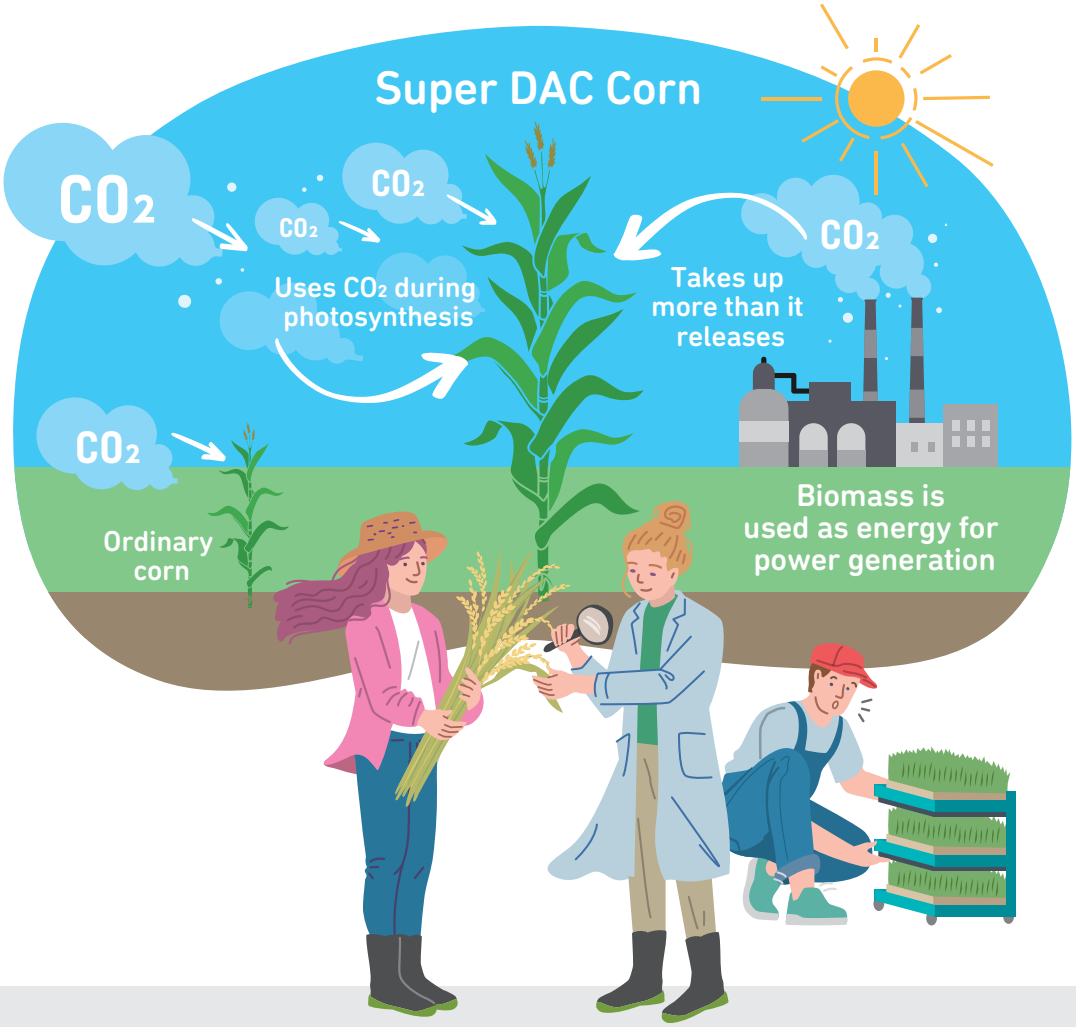
08 PROJECT

Super Crops Absorb Large Amounts of CO_2 and Convert It to Energy

DAC Agriculture Propels Us Towards a Carbon-Circulating Society

Direct Air Capture (DAC) is a well-known technology used to collect the greenhouse gas CO_2 from the atmosphere. In a way, agriculture can also be considered DAC, since we harvest crops that fix carbon through photosynthetic growth. However, when the crops are consumed as food, the fixed carbon returns to the atmosphere as CO_2, breaking the link from agriculture to decarbonization. We are working towards a new form of agriculture that contributes to carbon resource circulation without returning fixed CO_2 to the atmosphere.



Awaken Dormant Farmlands! The Future of Japanese Industry, Envisioned with Super Crops

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Japan's industrial technology is more than capable of producing energy. Yet Japan is not energy self-sufficient, since we depend on importing the raw materials needed to make use of those technologies. This challenge could be overcome by increasing production of recyclable biological resources, or biomass, through improved crops. Using fallow land for this purpose would increase energy resource self-sufficiency without posing any competition to food production. Providing industries with biomass materials from agriculture would not only contribute to sustainable environmental conservation, but would also enable agriculture to play a role in the future co-creation of a variety of industries.

Super Crops Absorb Large Amounts of CO_2 and Convert It to Energy

» Doubling Biomass Productivity With Improved Species

Biomass yields cannot be easily increased just by altering a single gene. With rice crops, we hope to increase yields in one try by changing multiple genes simultaneously. Selected genes are related to photosynthesis, nutrient uptake capacity, and grain count and size. We use genome editing technology targeting these genes in an effort to create rice with increased biomass production capacity. With corn, we are working to dramatically increase the amount of biomass by taking advantage of a characteristic called heterosis, or hybrid vigor, instead of genome editing technology.

» A New Form of Agriculture to Realize a Carbon-Circulating Society

This new type of agriculture can be referred to as "***DAC agriculture***." Crops with dramatically increased biomass production capacity capture and fix more CO_2, contributing to carbon resource circulation. In DAC agriculture, CO_2 Life Cycle Assessments (LCAs) for the resulting biomass are continuously carried out, making it possible to visualize the contribution to curbing global warming. This new form of agriculture meets a variety of needs, from the creation of sustainable industries to new businesses.

KEYWORD

DAC Agriculture

By developing crops with improved CO_2 absorption and fixation capacity and efficiently converting their biomass into energy and useful substances, this new form of agriculture contributes to the realization of a carbon-neutral society.

FUTURE VISION

2025

On the Brink of Super Crops

We will modify super DAC rice genes to increase biomass and make it more readily usable. We will develop seed collection technologies for super DAC corn.

2027

Super Crops Arrive

We will complete development of DAC crops that incorporate modified genes to maximize biomass production. Cultivation methods that reduce emissions of methane (CH_4), dinitrogen monoxide (N_2O), and other greenhouse gases will be designed.

2029

Plant-Based Fuel for Aviation

Through rigorous testing of ethanol and sustainable aviation fuel (SAF) made from DAC crop biomass raw materials, we will conduct precise cost evaluations and LCA to determine their feasibility.

Implementation National Agriculture and Food Research Organization (NARO), Tokyo University of Agriculture and Technology, Nagoya University

Project Introduction Video https://www.youtube.com/watch?v=Dn6QHc3f9J8&list=PLZH3AKTCrVsVm3UN1x40WW_QK-cEXaoo3