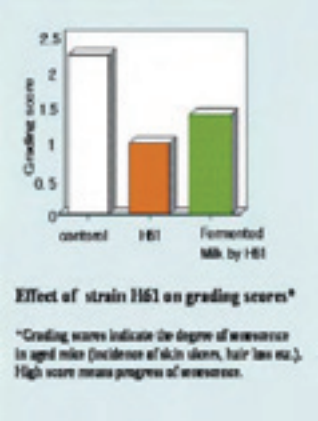
Emission of ammonia during composting of livestock manure or kitchen garbage causes an odor problem when air is emitted from the bottom of compost pile (forced aeration system). Odor emission from the compost pile can be reduced by using the vacuum-type aeration system, which NILGS developed, to remove the gas containing a high concentration of ammonia and transform it into an odorless liquid fertilizer. The exhaust gas, being poor in ammonia and rich in heat, moisture and carbon dioxide is useful for the green house system.



Description of research

Anti-aging effect of a lactococcal strain: analysis using senescence-accelerated mice

Oral administration of *Lactococcus lactis* subsp. *cremoris* strain H61 to senescence-accelerated mice was associated with a suppression of incidence of skin ulcers, and reduced hair loss, compared with controls. Strain H61 shows promise for the development of new functional foods with anti-aging effects.



National Institute of Animal Health

National Institute of Animal Health (NIAH)

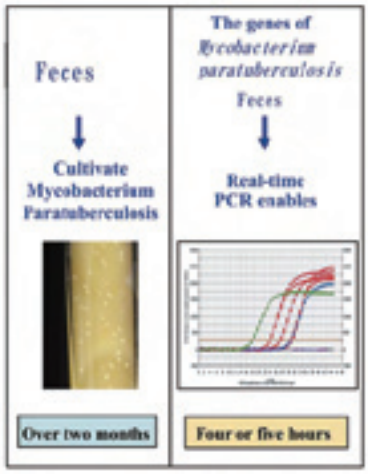
3-1-5 Kannondai, Tsukuba, Ibaraki, 305-0856
Tel.+81-29-838-7713, Fax.+81-29-838-7880
http://niah.naro.affrc.go.jp/index-j.html

With the motto "For animal health, For human health", NIAH promotes research on all aspects of animal disease, contributing to animal health and safe animal products.

Description of research

Molecular diagnosis of Johne's disease based on real-time PCR

Johne's disease (Paratuberculosis), which causes chronic granulomatous enteritis in ruminants through oral infection of *Mycobacterium avium subsp.paratuberculosis* (Map), is designated as an infectious disease by law in Japan.
Its prevention is promoted through diagnosis and elimination. Cases of this disease are gradually increasing, however, improvement in the diagnostic method therefore is urgently required. The conventional diagnostic method takes over two months for isolation, and identification of Map. In contrast, the gene diagnosis method using real-time PCR to detect and measure gene of Map enables us to identify within a few hours those animals that had excreted the organism in their faeces.



Difference between the real-time-PCR gene diagnosing method and the conventional diagnosing method

Description of research

Development of a deep intrauterine insertion catheter for non-surgical embryo transfer in sows

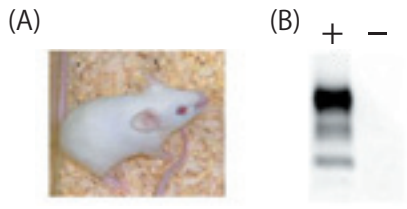
We have developed a catheter for insertion deep into one uterine horn through the cervix of non-sedated sows. With the newly developed catheter, piglets could be obtained by the non-surgical transfer of both in vitro-produced and in vivo-derived embryos. This procedure for non-surgical transfer of porcine embryos offers new possibilities for producing piglets in a farm setting.

Transplantation of embryos using a catheter for injection into a deep part of the uterus

Description of research

Prions in the peripheral nerves of bovine spongiform encephalopathy (BSE)-affected cattle

An abnormal isoform of prion protein (PrP^{Sc}) and prion infectivity were detected in the peripheral nervous system (PNS) of bovine spongiform encephalopathy(BSE)-affected cattle.The data showed that the prion was not limited to the specified risk materials(SRM) in BSE-affected cattle. To determine whether the PNS become positive before or after the central nervous system (CNS) is affected,we investgated PrP^{Sc} distribution in the experimentally BSE-affected cattle.We also found that PrP^{Sc} is detected in the PNS simultaneously,or after,it accumulates in the CNS.
This result shows that a positive BSE test at the brain followed by destruction of the carcass provides greater consumer protection than the removal of SRM alone.



Genetically engineered mousse and PrP^{Sc} detected

National Institute for Rural Engineering

National Institute for Rural Engineering (NIRE)

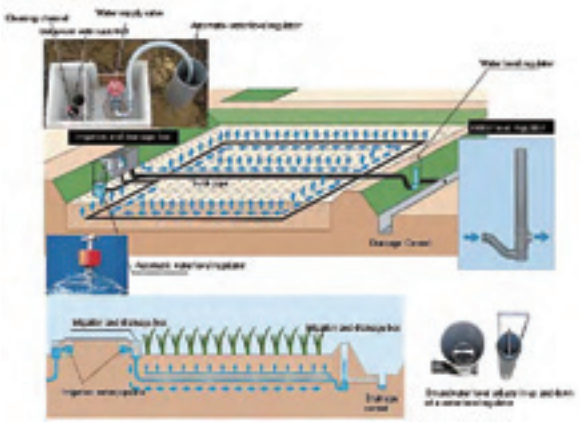
2-1-6 Kannondai, Tsukuba, Ibaraki, 305-8609
Tel.+81-29-838-7513, Fax.+81-29-838-7609
http://nkk.naro.affrc.go.jp/

NIRE performs research in rural development, including technologies for improvement and management of agricultural production infrastructure, community environment, regional resources, and multifunctionality of agriculture and rural communities.

Description of research

Underground water level controlling system "FOEAS", production infrastructure technology correspondent to paddy field and dry field rotation

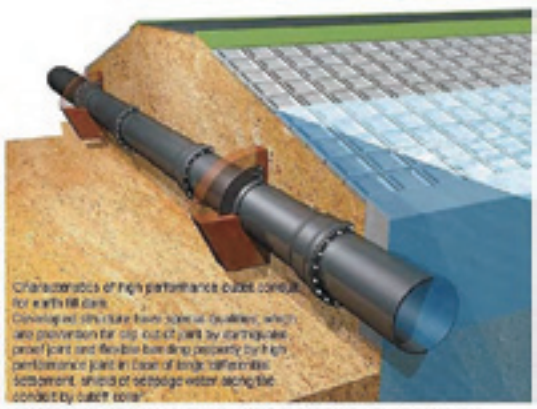
It was difficult for the traditional culvert drainage facilities to control appropriate water level underground that each crop requires according to the each growing period. This is why we have developed the new system "FOEAS", which enables to control drainage functions as culvert, and water level underground as well as over ground for the paddy rice cultivation. By adding auxiliary lines at 1-meter intervals intersecting with the horizontally laid culvert branch pipes underground, it becomes possible to maintain best water level underground uniformly all over the fields.



Description of research

Protection methods and disaster management technology of - water resource facilities for prevention of the rural disasters Prevention

Recently, many irrigation facilities, such as small earth dams, collapse due to earthquakes and heavy rainfalls. These collapses of facilities damage to the safety downstream of the facilities. In order to keep the sustainable agriculture and the safety of rural areas, our laboratory has researched reinforcement technology for small earth dams. We developed flexible structures of outlet pipes which are able to bend when the embankments are settled and deformed. The flexible structures of outlet pipes prevent leakages of water through the pipes and damages induced by earthquakes, and are expected to be used for 20,000 small earth dams which need to be repaired.

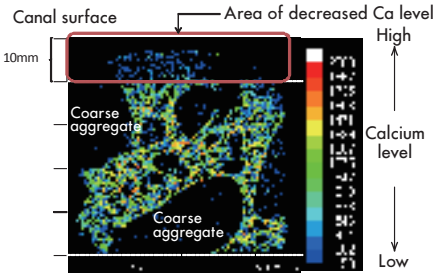


FLEXIBLE OUTLET CONDUIT WITH HIGH PERFORMANCE FOR EARTH FILL DAM

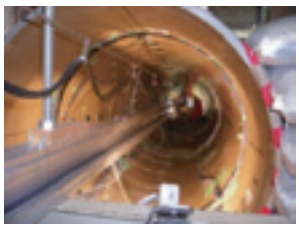
Description of research

Regeneration and conservation technologies of irrigation facilities for diagnosing facilities, predicting the degradation process, and prolonging useful life

In order to prolong the useful life and reduce life cycle costs of irrigation facilities, we are developing methods for diagnosing and monitoring the structural functions of these facilities, as well as methods for estimating their performance. For example, the results of analyses using microanalyzers have shown that over the long term,calcium levels in concrete irrigation canals decrease from the surface down to about 20-30 mm. With this type of monitoring technology, we are developing new repair and reinforcement methods, and low-cost, environmentally-friendly methods to improve these facilities.



Degradation mechanism of canal concrete through decreased Ca level



Traffic loading test of pipeline

National Food Research Institute

National Food Research Institute (NFRI)

2-1-12 Kannondai, Tsukuba, Ibaraki, 305-8642
Tel.+81-29-838-7971, Fax.+81-29-838-7996

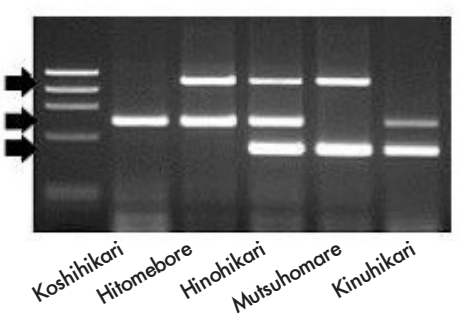
http://nfri.naro.affrc.go.jp/

NFRI engages in basic and fundamental research on scientific analysis of food and health, ensures food safety, and develops innovative technologies for food distribution and processing.

Description of research

Development of DNA makers to quickly and easily identify and distinguish rice cultivars from rice grain or processed rice foods.

NFRI developed the "enzyme-mediated DNA extraction method" to extracting and purify DNA from rice grain or processed rice foods, in which the gelatinized starch and the denatured proteins are degratated by the heat-resistant alpha-amylase andproteinase K.
The extracted DNA is suitable for DNA marker analysis to identify rice cultivars.
This method enables identification of rice cultivars from a single cooked rice grain and can be applied to rice products such as rice cakes and rice crackers.

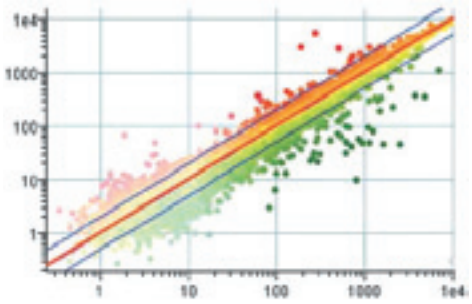


DNA marker analysis using DNAs extracted from a single cooked rice grain

Description of research

Application and control technology of food functionality and development of functional foods

NFRI analyzed gene expression of food component-treated cells (vertical axis) and untreated control cells (horizontal axis). Each spot on the figure shows the expression level of the identified gene. Gene expression may increase (above the red line) or decrease (below the red line) due to the physiological function of a food component.



Analysis of gene expression with DNA microarray
The figures shows an analysis of the growth suppressive effect of a mushroom component on colon adenocarcinoma cells. Red spots show the gene. expression induced by the mushroom component. Most genes don't change expression levels but some genes are markedly induced

Description of research

Production of Certified Reference Materials (CRMs) for Genetically Modified (GM) Crop - For quality control of GM analysis

The production of CRMs requires the construction of a quality system meeting ISO Guide 34 "General requirements for the competence of reference material producers" and ISO/IEC 17025 "General requirements for the competence of testing and calibration laboratories". NFRI produces CRMs consisting of GM and non-GM ground seeds and they are accompanied by certified values for the percentage of GM as quantified by the "Japanese standard method" for GM analysis. NFRI has been accredited as a reference materials producer (ASNITE 0018R) by the National Institute of Technology and Evaluation-International Accreditation Japan (NITE-IAJapan). This facilitates GM analysis provided that the Japanese standard method is properly carried out.

Each NFRI's CRM is provided in a brown glass bottle and accompanied by a certified value.

National Agricultural Research Center for Hokkaido Region

National Agricultural Research Center for Hokkaido Region (NARCH)

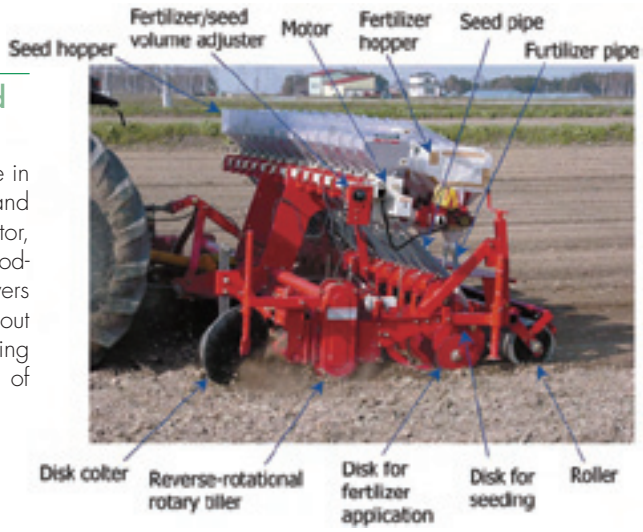
1 Hitsujigaoka, Toyohira, Sapporo, Hokkaido, 062-8555
Tel.+81-11-851-9141, Fax.+81-11-859-2178
http://cryo.naro.affrc.go.jp/

NARCH performs technical development to establish large-scale production systems utilizing the ample land of Hokkaido and to overcome the harsh natural environment.

Description of research

Multi-purpose rotary tillage seeder for rice, wheat, and soybean seeding

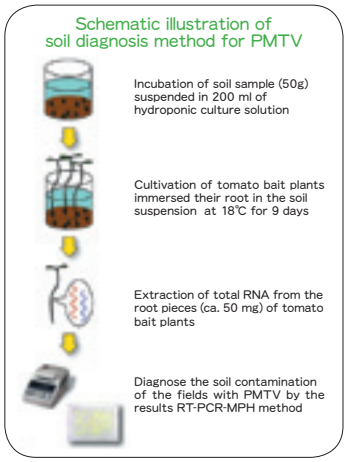
NARCH developed a multi-purpose tillage seeder suitable for general use in sowing paddy rice (direct sowing in dry paddies), wheat, soybeans, and so on. The implement combines a rotary tiller with a fertilizer applicator, seeder, and roller. The tiller is a reverse-rotational rotary type with high clod-breaking capacity. Setting it for shallow tillage depth of 5-8 cm, lowers power requirements and the higher speed results in time savings of about 30 percent compared with conventional rotary tillage seeders. Adopting this equipment increases work efficiency and enables easy expansion of scale.



Description of research

Soil diagnosis by detection of potato mop-top virus using bait plant bioassay and RT-PCR-microplate hybridization

For the first time in 25 years, in November 2005 an incidence of spraing (brown rings or arcs) caused by *Potato mop-top virus* (PMTV) occurred in potatoes (cv. Sayaka) in a field in Tokachi district of Hokkaido, the northernmost island of Japan. In order to study the epidemic of PMTV, we developed a supersensitive soil diagnosis method that consisted of bait plant bioassay for trapping the vector of PMTV, *Spongospora subterranea*, a causal agent of powdery scab of potatoes and reverse transcription-polymerase chain reaction microplate hybridization (RT-PCR-MPH) for detecting PMTV from the roots of bait plants (patent pending). With our method, PMTV was reliably detected from the soil sampled not only in the field from which some of the harvested tubers had the typical symptom of spraing but also in the fields with no incidence of spraing. This method is considered to be useful for survey of soil contamination before planting potatoes, especially on the potato foundation stock seed farm.



Description of research

Colorful potato varieties

Colorful potatoes have been bred that have flesh colors of red, purple or orange-yellow. Anthocyanin pigments are included in red or purple fleshed potatoes, and carotenoid pigments such as zeaxantin etc. are included in orange-yellow fleshed potatoes. These pigments have physiological functionality for human health. Potato anthocyanin pigments elucidate "anti-influenza virus activity" at the level of the test tube and "apoptosis-inducer activity" is elucidated at the level of an animal test. It is expected that availability of new colorful potatoes that are delicious and superior in physiology functionality would reactivate the current market and generate a new demand.


Potato of 'Northern Ruby'


Potato of 'Inca no Hitomi'


Potato of 'Shadow Queen'

National Agricultural Research Center for Tohoku Region (NARCT)

4 Akahira, Shimo-kuriyagawa, Morioka, Iwate, 020-0198
Tel.+81-19-643-3433, Fax.+81-19-643-7794
http://tohoku.naro.affrc.go.jp/

NARCT conducts research and development to contribute to the promotion of regional agriculture making better use of various regional resources and the cool summer temperatures of the Tohoku region.

Description of research

Development of technologies to produce strawberry fruits from summer to autumn in the Tohoku region

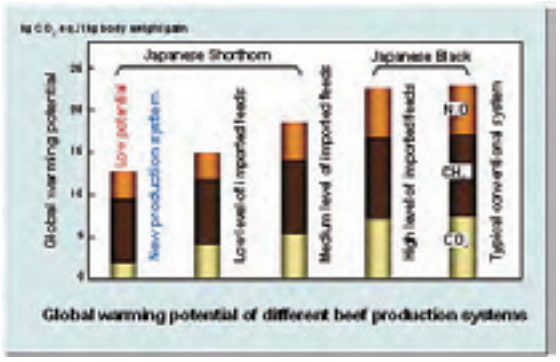
In Japan it is difficult to produce strawberry fruits from summer to autumn because it is too hot and day length is too long to initiate flower buds and set fruit. About 4000 tons of strawberry fruits a year are imported from the USA primarily for cake decoration. Therefore, we developed a new method to produce strawberry fruit from summer to autumn. We utilized the cool summer in Tohoku region in northeastern Japan to grow June-bearing strawberry seedlings after inducing flower initiation with a short-day treatment. Also we developed two ever-bearing strawberry cultivars 'Natsuakari' and 'Dekoruju' which are able to produce fruits with good taste from summer to autumn.

Fruits of 'Natsuakari in July'

Description of research

A new beef production system based on regional feed resources

The conventional system of beef production in Japan is based on feeding imported grain mixtures, which require a large amount of fossil fuel consumption while their transportation from overseas and contribute to accelerating global warming through emitting enormous CO_2. NARCT has developed a new beef production system of Japanese Shorthorn (local cattle breed) based on regional feed resources. This system, composed of grazing in mountainous pasture and subsequent fattening with grass silage, wheat bran and apple juice pulp, enables low cost production of high quality beef and shows low global warming potential.

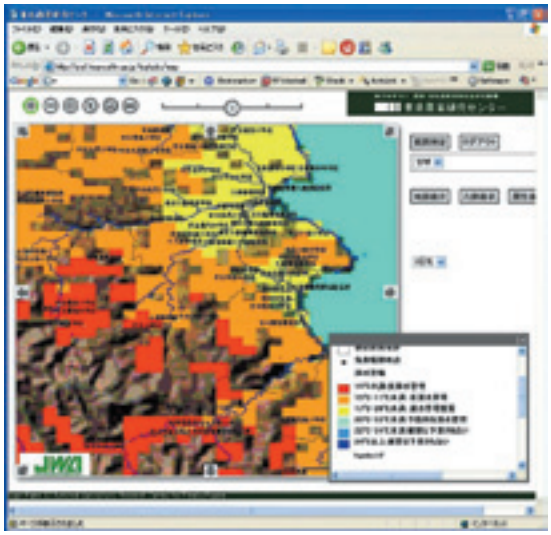


Global warming potential of different beef production systems

Description of research

The information web-system to reduce cold weather damage for crops based on meteorological forecast data

In North-eastern Japan, cold summer weather occurs approximately once in five years since the 1980s. In cold summer, deep flood irrigation is highly effective to protect rice crops from cold weather damage. Using 7 days forecast meteorological data available from the Japan Meteorological Agency, we have developed a web-system which provides downsized forecast data of $1km^2$. By using this information, producers can fill paddy fields with water during sensitive growth stages before cold weather comes. Web contents include: a map of the meteorological data distribution, a forecast of the booting stage and heading dates, and advice concerning deep flood irrigation to protect developing grain from the cold and wind damage.
URL: http://tohoku.dc.affrc.go.jp/yamase.html



Advice map for deep flood irrigation in paddy field. Orange and red colors indicate temperature will fall lower than 17°C and 15°C few days later. It needs to fill water in paddy field for protecting the ear if it's in sensitive growing stage.

National Agricultural Research Center for Western Region

National Agricultural Research Center for Western Region (WeNARC)

6-12-1 Nishifukatsucho, Fukuyama, Hiroshima, 721-8514
Tel.+81-84-923-4100, Fax.+81-84-923-7893
Shikoku Research Center : Senyucho 1-3-1, Zentsuji, Kagawa 765-8508
Tel.+81-877-62-0800, Fax.+81-877-63-1683
http://wenarc.naro.affrc.go.jp/

WeNARC performs technical development to contribute to the vitalization of agriculture in the Kinki, Chugoku, and Shikoku regions with their characteristic sloping land and semi-mountainous areas interspersed with cities.

Description of research

Development of cover crop use and other resource-saving, environment-conserving cultivation management techniques (border management using bark mulch)

WeNARC is developing techniques to introduce cover plants using bark mulch from conifers (crushed cypress and cedar bark) in order to reduce the labor required for weed control along field borders in semi-mountainous areas. Covering the borders with short-statured cover plants can control weed growth and prevent soil erosion. Crushed bark is stable even on slopes and does not hinder the growth of transplanted cover plants, which will spread over the bark as it gradually decomposes.

Field border control using cover plants and bark mulch (crushed cypress and cedar bark)

Description of research

Technical development for greenhouse horticulture production

On sloping land, soil erosion is common due to rain or simply due to gravity. Even inside facilities, soil recovery work is needed every year. However, turning machinery around to various directions involves considerable physical effort and places a strain on worker's hands and arms. WeNARC, therefore, developed a switchback-handle machine for soil recovery, which can be turned without lifting it. Compared with the conventional machines, the developed machine lowers a worker's heart rate during manipulation. The machine is commercially available.

Soil recovering machine for sloping fields realizing safety and labor saving

Description of research

'Haiibuki', a giant embryo rice contains a high level of GABA

GABA (gamma-amino butyric acid) has been found to have an effect to normalize blood pressure and anti-stress effects. When brown rice is soaked in water, its embryos produce GABA. 'Haiibuki' has 2 to 3 times larger embryos and accumulates at least twice as much GABA as general varieties. Because a high amount of embryos remains after polishing, 'Haiibuki' can be used as partially polished rice. It is suitable for cooking scramble rice dish as a vinegary rice mixed with various vegetables or fish, or rice dishes including additional seasonal ingredients.

National Agricultural Research Center for Kyushu Okinawa Region

National Agricultural Research Center for Kyushu Okinawa Region (KONARC)

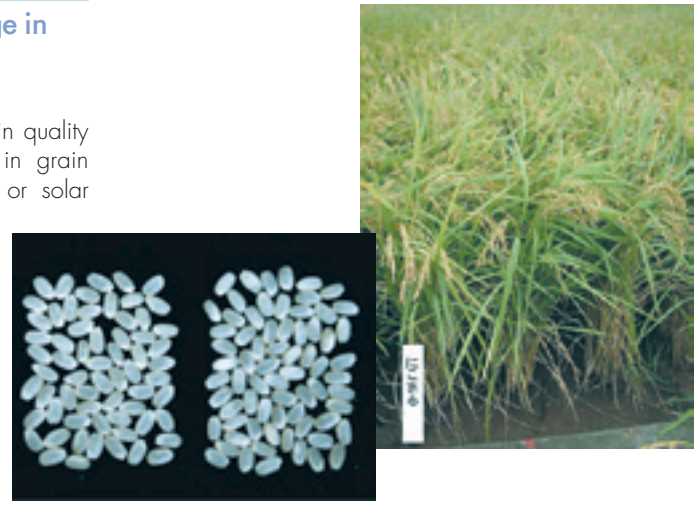
2421 Suya, Koshi, Kumamoto, 861-1192
Tel.+81-96-242-1150, Fax.+81-96-249-1002
http://konarc.naro.affrc.go.jp/

KONARC carries out technical development for agricultural and rural development in harmony with nature and society in Kyushu and Okinawa and for improved agricultural productivity.

Description of research

"Nikomaru", a new rice variety tolerant to damage in grain appearance caused by high temperature in ripening period

A main rice variety "Hinohikari" in Kyushu has a severe problem in quality due to an increase of chalky immature grain. This damage in grain appearance is considered to be caused by high temperature or solar radiation shortage in the ripening period. "Nikomaru" is a new rice variety which exhibits an outstanding grain filling ability and excellent grain appearance under high temperature weather conditions. Furthermore, compared to "Hinohikari", "Nikomaru" shows higher yield and milling ratio. Its grain shows lower protein content and equivalent palatability. Therefore, "Nikomaru" is attracting the attention of rice merchants and the food service industry.



'Nikomaru' 'Hinohikari'

Description of research

Development of the 'Suioh' sweetpotato and research on its functionality

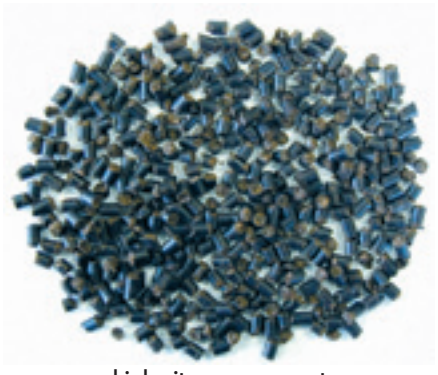
KONARC developed the 'Suioh' sweetpotato variety, which provides a high yield of delicious edible leaves and petioles. 'Suioh' leaves are rich in vitamins, minerals, and other nutrients. They contain much more of the functional ingredients, polyphenol and lutein, than other vegetables.

'Suioh' sweetpotato

Description of research

Odor emission control and high nitrogen organic fertilizer production system in the cattle manure composting facility using compost deodorization

Composting is one of the prevalent methods for manure management, however, great amounts of ammonia are emitted. By using the compost deodorization system developed by KONARC, the emitted ammonia from the fermentation reactors is trapped into the finished compost, thus the nitrogen can be recycled as a nutrient. The nitrogen concentration of the finished compost was increased from 2% DM to 6-7% DM, and the relative efficiency of fertilizer for nitrogen was increased from 30% to 70%. The high nitrogen compost can be used for open-field vegetable cultivation and soybean cultivation in organic agriculture. Pelletizing the compost can reduce the cost of preservation, transportation and fertilization because the weight and volume are reduced to 40-60%. KONARC has started to develop a low cost organic fertilizer using the high nitrogen compost produced by the compost deodorization system.



high nitrogen compost

Bio-oriented Technology Research Advancement Institution (BRAIN)

1-40-2 Nisshincho, Kita, Saitama, Saitama, 331-8537
Tel.+81-48-654-7000, Fax.+81-48-654-7129
http://brain.naro.affrc.go.jp/

BRAIN performs support work for basic research on bio-oriented technology. In order to promote private-sector research on bio-oriented technology, it engages in contracted research and in support work. It carries out experimental research, surveys, inspections, and evaluations related to the promotion of agricultural mechanization.

Description of research

Development of self-propelled harvesting baler

A self-propelled harvesting baler with outstanding maneuverability in soft fields is being developed. The machine can harvest and chop diverse forage crops, i.e., maize, wilting grass and forage rice, and at the same time form them into a roll bale with little loss. The attachments for the harvesting unit of the machine can be changed in order to apply to variable forage crops.

Bale wrapper

Self-propelled harvesting baler equipped with the attachment for forage rice

Description of research

Development of a robot strawberry harvester

BRAIN is developing a robot strawberry harvester that will pick only red berries and will not damage them. It consists of a visual recognition unit (eyes), manipulator units (arms), end-effector units (hands), and a movement unit (legs). Because the robot will be able to work automatically at night, it will create major labor and time savings in strawberry production.

Development of a robot strawberry harvester

Description of research

Support for basic research on bio-oriented technology

Bio-oriented Technology Research Advancement Institution (BRAIN) provides funds to the following kinds of research, in order to help advancement of agriculture, forestry, fisheries, food industries, and their correlative industries:

1) Research in the utilization stage conducted by private sectors
2) Research for developing the early stages of innovative technologies which lead to developing the technologies into the application stage and creation of new businesses conducted by universities, public research institutes, private companies and independent administrative agencies

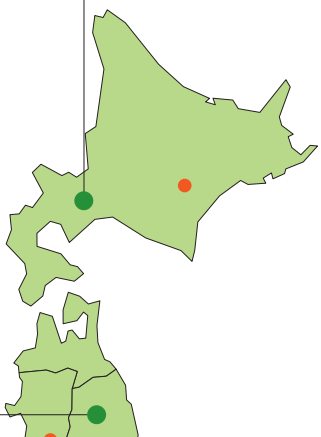
BRAIN also provides research support services, such as recommendation of collaborators for joint research, arrangements for the acquisition of genetic resources, and other various information services.

Locations of the National Agriculture and Food Research Organization

National Agricultural Research Center for Hokkaido Region

Bio-oriented Technology Research Advancement Institution

National Agricultural Research Center for Tohoku Region



● Research Station of regional research centers

National Institute of Vegetable and Tea Science

National Agricultural Research Center for Kyushu Okinawa Region

National Agricultural Research Center for Western Region

Organizational Structure

- Headquarters
- National Agricultural Research Center
- National Institute of Crop Science
- National Institute of Fruit Tree Science
- National Institute of Floricultural Science
- National Institute of Livestock and Grassland Science
- National Institute of Animal Health
- National Institute for Rural Engineering
- National Food Research Institute


National Agricultural Research Center


National Institute of Crop Science


National Institute of Fruit Tree Science


National Institute of Floricultural Science


National Institute of Livestock and Grassland Science

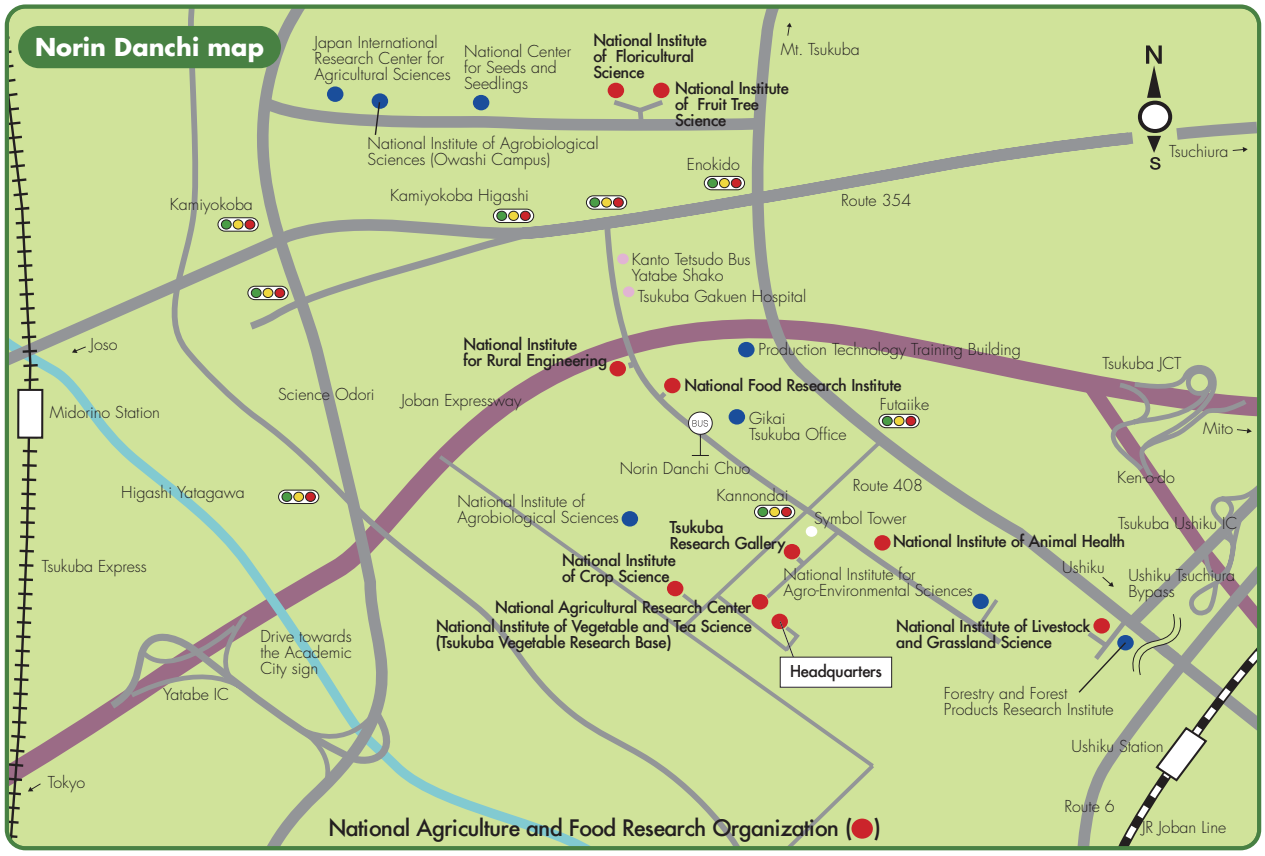

National Institute of Animal Health


Headquarters


National Institute for Rural Engineering


National Food Research Institute

Access to Headquarters



Transportation Access

By train

JR Joban Line, Ushiku Station
(Please check JR East timetable.)

Tsukuba Express, Midorino Station
(Please check Tsukuba Express timetable.)

By bus

Kanto Tetsudo bus from Ushiku Station West Exit
Take a bus for Daigaku Byoin, Yatabe Shako, Seibutsuken Owashi Campus, Tsukuba Bus Center, or Daigaku Chuo.
Get off at Norin Danchi Chuo (about 20 minutes)

Kanto Tetsudo bus from Midorino Station
Take a bus bound for Yatabe Shako, Norin Danchi Chuo, and Enokido Get off at Norin Danchi Chuo (about 15 minutes)
*Note: Buses do not run on weekends & holidays

By car

About 5 km from Yatabe IC
About 4 km from Tsukuba Ushiku IC

National Agriculture and Food Research Organization (NARO)

Kannondai 3-1-1, Tsukuba, Ibaraki, 305-8517
Tel.+81-29-838-7699, Fax.+81-29-838-8989
URL. http://www.naro.affrc.go.jp/
E-mail: www@naro.affrc.go.jp

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Planning/editing: National Agriculture and Food Research Organization