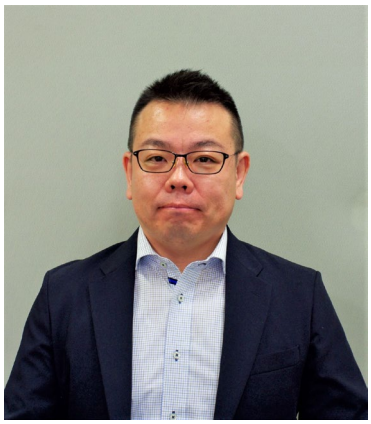

Reducing Methane from Cows Will Save the Planet and Solve the Food Crisis

Methane gas from cows, produced through ruminal fermentation, is released into the atmosphere when they burp. This gas not only contributes to global warming but also results in the loss of feed energy. By 2050, we aim to contribute to the prevention of global warming by reducing methane emissions from cattle by 80%, and concurrently improving milk and beef production efficiency by 10%. Furthermore, we will contribute to the relief of the food crisis by building a livestock production system which will ensure that 100% of the grains used for feed can be used for human consumption; we will subsequently spread this system worldwide.

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Realization of a new livestock production system to reduce methane by 80% through complete control of the bovine rumen microbiome

Keywords: cattle, rumen, microbiome, methane reduction, productivity improvement

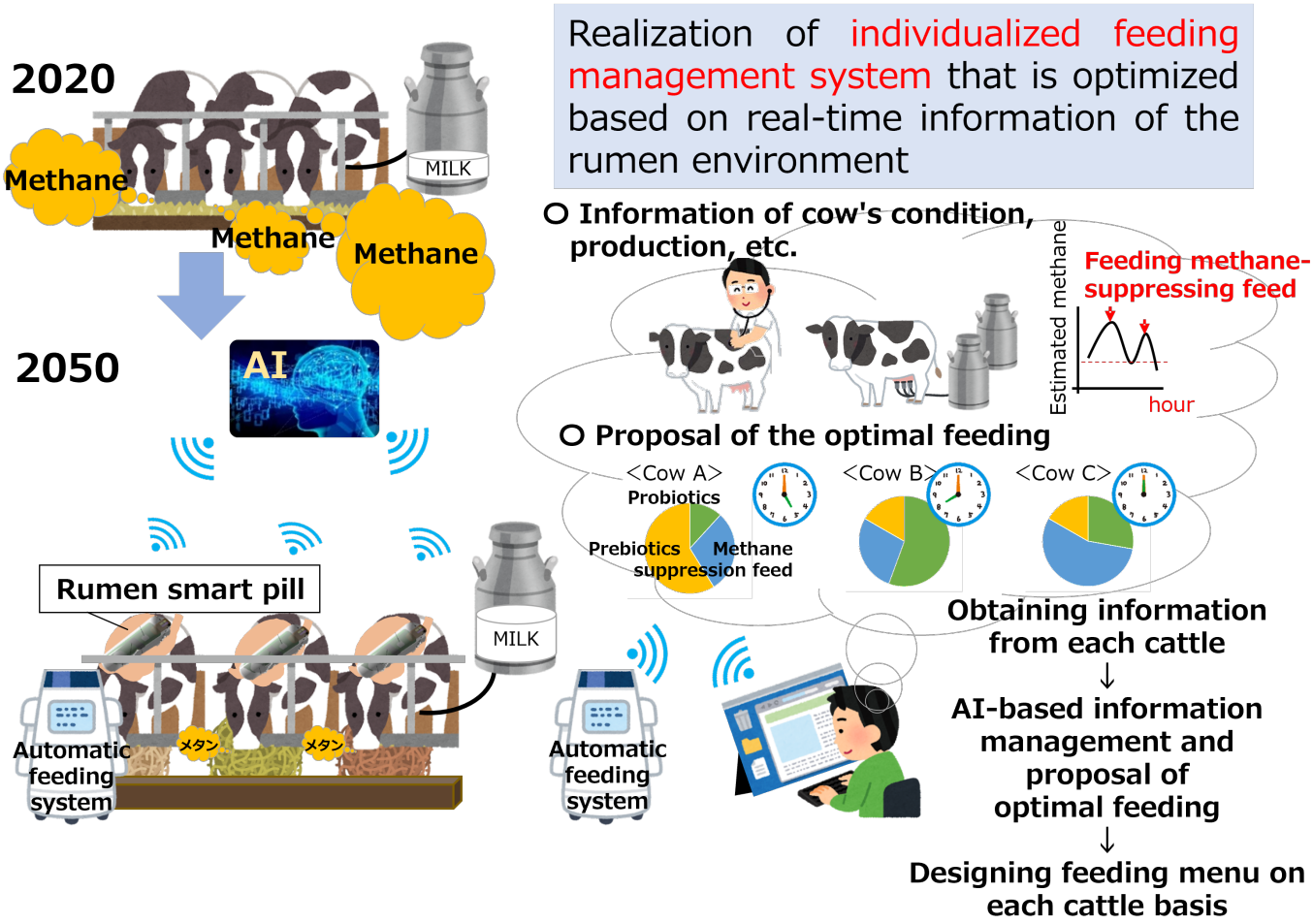
Background — Why do we need methane reduction?

Moonshot Goal 5 aims to "develop a fully resource-recycling food production system by fully utilizing biological functions." In this project, we aim to optimize and fully control the functions of cows, especially the microbiome function that symbiotically coexists in the rumen. The methane produced through microbial fermentation not only releases a greenhouse gas in the atmosphere but also leads to a loss of feed energy. By controlling fermentation, methane can be minimized and feed energy can be allocated to milk and beef production, thereby concurrently reducing the effects on global warming and increasing livestock productivity.

Research Contents — How do we reduce methane emission?

In this project, we aim to develop individualized feeding management systems that minimize methane from cattle. First, we will develop new feed additives that strongly suppress methane production, as well as pro- and prebiotics that will minimize methane generation produced by the microbiome. Furthermore, we will develop a novel device (smart pill) that can be placed in the rumen and to transmit fermentation status to the outside of the body in real time. Fermentation status data will be analyzed by AI and used for proposing precision feeding programs. Ultimately, we will establish and expand the use of a futuristic feeding management system that can control and manage the rumen microbiome and nutritional status of each individual animal, which will subsequently reduce methane production and improve productivity worldwide.

The search for methane inhibitors and proposals for feeding programs will be conducted by Hokkaido University, Obihiro University, Hokkaido Research Organization, and National Agriculture and Food Research Organization (NARO); microbiome control strategies will be developed by NARO, Nagoya University, ZEN-NOH Central Research Institute; and smart pill innovations will be realized by University of Tokyo, National Institute for Materials Science, National Institute of Advanced Industrial Science and Technology, and NARO.



Reduce global warming and food problems at the same time!

Targets by 2030

By 2030, we will develop a new feed additive that controls the rumen microbiome and suppresses methane production, and a smart pill that enables constant monitoring of the rumen environment (VFA, among others). By combining the newly developed pro- and prebiotics and methane inhibitors with an individual cow feeding method that uses AI analysis of data obtained from the smart pill, we aim to reduce methane emissions from cows by 25%.

By the fiscal year 2024, we will (1) visualize the rumen fermentation state and explore prebiotic materials for methane suppression, (2) produce prototype smart pills equipped with a sensor to measure total VFA concentration in the rumen, (3) propose methane suppression candidate materials that can reduce methane by 25% and formulate draft guidelines for producers.

Cooperating Research Institutes

Hokkaido University / National Agriculture and Food Research Organization (NARO) / Nagoya University / ZEN-NOH Central Research Institute for Feed & livestock / National Institute for Materials Science (NIMS) / University of Tokyo / National Institute of Advanced Industrial Science and Technology (AIST) / Obihiro University / Hokkaido Research Organization (HRO)