2013年度より運営費交付金を得て、国内外の研究機関と連携しながら植物 の高温・高CO2応答機構を研究・解明し、高温・高CO2耐性を有する次世代イネ を開発するとともに、国内外の学生が共に学び研究する国際的な教育研究拠点 形成を目指すプロジェクトが行われています。

Overview

CO₂ concentration in the atmosphere has rapidly increased since 1750 (280ppmy) reaching 400ppmy 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 Koshiikari brand

Using funding made available from 2013, many projects have been implemented in cooperation with research institutions in Japan and overseas to form international research and education bases for students in and outside of Japan such as a project to clarify the mechanisms of high temperature and CO₂ response and a project initiated to produce next-generation rice with tolerance to heat and CO₂

📕 큤 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 vield and quality due to frequent high-temperature injury

 Lack of research facilities capable of reproducing high-temperature, high-CO2 environments

●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

the promotion of regional agriculture as well as in the world

2012年10月1日に刈羽村が整備した複合施設「ぴあパーク とおりんぼ」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。

当センターでは高機能の温室群であるバイオドームと実験棟を備え、先端科学技 術により、世界的な課題である気候温暖化への対策としての高温・高CO₂耐性のあ る水稲開発等、世界と地域の農業振興に貢献する研究を行っています。

事業実施にあたり、刈羽村との連携の他 国・県の研究機関の他、企業と連携して います。また国外の大学・研究機関と連携して事業に関係する国際共同研究や交流 を実施しています。これらの事業統括のために運営委員会を組織し、フォーラムや国 際シンポジウムの開催、成果報告会を行っています。また、アドバイザリーボードによ る評価とアドバイスを、事業に反映させています。

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

In this project, we are collaborating with companies as well as national research institute, prefectural research institute, and Kariwa village. We also collaborate with overseas universities and research institutes to conduct international collaborative research and exchange related to the projects. We organize a management committees for the progect implementation, and hold KAAB forums and KAAB international symposiums, and annual meeting for report the progress and outcome. In addition, the external and internal advisory boards provide us with expert advice and evaluation, and support in improvement of the project's final results.

サテライト実験施設の整備と共同利用

Enhancement of cooperation with research institutions and

国内外の研究機関、企業との連携強化

Establishment and shared use of a satellite

新潟県農業総合研究所 (独)農業・食品産業技術

- ●高温耐性イネに関する共同研究 ●イネ高温登熟性改良
- National Agriculture and Food Research Organization (NARO), Hokuriku Research Center

総合研究機構北陸研究センター

Joint research on high-temperature-tolerant rice Improvement of high-temperature tolerance levels during grain filling in rice

- ●次世代イネの開発
- ●品種登録・栽培普及
- Niigata Agricultural Research
- Development of next-generation rice Promotion of variety registration & cultivation

Cooperation systems

他研究機関・企業

- 品質予測技術開発

technologies for agricultural produce

- in high-temperature, high-CO₂
- thermotolerance in plants

Comprehensive Partnership Agreement

新潟大學 KAAB

- ●高温・高 CO₂環境下における農産物の
- ●植物熱耐性資材開発
- Other research institutes and companies Development of quality prediction

Development of materials to improve

●機能タンパク質の新奇プラスチド輸送、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」「植物熱耐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))

[Horizon 2020 / ExpoSEED]

作物における種子収量の分子制御の探索

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

focused on Improving Resource Use

Efficiency in Cereals under Climate

Towards a multi-approach study

Change (IRUEC)

Exploring the molecular control of seed yield in crops

[SICORP / EIG CONCERT-JAPAN]

Promotion of international joint research projects: SICORP / EIG CONCERT-Japan (POISE, IRUEC), ExpoSEED

国際共同研究 International joint research projects

●学生交流の推進(研究留学生の受入と派遣)

UPNA

スウェーデン

Umeå Plant Science

Centre, Sweden

Universidad Pública

de Navarra, Spain

スペイン CSIC

Council (CSIC)

Center, Spain

upna

International Exchange Agreements

スウェーデン

Umeå 大学

Umeå University,

イタリア CREA

Research Center, Italy

carbohydrate metabolism in crops

CREA-Genomics

Spanish National Research

Biotechnology Research

Promotion of student exchanges (Acceptance and dispatch of research students)

高温・高 CO2・乾燥・ 塩応答機構の学術的理 解に貢献

Contributing to the academic understanding of mechanisms to respond to high temperatures, high CO₂ levels, drought, and salinity

高温·高 CO2·乾燥 塩への複合ストレス耐 性イネを開発

Development of rice varieties resistant to the stress caused by the ombination of high temperatures, high CO2 levels, drought, and salinity

地域密着型の教育効 果による農力を有する 人材の輩出

Community-oriented educationa benefits, producing people with agricultural skills

国際的な教育研究拠点

Niigata University Kariwa Village Advanced Agro-Biotechnology Research Center

Establishment of international research and education center of excellence

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(新潟県を代表する酒米)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 ntribution 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

KAAB閉鎖温室・バイオドーム遠隔操作システムの概要

System for the Biodome and

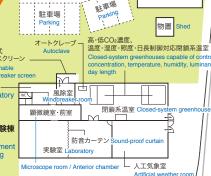


植物病原体:環境条件の変化の下における 真菌を用いた作物の収量と品質の向上法

Phytopathogens: a good Opportunity to Improve crop yieldS and quality under changing

Overview of the Remote-control

Closed-system Greenhouses



観測カメラ CO2濃度制御可能高性能閉鎖温室

バイオドーム内観

canable of CO₂ concentration control

Artificial light source-type closed-syste 温度、CO2、光、温度を精密に制御した高性

能閉鎖性温室で次世代の高温、高CO2耐性 イネの開発に向けた基礎研究を行います。 This highly-functional greenhouse accurate controls temperature, CO2, light, and humid for fundamental studies on the development next-generation rice with high temperature and 観測カメラ 🚩 Observational camera

バイオドームA

バイオトロン群 Biotron facilities A棟:2基 CO₂制御 2基 光制御

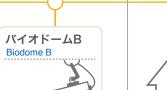
B棟:2基 CO₂制御 2基 温度·湿度制御 Building A: 2 CO₂ control units / 2 light control units Building B: 2 CO₂ control units / 2 temperature &

約200㎡の豊富なスペースを利用して、人工水田を 作り、米の品質・収量に及ぼす高温・高CO₂の影響に て調査研究を行います。

ximately 200m² space makes it possible to create artificial rice paddies for surveys on the impact of high temperature and CO₂ on rice quality and yield.



バイオドーム外観







インターネット網

Internet netwo

ISPメールサール

新潟市から刈羽村まで、約80kmを遠隔操作システムにより、リアルタイムに環境制

刈羽村

Kariwa Village

新潟大学

新潟大学

三ツ井研究室

Niigata University

Mitsui Laboratory

操作・観測専用パソコン

Operation and observat

over a distance of approximately 80 km between Niigata City and Kariwa Village



海外の大学、研究機関との国際交流協定の締結

国際交流の推進

experimentation facility

companies in Japan and overseas

Promotion of international exchange Conclusion of international exchange agreement with

overseas universities / research institutes

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

response of rice to high temperatures, high CO₂ levels, drought, and salt

Elucidation of multi-stress response affecting

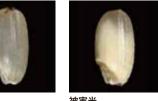




プロトコル確立

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









バイオ実験室 バイオ実験棟



人工光型閉鎖系温室

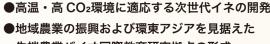
御・観察実験を行います。

芦







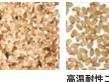


Establishing the international research and education center of excellence for advanced agro-biotechnological research toward including the East Asian Rim.

複合ストレス耐性イネ開発と栽培管理 イネの高温・高 CO2・乾燥・

Fundamental research on the

高温登熟米 Rice grains developed under high-temperature



next-generation rice adaptable to the world's harsh

Development of high-temperature-tolerant Koshihikari rice an

environments (high temperatures, high CO2 levels, drought

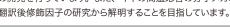


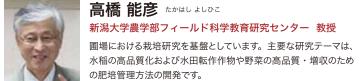




新潟大学農学部 教授

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プン I am applying biotechnology in the development of rice starch that has 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 novel properties and structure. I am also trying to clarify heat response







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



中野優 なかのまさる

所潟大学創生学部·農学部 教授 ど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 Propagation and Breeding of Ornamental Plants Utilizing Biotechnology 具植物の増殖、および胚救出や遺伝子組換えによる新奇なオリジナ し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 Our field of study includes investigation mechanism of soybean seed 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 control. A purpose of our study is to provide a cultivation technology of high 基礎的研究を進めています。



狩野 直樹 かのう なおき

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をベースにした吸着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 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 堅太郎 かねこ けんたろう 新潟大学農学部 助教

Kentaro Kaneko Assistant Professor, Faculty of Agriculture, Niigata University

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 I study on proteomics for the development and suppression mechanism of 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 rice chalky grains which occurs in high temperature condition. And, I am aiming to produce high quality rice in global warming.

Professor, Faculty of Agriculture, Niigata University

posttranslational modification factors.

Yoshihiko Takahashi

Kazuhiro Nakano

Masaru Nakano

Norikuni Ohtake

Naoki Kano

quality soybean through a physiologic study.

biomass and by applying phytoremediation

storage technology using this mechanism

Marouane Baslam

Niiaata University

Faculty of Agriculture, Niigata University

increase of switch crop / vegetable from rice culture

Faculty of Agriculture, Niigata University

mechanisms in rice at the molecular level through the study of

Professor, Field Center for Sustainable Agriculture and Forestry,

I study on a cultivation technology with nutrient management in the

farmland. The main research theme is high quality of rice production and

Professor, Department of Production and Environmental Science,

I am involved in technological development for the effective culturing of

the Sea of Japan side where the amount of solar radiation is limited

Professor, College of Creative Studies / Faculty of Agriculture,

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.

Associate Professor, Faculty of Agriculture, Niigata University

nitrogen metabolism and storage compounds, and of nitrogen fixation

Associate Professor, Faculty of Engineering, Niigata University

Environmental Remediation based on Natural Resources such as Biomass

recovery of pollutants such as heavy metals and radioactive nuclides by

developing environmentally-friendly and low-cost absorbents based on

Specially Appointed Assistant Professor, Faculty of Agriculture,

Golgi apparatus and plastid and to develop high efficiency plastid protein

I am engaged in technological establishment for the effective removal and

microalgae, which has attracted attention as a biomass energy source, on

KAABスタッフ KAAB Staff



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 I am trying to elucidate the membrane transport mechanism between the -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。



|バスラム マルワン 新潟大学農学部 特任助教

I am conducting seminal work in the fields of: (1) plant-microbe interactions and 1)植物一微生物間の相互作用と植物の成長と品質を促進させる their responses to other environmental signals to promote plant growth and quality, 環境シグナル、(2)穀類の気候変動に応答する分子メカニズム、(3) (2) studying the molecular mechanisms -employing systems biology approaches-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 involved in the response of plants to climate change, and (3) understanding how るメカニズムについて研究しています。 signaling pathways interact to regulate plant growth and development.



高松壮 たかまつ たけし

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 For understanding the rice organelle genome as a novel breeding target, 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。

Takeshi Takamatsu

Aya Koga

Specially Appointed Assistant, Faculty of Agriculture, Niigata University

Specially Appointed Assistant Professor, Faculty of Agriculture, Niigata University

my current research is to reveal genome diversity by Next-Generation Sequencing and develop technology for mutation induction in rice organelle







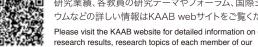
新潟大学・刈羽村先端農業バイオ研究センター



〒945-0307 新潟県刈羽郡刈羽村大字刈羽4286番地2 TEL.0257-31-8871 FAX.0257-31-8872

Niigata University Kariwa Village Advanced Agro-Biotechnology Research Center (KAAB)

4286-2 Oaza-Kariwa, Kariwa Village, Kariwa-gun, Niigata 954-0307, Japan TEL: +81-257-31-8871 FAX: +81-257-31-8872



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 などの詳しい情報はKAAB webサイトをご覧ください。 ase visit the KAAB website for detailed information on our

teaching staff, forums, international symposia, etc.

刈羽バイオ Kariwa Bio Research Center

https://www.agr.niigata-u.ac.jp/~nkariwa/





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



新潟大学・刈羽村先端農業バイオ研究センター長 挨拶



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 味し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.



Orcid ID 0000-0002-9165-8830

KAAB研究センターは新潟大学と刈羽村との連携事業として刈羽村に建設されたサテライト実験施設を核として 国内外の研究者と学生が学び研究する国際的な教育研究拠点形成を目指しています。当センター運営委員による 国際共同研究が積極的に行われ、科学技術振興機構(JST)戦略的国際共同研究プログラム(SICORP) (EIG-CONCERT-Japan共同研究「食料及びバイオマスの生産技術」) やイタリアCREAがコーデイネーターとなっ て進められているHorizon 2020 ExpoSEEDプロジェクト等に参画しています。また、ヨーロッパ第3位の規模を誇 るスペインCSICやスウェーデン ウメオ植物科学研究センター(ウメオ大学・スウェーデン農科大学ウメオ校)との学 術交流協定の締結を進めています。加えて、モロッコ カジアヤッド大学等の北アフリカ地域との交流も着実に進展し ています。このように、KAAB研究センターは順調にそして着実に国際化の道を歩んでいます。現在、スウェーデン、ス ペイン、イタリア、モロッコ、ブラジル、エジプト、タイ、バングラデシュ、マレーシア、ロシア、中国等、様々な国の研究者 および留学生が「高温・高CO2等の複合ストレス環境に適応する次世代イネの開発研究」を含め様々なKAAB研究 プロジェクトに参加しています。無論、国内の大学・研究機関や県内外の企業・公設試との共同研究も種々のプラット フォーム並びにコンソーシアムを通じて活発に行われており、地域が抱える諸問題に取り組み、地域農業の振興およ び環東アジアを見据えた農業バイオ教育研究拠点の構築を進めています。当センターの運営に関して、皆様からのさ らなるご支援、ご協力を賜りますようよろしくお願い申し上げます。

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 Nijgata 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 also take 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 African 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 eve 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 前 新潟大学自然科学系附置「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置コア・ステーションとして設置 The Regional Collaboration Center for Advanced Medicine and Science was dissolved to establish Nijgata 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.

- 2012.10 🎍 刈羽村バイオドーム・バイオ実験施設 開所
- 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
- 2014.02 高性能閉鎖温室 1 が完成

CO₂ environments".

- 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
- 2015.01 高性能閉鎖温室 2 が完成