



新潟大学・刈羽村先端農業バイオ研究センターの概要と活動実績

Outline and Activities of Niigata University Kariwa Village Advanced Agro-Biotechnology Research Center

概要

大気中CO₂の濃度は1750年(280ppmv)以降から急速に増加し、2015年には400ppmvに達しています。CO₂の濃度上昇は、温暖化のみならず、イネの植物体温を上昇させ高温障害を悪化させる事が知られています。実際、2010年夏季は各所で観測史上例を見ない猛暑となり、新潟県でもブランド米コシヒカリの生産に大打撃を被りました。

Overview

CO₂ concentration in the atmosphere has rapidly increased since 1750 (280ppmv), reaching 400ppmv in 2015. It is well known that this increase in CO₂ not only causes global warming, but also increases plant body temperature and exacerbates heat injury. In the summer of 2010, in fact, Japan experienced temperatures nationwide that were the highest in recorded history and which significantly damaged Niigata's Koshihikari brand rice harvest.

1 背景 Background

- 大気 CO₂濃度上昇による地球温暖化
- イネの高温障害多発による収量・品質の低下
- 高温・高 CO₂環境再現可能な研究施設の不足
- Global warming due to increasing CO₂ levels in the atmosphere
- Decrease in rice yield and quality due to frequent high-temperature injury
- Lack of research facilities capable of reproducing high-temperature, high-CO₂ environments

2 目標 Objectives

- 高温・高 CO₂環境に適応する次世代イネの開発
- 地域農業の振興および環東アジアを見据えた先端農業バイオ国際教育研究拠点の形成
- Development of next-generation rice adapted to high-temperature, high-CO₂ environments
- Establishing the international research and education center of excellence for advanced agro-biotechnological research toward the promotion of regional agriculture as well as in the world including the East Asian Rim.

事業実施体制

2012年10月1日に刈羽村が整備した複合施設「びあパーク」とりおんほ」内に、本学と刈羽村との連携融合事業として「新潟大学・刈羽村先端農業バイオ研究センター」のサテライト施設を開所しました。

Project Implementation System

Niigata University established a KAAB satellite at Peach & Agriculture Park Tourinbo, a complex developed by Kariwa Village on October 1, 2012, as a collaborative integration project promoted by the university and Kariwa Village. Featuring cutting-edge technologies, this Research Center is equipped with a Biodome and experiment buildings that have highly-functional greenhouses for the conduct of a wide range of studies such as the development of rice with high-temperature and CO₂ tolerance as a measure against global warming, that contribute to the promotion of agricultural in the world and the communities.

3 取り組み Approaches

サテライト実験施設の整備と共同利用
国内外の研究機関、企業との連携強化
Establishment and shared use of a satellite experimentation facility
Enhancement of cooperation with research institutions and companies in Japan and overseas

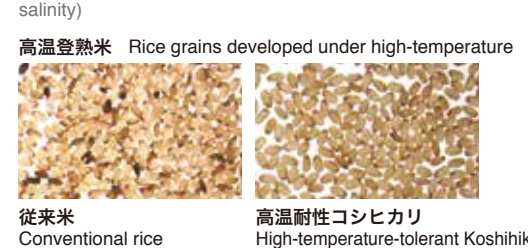
国際交流の推進
海外の大学、研究機関との国際交流協定の締結
Promotion of international exchange
Conclusion of international exchange agreement with overseas universities / research institutes



イネの高温・高 CO₂・乾燥・塩応答に関する基礎研究
米粒の品質に関わる複合ストレス応答を解明
Fundamental research on the response of rice to high temperatures, high CO₂ levels, drought, and salt
Elucidation of multi-stress response affecting rice grain quality



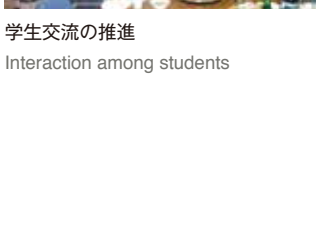
複合ストレス耐性イネ開発と栽培管理プロトコル確立
高温耐性コシヒカリを開発することに加え、世界の劣悪環境(高温・高 CO₂・乾燥・塩害)に適応する次世代イネを開発
Development of multi-stress-resistant rice and establishment of cultivation management protocol
Development of high-temperature-tolerant Koshihikari rice and next-generation rice adaptable to the world's harsh environments (high temperatures, high CO₂ levels, drought, salinity)



作物の糖代謝に関する国際共同研究
International joint research projects on carbohydrate metabolism in crops



学生交流の推進
Interaction among students



国際共同研究 International joint research projects

【Horizon 2020 / ExpoSEED】
作物における種子収量の分子制御の探索
Exploring the molecular control of seed yield in crops

【SICORP / EIG CONCERT-JAPAN】
気候変動下における穀物資源の利用効率化に関する包括研究
Towards a multi-approach study focused on Improving Resource Use Efficiency in Cereals under Climate Change (IRUEC)

植物病原体：環境条件の変化の下における真菌を用いた作物の収量と品質の向上法
Phytopathogens: a good Opportunity to Improve crop yields and quality under changing Environmental conditions (POISE)



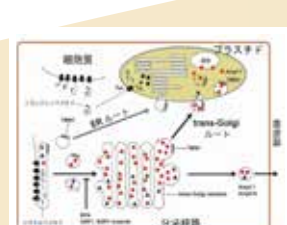
●機能タンパク質の新奇プラスチック輸送、局在化経路の発見(新潟大学が本分野を牽引)
Discovery of alternative transport mechanisms and targeting pathway of functional protein to plastids (Niigata University plays a leading role in this field)

●高機能イネの作出(特許・品種登録への出願、マスコミ等を通じた社会への発信)
Creation of highly functional rice (Proactively publicized through application for patents and variety registration, the mass media, and other channels)

●産学官の研究開発プラットフォームおよびコンソーシアムによる共同研究(「遺伝子解析を活用した農産物の品質予測技術開発」「植物耐熱性向上資材研究開発」)
Joint research in the industry-academia-government R&D platform and by consortiums ("Development of technologies to predict the quality of agricultural produce using gene analysis" "research and development of materials to improve thermotolerance in plants")

●国際共同研究の推進(ExpoSEED, SICORP / EIG CONCERT-Japan(POISE, IRUEC))
Promotion of international joint research projects : SICORP / EIG CONCERT-Japan (POISE, IRUEC), ExpoSEED

●学生交流の推進(研究留学生の受入と派遣)
Promotion of student exchanges (Acceptance and dispatch of research students)



5 期待される効果 Expected impact



研究成果を地域および世界に還元

Returning research results to communities and the world

- 高温・高CO₂耐性コシヒカリ・越淡麗(新潟県を代表する米)の開発を通じて地域未来創生に寄与
- 複合ストレス耐性イネの開発を通じて環東アジアを含む世界の農業人材の育成に貢献
- Contribution to the creation of the future of the region through the development of Koshihikari and Koshitanrei (representative sake rice of Niigata Prefecture) that are tolerant to high temperatures and high CO₂ levels
- Contribution to the development of agricultural human resources in the East Asian Rim and other areas of the world, through the development of multi-stress-tolerant rice



伊藤 紀美子 いとう きみこ
 新潟大学農学部 教授
 バイオテクノロジーを用いて、新奇構造・物性をもつコメデンブンの開発を行っています。また、イネの高温応答の分子メカニズムを翻訳後修飾因子の研究から解明することを目指しています。

高橋 能彦 たかはし しのぶ
 新潟大学農学部フィールド科学教育研究センター 教授
 圃場における栽培技術を基盤としています。主要な研究テーマは、水稲の高温質化および水田転作作物や野菜の高温質・増収のための肥培管理方法の開発です。

中野 和弘 なかの かずひろ
 新潟大学農学部 教授
 近年、バイオマスエネルギー源として注目されている微細藻類について、太陽日射の少ない日本海側で効率よく培養する技術の開発を行っています。

中野 優 なかの まさる
 新潟大学創生学部・農学部 教授
 花き園芸植物を材料に用いて、組織培養による優良個体や絶滅危惧植物の増殖、および胚救出や遺伝子組換えによる新奇なオリヅナ品種の育成を目指して研究を行っています。

大竹 憲邦 おおたけ のりくに
 新潟大学農学部 准教授
 ダイズ種子の窒素代謝や貯蔵物質の集積調節機構の解明、窒素固定活性の調節機構の解明など、高品質ダイズの栽培技術に資する基礎的研究を進めています。

狩野 直樹 かのう なおき
 新潟大学工学部 准教授
 バイオマス等の天然資源をベースにした環境修復 環境に低負荷で低コストであるバイオマスにベースにした取替剤の開発や植物を利用したファイトレメディエーションにより、重金属や放射性核種等の汚染物質を効率よく除去・回収する手法を確立することを目指しています。

金古 聖太郎 かねこ けんたろう
 新潟大学農学部 助教
 高温環境下で発生するイネの登熟白濁米の発生、抑制機構のプロテオミクス解析をもとに高品質なコメの生産に向けた研究を行っています。

古賀 彩 こが あや
 新潟大学農学部 特任助教
 ゴルジ体-プラスチド間の膜交通メカニズムの解明と、これを利用した高効率プラスチドタンパク質蓄積技術の開発を目指しています。

バスマル マルワン
 新潟大学農学部 特任助教
 (1)植物-微生物間の相互作用と植物の成長と品質を促進させる環境シグナル、(2)穀類の気候変動に反応する分子メカニズム、(3)シグナル伝達経路のクロストークによる植物の成長と発達を制御するメカニズムについて研究しています。

高松 壮 たかまつ たくし
 新潟大学農学部 特任助手
 新たな育種標的としてオルガネラゲノムに着目し、イネオルガネラゲノムの次世代シーケンサーを用いた多様性解析ならびに突然変異導入法の開発に取り組んでいます。

Kimiko Itoh
 Professor, Faculty of Agriculture, Niigata University
 I am applying biotechnology in the development of rice starch that has novel properties and structure. I am also trying to clarify heat response mechanisms in rice at the molecular level through the study of posttranslational modification factors.

Yoshihiko Takahashi
 Professor, Field Center for Sustainable Agriculture and Forestry, Faculty of Agriculture, Niigata University
 I study on a cultivation technology with nutrient management in the farmland. The main research theme is high quality of rice production and increase of switch crop / vegetable from rice culture.

Kazuhiro Nakano
 Professor, Department of Production and Environmental Science, Faculty of Agriculture, Niigata University
 I am involved in technological development for the effective culturing of microalgae, which has attracted attention as a biomass energy source, on the Sea of Japan side where the amount of solar radiation is limited.

Masaru Nakano
 Professor, College of Creative Studies / Faculty of Agriculture, Niigata University
 Propagation and Breeding of Ornamental Plants Utilizing Biotechnology
 I am engaged in studies on propagation and conservation of valuable and endangered plants by tissue culture, and on production of novel cultivars through embryo rescue and genetic transformation in ornamental plants.

Norikuni Ohtake
 Associate Professor, Faculty of Agriculture, Niigata University
 Our field of study includes investigation mechanism of soybean seed nitrogen metabolism and storage compounds, and of nitrogen fixation control. A purpose of our study is to provide a cultivation technology of high quality soybean through a physiologic study.

Naoki Kano
 Associate Professor, Faculty of Engineering, Niigata University
 Environmental Remediation based on Natural Resources such as Biomass
 I am engaged in technological establishment for the effective removal and recovery of pollutants such as heavy metals and radioactive nuclides by developing environmentally-friendly and low-cost adsorbents based on biomass and by applying phytoremediation.

Kentaro Kaneko
 Assistant Professor, Faculty of Agriculture, Niigata University
 I study on proteomics for the development and suppression mechanism of rice chalky grains which occurs in high temperature condition. And, I am aiming to produce high quality rice in global warming.

Aya Koga
 Specially Appointed Assistant Professor, Faculty of Agriculture, Niigata University
 I am trying to elucidate the membrane transport mechanism between the Golgi apparatus and plastid and to develop high efficiency plastid protein storage technology using this mechanism.

Marouane Baslam
 Specially Appointed Assistant Professor, Faculty of Agriculture, Niigata University
 I am conducting seminal work in the fields of: (1) plant-microbe interactions and their responses to other environmental signals to promote plant growth and quality, (2) studying the molecular mechanisms -employing systems biology approaches- involved in the response of plants to climate change, and (3) understanding how signaling pathways interact to regulate plant growth and development.

Takeshi Takamatsu
 Specially Appointed Assistant, Faculty of Agriculture, Niigata University
 For understanding the rice organelle genome as a novel breeding target, my current research is to reveal genome diversity by Next-Generation Sequencing and develop technology for mutation induction in rice organelle genome.



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研究業績、各教員の研究テーマやフォーラム、国際シンポジウムなどの詳しい情報はKAAB webサイトをご覧ください。
<https://www.agr.niigata-u.ac.jp/~nkariwa/>

刈羽バイオ Kariba Bio Research Center

先端バイオを地域へ、世界へ

Advanced Agro-biotechnology, to the Region and the World.



新潟大学・刈羽村先端農業バイオ研究センター

Niigata University Kariwa Village
 Advanced Agro-Biotechnology Research Center



三ツ井 敏明 (みつい としあき)
 KAABセンター長 新潟大学農学部 教授
 イネの澱粉代謝制御機構やゴルジ体-プラスチド間膜交通メカニズムの解明、これらの基礎研究を通じて高温・高CO₂登熟耐性を有する美味いコシヒカリの開発を進めています。

Toshiaki Mitsui
 KAAB Director
 Professor, Faculty of Agriculture, Niigata University
 I am engaged in the development of tasty heat- and CO₂-tolerant Koshihikari rice through fundamental research to clarify the regulation of starch metabolism in rice, and the mechanism that governs membrane traffic between Golgi apparatus and plastids.

Researcher ID N-9773-2017
 Orcid ID 0000-0002-9165-8830

The KAAB Research Center aims to form international research and education bases where researchers and students from both inside and outside Japan pursue learning and research, with the satellite experimentation facility in Kariwa Village, which was jointly constructed by Niigata University and the village, playing the central role. International joint research projects led by our Center's operating committee members are actively carried out. Projects that we take part in include the joint research project in the field of Food Crops and Biomass Production Technologies, which is organized by EIG-CONCERT-Japan, and which is conducted as part of the Strategic International Collaborative Research Program (SICORP) promoted by the Japan Science and Technology Agency (JST). We are also taking part in the Horizon 2020 ExpoSEED project, coordinated by the Council for Agricultural Research and Analysis of the Agrarian Economy (CREA) of Italy. In addition, we are working to establish an academic exchange agreement with the Spanish National Research Council (CSIC), the third largest public institution dedicated to research in Europe, and the Umeå Plant Science Centre, Sweden (a joint establishment of Umeå University and the Swedish University of Agricultural Sciences). We are also making steady progress with exchange programs with the North Africa region, including Cadi Ayyad University, Morocco. In this way, the KAAB Research Center has been promoting internationalization successfully and steadily. Currently, researchers and students from various countries, including Sweden, Spain, Italy, Morocco, Brazil, Egypt, Thailand, Bangladesh, Malaysia, Russia, and China, are involved in KAAB's various research projects, including the research and development of next-generation rice adapted to environments under multiple stresses, such as high temperatures and high CO₂ levels. Needless to say, we actively conduct joint research with other universities and research institutions in Japan, as well as with companies and public research organizations inside and outside Niigata Prefecture, through various platforms and consortiums, to address various regional issues, and to work to build agro-biotechnological research and education bases with an eye toward the promotion of agriculture, both locally and throughout the East Asian Rim. We appreciate your continued support and cooperation for the operation of the Kariwa Village Advanced Agro-Biotechnology Research Center.

沿革 History

- 2005.05 ● 新潟大学自然科学系附属「地域連携先端医療・科学センター」設置 (2005~2008年度)
 The Regional Collaboration Center for Advanced Medicine and Science was established as an institution affiliated with the Institute of Science and Technology of Niigata University (2005-2008 academic years).
- 2006.11 ● 新潟大学と刈羽村との間で包括連携協定締結
 A comprehensive partnership agreement was established between Niigata University and Kariwa Village.
- 2009.05 ● 「地域連携先端医療・科学センター」を発展的に解消し、農業バイオ研究に特化した「新潟大学・刈羽村先端農業バイオ研究センター」を新潟大学自然科学系附属コア・ステーションとして設置
 The Regional Collaboration Center for Advanced Medicine and Science was dissolved to establish Niigata University Kariwa Village Advanced Agro-Biotechnology Research Center, an institution specializing in agro-biotechnological research, as a "Core Station" affiliated with the Institute of Science and Technology, Niigata University.
- 2012.09 ● 刈羽村地域共生事業「びあパークとうりんぼ」竣工
 Peach & Agriculture Park Tourinbo was completed as part of Kariwa Village's community coexistence program.
- 2012.10 ● 刈羽村バイオドーム・バイオ実験施設 開所
 The Kariwa Village Biodome and Biotechnological Experiment Facility was opened.
- 2013.04 ● 文部科学省より国立大学法人運営費交付金 交付
 Funding from MEXT Management Expenses Grants for project "Research and development of next-generation rice adapted to high temperature and CO₂ environments".
- 2014.02 ● 高性能閉鎖温室 1 が完成
 Highly-functional Closed-system Greenhouse 1 was completed.
- 2014.12 ● 高温・高CO₂耐性イネ「コシヒカリ新潟大学 NU1号」品種登録出願 (出願番号 29817、出願年月日 2014.12.25)
 Application for variety registration "Koshihikari Niigata Univ. NU1" Rice adapted to high temperature and CO₂ environments. (Application No.29817, Date of filing of application 25/12/2014)
- 2015.01 ● 高性能閉鎖温室 2 が完成
 Highly-functional Closed-system Greenhouse 2 was completed.