



Understanding and utilization of **soil microbial functions**

Our project focuses on understanding and utilizing cooperative interactions of soil and soil microbiome to improve and maintain a healthy soil environment for enhanced crop production, and to create a sustainable food supply industry. Through multi-factor experimental big data analysis, we aim to revitalize agricultural food production system for the future dietary requirements.

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Construction of circulating production platform by environmental control based on Soil Microbe Atlas

Keywords: soil microbes, soil health, soil microflora atlas, high performance soybean, single cell analysis, environmental control, recycling-oriented cooperative agriculture, cultivation management, future food production

Background

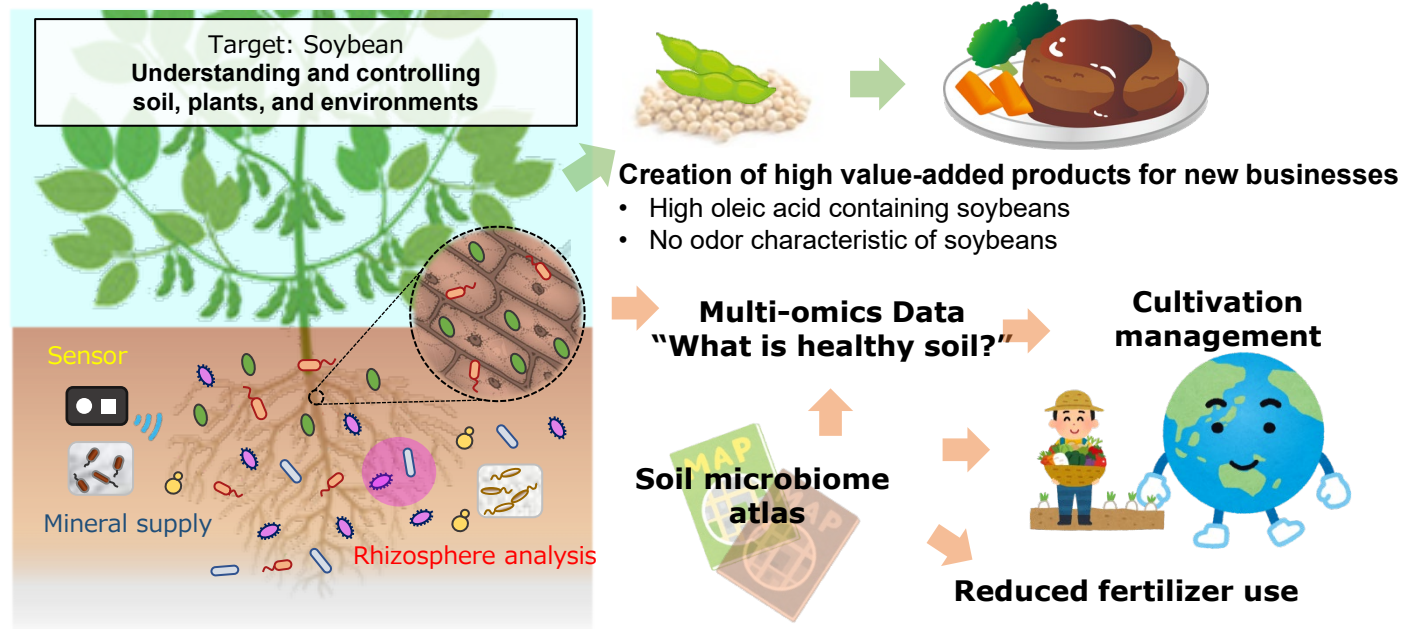
Achieving "regenerative agriculture" by exploring and utilizing functions of soil microbes and minimizing the use of chemicals

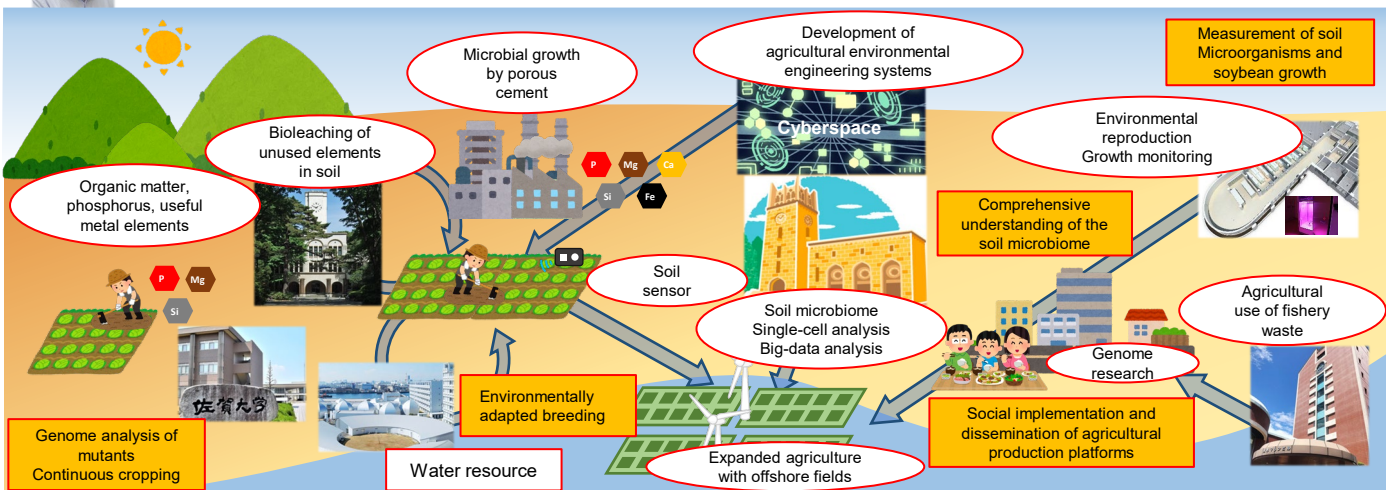
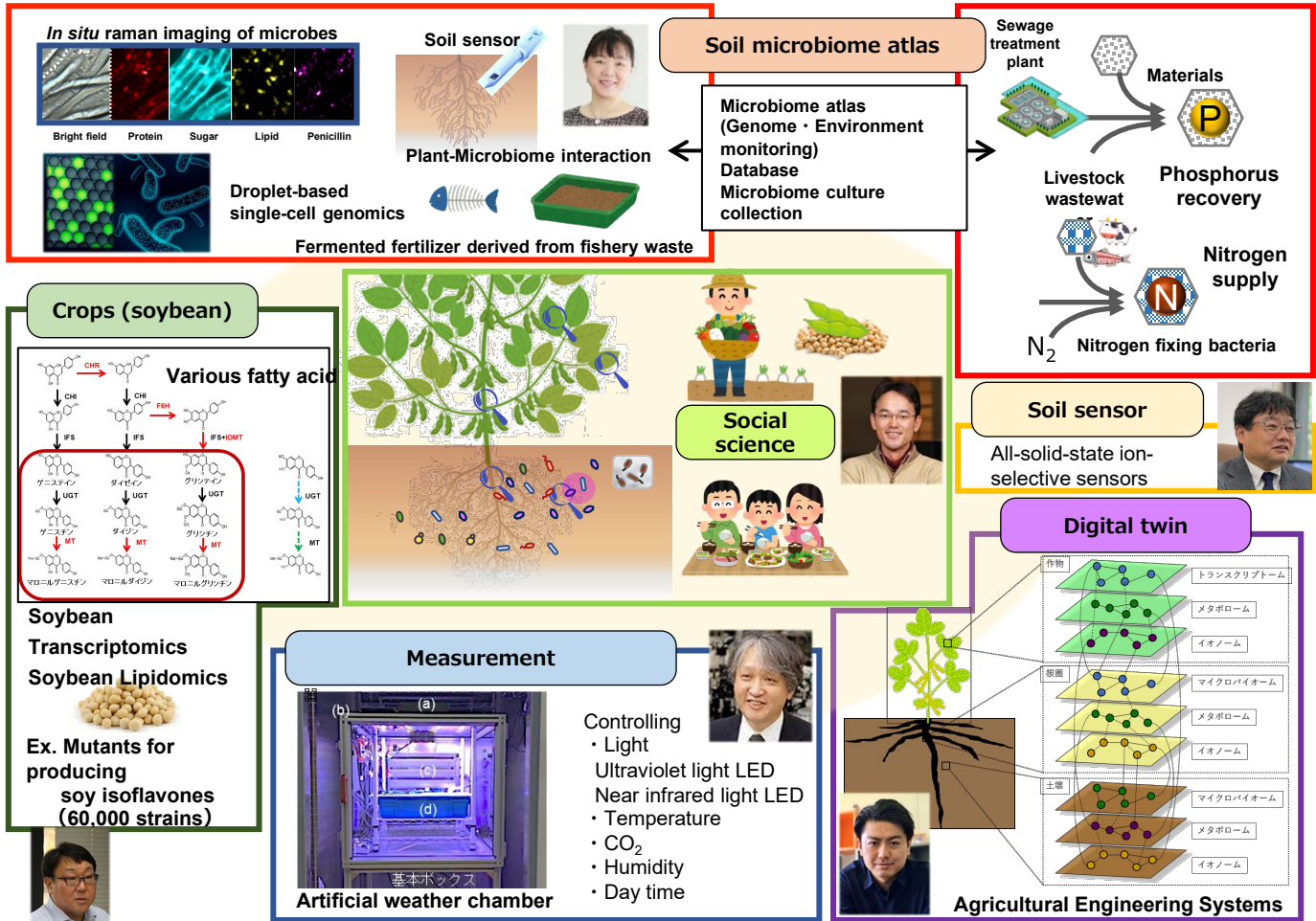
A platform for regenerative agriculture is needed to mitigate adverse effects of chemical fertilizers on natural environment and agricultural production. This project targets soybean, one of the main future foodstuffs, aims to construct a soil environment that effectively uses the functions of microbes, and to identify new soil health indicators. We plan to construct a soil microbe atlas (database) by (1) collecting comprehensive information on biological, chemical, and physical factors in soil, (2) archiving genome data of useful microbes, and (3) analyzing the interactions between plants and microbes. We will subsequently simulate soil environments based on multi-omics big data to construct a future "platform for sustainable farming through environmental control."

Research Contents

Developing technologies for practical use in society

We have established a consortium with six research groups aiming to understand and control soil microbes, plants, environment, and their interactions. We aim to achieve our goals of agricultural innovation by promoting the creation of a system for agriculture management based on a "platform for sustainable farming through environmental control."





Targets by 2030

By 2030, we aim to build a “platform for sustainable farming” by analyzing and controlling the interactions between soil microbes, plants, and the environment for the future crop production that minimizes the use of chemical fertilizers. Furthermore, we plan to start a business of agriculture management by digitalizing agroecosystems using multi-omics. To achieve the goals, we will utilize cutting-edge technology to collect and analyze multi-omics big data.

Cooperating Research Institutes

Soil Microbiome Atlas: Waseda University / AIST / TOWING / Tokyo University of Agriculture and Technology / Taiheiy Cement, **Digital twin:** RIKEN / Fukushima University / University of Tokyo / University of Tsukuba / Kyoto University / Fukushima Prefecture / Hokkaido University / National Agriculture and Food Research Organization / Niigata Prefecture / Mie University / Kyushu University / Nagoya City University / Maekawa Research Institute, **Measurement:** RIKEN / Agri Open Innovation Organization, **Soil Sensor:** Kyoto University, **Crops:** Kyushu University/ Yokohama City University / RIKEN, **Social Sciences:** Waseda University, **Project website:** <https://www.microbe-soil.sci.waseda.ac.jp/>