Building Sustainable Food Systems

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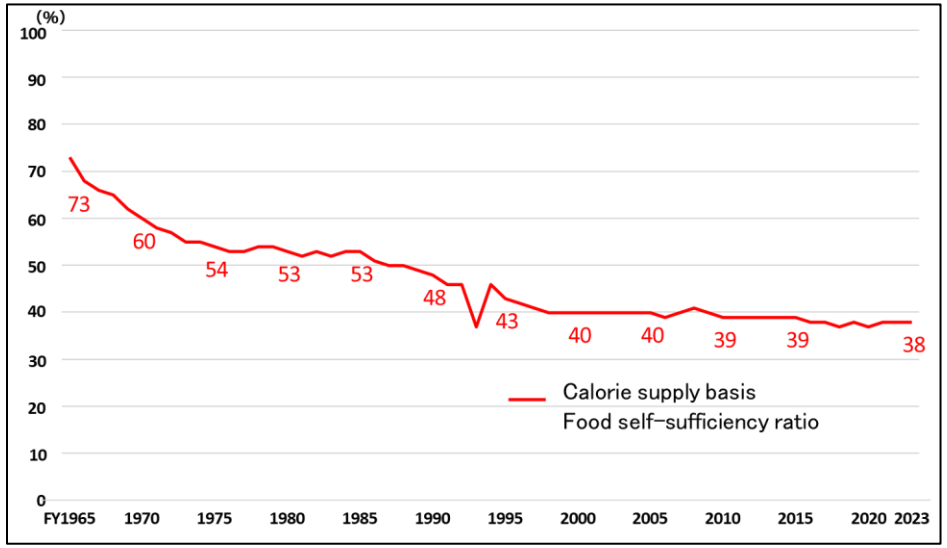
1. Issues Facing Agriculture, Forestry, Fisheries and Food Industries in Japan

- In Japan, the agriculture, forestry, fisheries and food industries are working to improve productivity and reduce environmental burden to cope with the low food self-sufficiency ratio, the declining number of agricultural workers, and environmental issues.
- At the global level, these industries are working to both meet increasing food demand induced by population growth and reduce environmental burden.
- To address these issues, the Basic Act on Food, Agriculture and Rural Areas was revised for the first time in 25 years.

Trend of food self-sufficiency ratio

○ The nation's food self-sufficiency ratio on calorie supply basis has declined from 1965 to 1998, but has since remained around 40%.



Trend of Food Self-Sufficiency Ratio (1965～2023)

The number of key farmers decreased

○ The number of core persons mainly engaged in farming has halved in the quarter century since 2000 and the farming population is aging. Further significant declines are expected in the future.

Addressing Environmental Issues

○While agriculture is an industry with a high affinity for the environment, there are concerns about its impact on climate change and biodiversity due to the generation of greenhouse gases and deterioration of water quality.
○Since the adoption of the Paris Agreement and SDGs, efforts to reduce environmental burden are internationally required.

Source: Ministry of Agriculture, Forestry and Fisheries(MAFF)

2. Revisions to the Basic Act on Food, Agriculture and Rural Areas

- The revised Basic Act not only addresses shared global issues, such as strengthening food security and shifting to environmentally friendly agriculture, but also mentions improving productivity to ensure production infrastructure and the sustainable development of agriculture.

- Key Revision #1: A new focus on food security for every citizen in the act's basic principles
  - Establishes **food security for every citizen** as a central pillar
  - **Priority is given to increasing domestic agricultural production**. This will be supported by **stable imports and reserve stockpiling**
  - **Exports will be promoted to secure infrastructure for agricultural production**
  - **Prices must now reflect reasonable costs**
- Key Revision #2: "Environmentally friendly food systems" added to the act's new basic principles
  - The new basic principles include **the establishment of environmentally friendly food systems**
  - Multifunctional roles of agriculture and rural areas must be demonstrated while reducing environmental burden
- Key Revision #3: The guiding directions for agricultural production in a declining population were clarified
  - **Even as the number of farmers is decreasing** due to population decline, agriculture must **demonstrate its multifunctional roles, including the supply of food**, and **pursue sustainable development**
  - The guiding directions for agricultural production are **"improving productivity," "increasing added value," and "reducing environmental burden"**

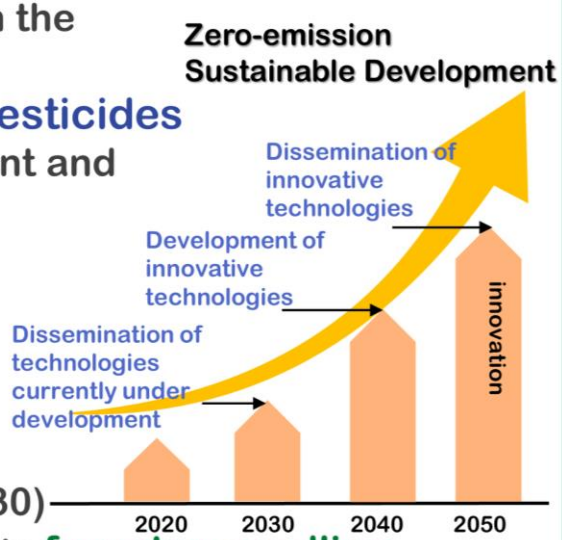
Source: MAFF

3. Japan's Policy: Strategy for Sustainable Food Systems and More

- It is necessary **to build food systems** that not only fulfill their multifunctional roles but are also **environmentally friendly**, taking into account the food supply's impact on the environment.
- In 2021, Japan formulated the **Strategy for Sustainable Food Systems**, also known as Strategy MIDORI, which **sets 14 KPIs** for GHG reduction, environmental conservation, food industry, etc.
- In 2021, Japan also formulated the Green Growth Strategy Through Achieving Carbon Neutrality in 2050, which sets the food, agriculture, forestry, and fishery sectors as focus sectors. Since then, projects have been implemented under the Green Innovation Fund along with other programs.

Key performance indicators by 2050

- Zero CO2 emission from fossil fuels combustion in the agriculture, forestry and fisheries sectors
- 50% reduction in risk-weighted use of chemical pesticides by dissemination of the Integrated Pest Management and newly-developed alternatives
- 30% reduction in chemical fertilizer use
- Increase in organic farming to 1Mha (equivalent to 25% of farmland)
- At least 30% enhancement in productivity of food manufacturers (by 2030)
- Sustainable sourcing for import materials (by2030)
- 90% and more superior varieties and F1 plus trees in forestry seedling
- 100% of artificial seedling rates in aquaculture of Japanese eel, Pacific bluefin tuna, etc.



Source: MAFF

4. Related Projects and Measures (1): Low-carbonization/Decarbonization

Development of Negative Emissions Technologies in Food, Agriculture, Forestry, and Fisheries Industries, supported by NEDO's Green Innovation Fund

- This project **accelerates the technological development of carbon capture and storage in agriculture, promotes the recycling of forestry resources and rejuvenation of forests, and even creates underwater carbon sinks (blue carbon), i.e., seaweed beds that are important for fisheries**. It aims to achieve both carbon neutrality and growth in agriculture, forestry, and fisheries.

【Research and Development 1】
Development of technologies to realize and effectively utilize high-functional biochar and other materials

・Technologies will be developed to realize and effectively utilize highly functional biochar that improves crop yields by approximately 20% and sustainably captures/stores about 3 tons of CO2 per hectare of cropland per year (equivalent to approximately 1.9 tons/hectare in terms of biochar volume). In addition, methods will be developed to objectively assess the "environmental value" of agricultural products cultivated through carbon capture and storage activities.

Biochar

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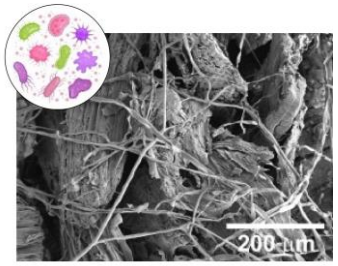
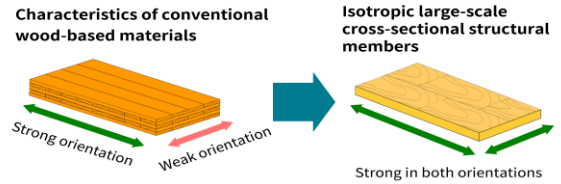


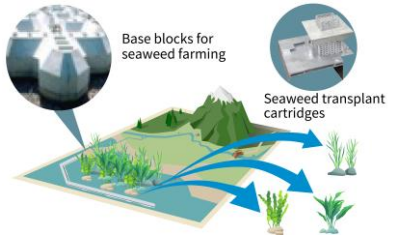
Effective microorganisms for aiding supply of fertilizer constituents and promoting growth

→ Highly functional biochar

【Research and Development 2】
Development of wood-based isotropic large-scale cross-sectional structural members for the construction of high-rise buildings and other structures



【Research and Development 3】
Development of technologies for constructing seaweed beds in support of blue carbon efforts

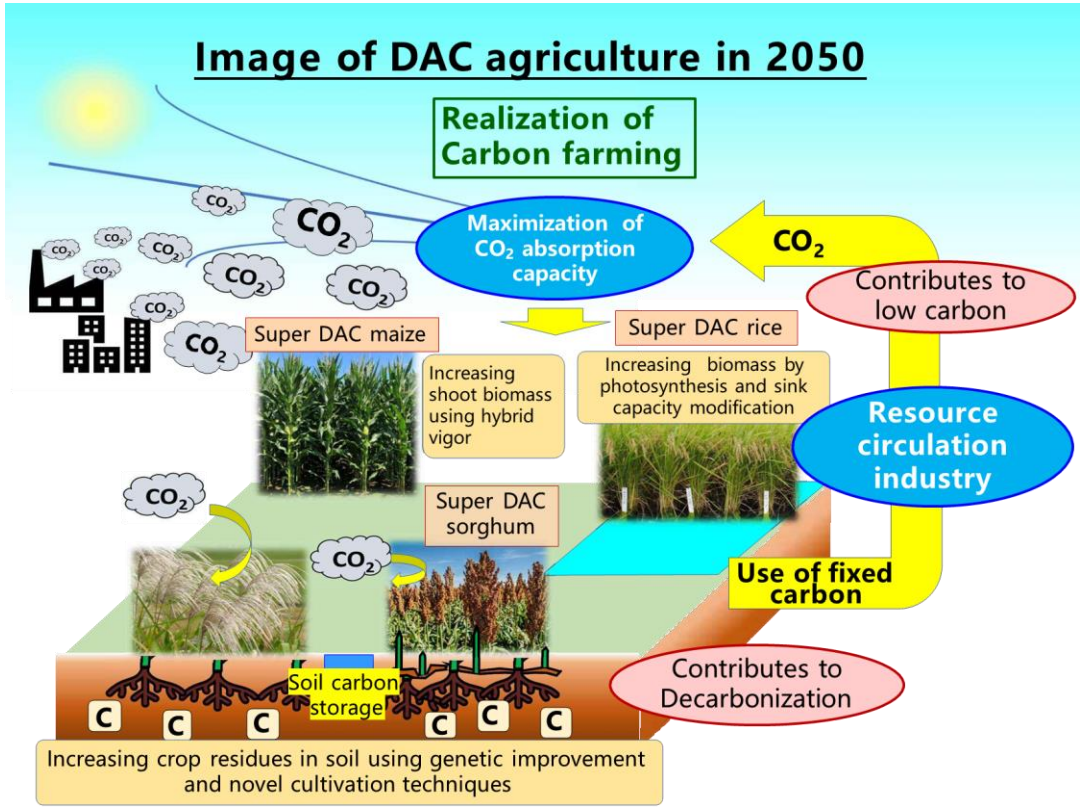


Source: New Energy and Industrial Technology Development Organization(NEDO)

4. Related Projects and Measures (2): Low-carbonization/Decarbonization

Agrobiotechnological Direct Air Capture Towards Carbon Circulation Society, supported by NEDO's Moonshot Research and Development Program

- This project will achieve the development of crops with dramatically improved CO2 fixation capacity and increased biomass production capacity, thereby contributing to the realization of a new type of agriculture (DAC agriculture) in which the resulting biomass can be used to produce energy and useful substances that contribute to decarbonization.



Challenges, Goals, and Research theme

Technical challenges	Achievement goal	Research theme
Doubling CO_2 fixation ability of crops 1	**Development of Super DAC crops** Rice grain : 50%↑ Maize shoot : 100%↑	• Theme I Development of Super DAC Rice by increasing CO_2 absorption/ fixation ability • Theme II Research on carbon fixation by increasing crop biomass
Biomass storage in soil 2	**Increase in underground biomass and soil carbon assessment.** Sorghum root, rhizome : 100%↑	• Theme II Research on carbon fixation by increasing crop biomass
Circular utilization of above-ground biomass 3	**Research and analysis of breakthrough(s) in resource circulation by Super DAC crops**	• Theme III : Economic value and life cycle assessments of processes for resource utilization in DAC agriculture

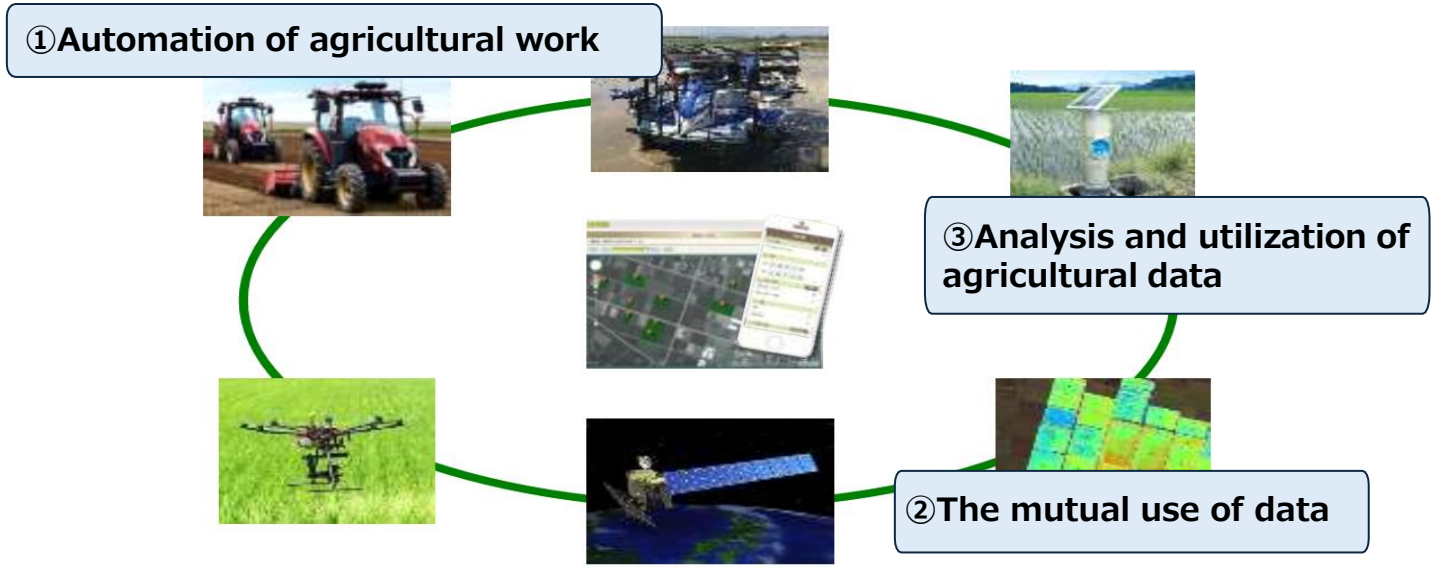
Source: NEDO

4. Related Projects and Measures (3): Smart Agriculture/Precision Farming

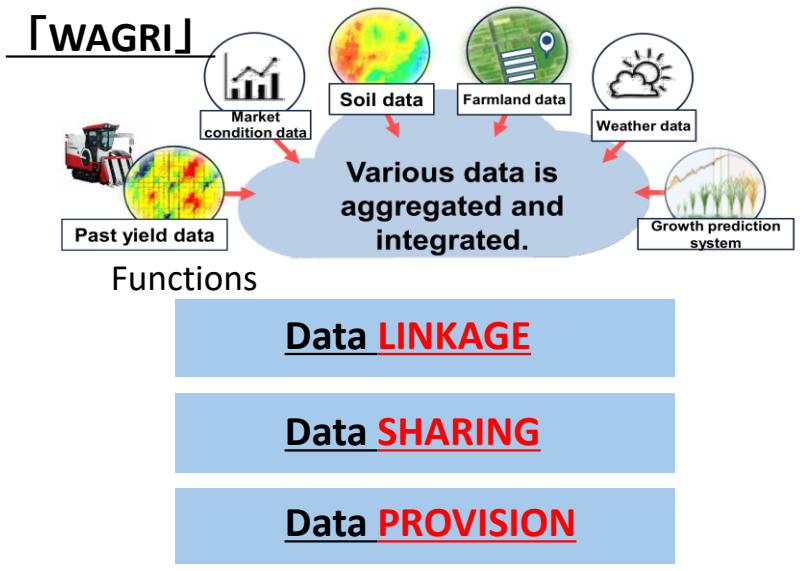
- As the number of farmers is expected to decrease significantly, the challenge is to establish a system that can provide a stable food supply even with a small number of workers.
- It is necessary to promote **research and development** through enhanced cooperation among industry, academia, and government; **support service provider initiatives** that facilitate the use of smart agriculture technology; **introduce new production methods and review existing farming methods** to make them compatible with smart agriculture technology; and promote the introduction of smart agriculture technology to mountainous and other rural areas.

Solving Production Sites Issues with Advanced Technology! We realize Society 5.0 (super-smart society) in agriculture.

Effects of Smart Agricultural Technologies



Agricultural Data Collaboration Platform



Source: MAFF

Reference 1: NEDO/TSC Research and Analysis Report (1) (excerpt)

<Agritech Report>

- In Europe and the United States, while specific numerical targets are being set for the transition to agriculture that respects biodiversity and addresses climate change, agrochemical companies, farm machinery manufacturers, and major IT companies are **promoting precision farming and Controlled Environment Agriculture (CEA), both of which aim to increase yields of high-quality crops while minimizing the use of materials by making full use of digital technology**.

- If precision farming helps reduce the use of pesticides and synthetic fertilizers, and **bio-based fertilizers become more popular, it will help further reduce environmental impact** and improve fertilizer self-sufficiency and can be an important driver in mitigating food security issues.

- Among these trends, in particular, the use of digital technology and the efficiencies it brings could help achieve the new 3Ks (*Kando*, *Kakkoii*, and *Kasegeru*; “fun, cool, and profitable”) in agriculture. As a result, **agritech has the potential to bring about major changes in Japan**, such as finding successors from the younger generation, enabling unskilled people to work in agriculture, attracting new business operators, and supporting the sustainable development of agriculture, which is one of the objectives of the Basic Act on Food, Agriculture and Rural Areas. On the other hand, for those already working in agriculture and those considering entering the industry**, the use of agritech could be a great opportunity, and we believe it would be important to keep an eye on developments in this area.**

Source: NEDO

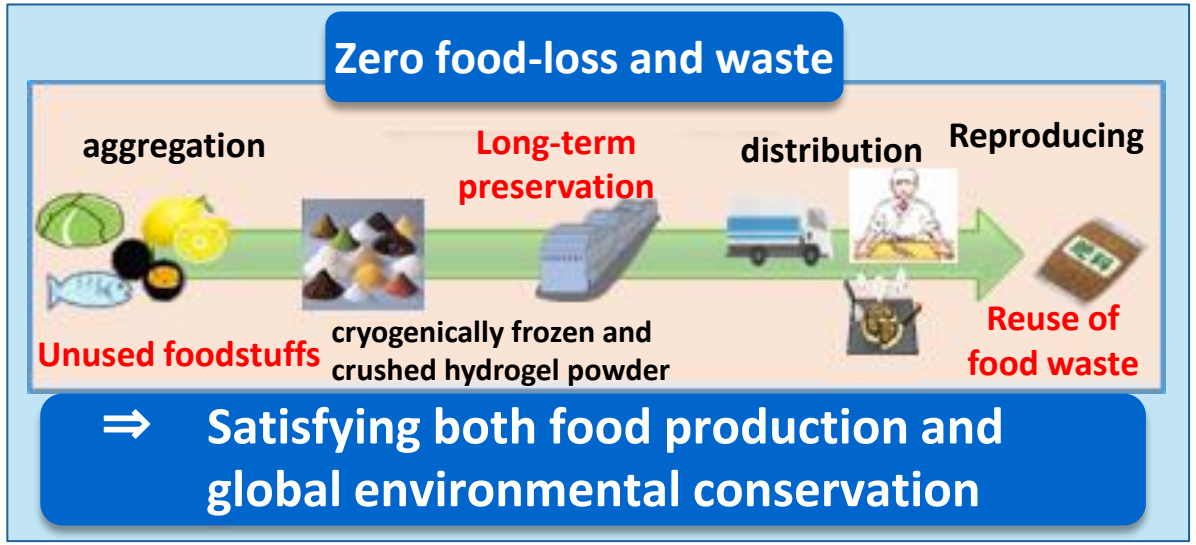
4. Related Projects and Measures (4): Reducing Food Loss

- Food loss reduction is recognized as an important challenge in achieving sustainable food systems. In Japan, various measures are being taken to meet food loss reduction targets for FY2030.
- Relevant ministries are supporting the development of long-term food preservation technologies and the construction of a smart food chain platform to promote digital transformation in food distribution.

○Moonshot Goal 5

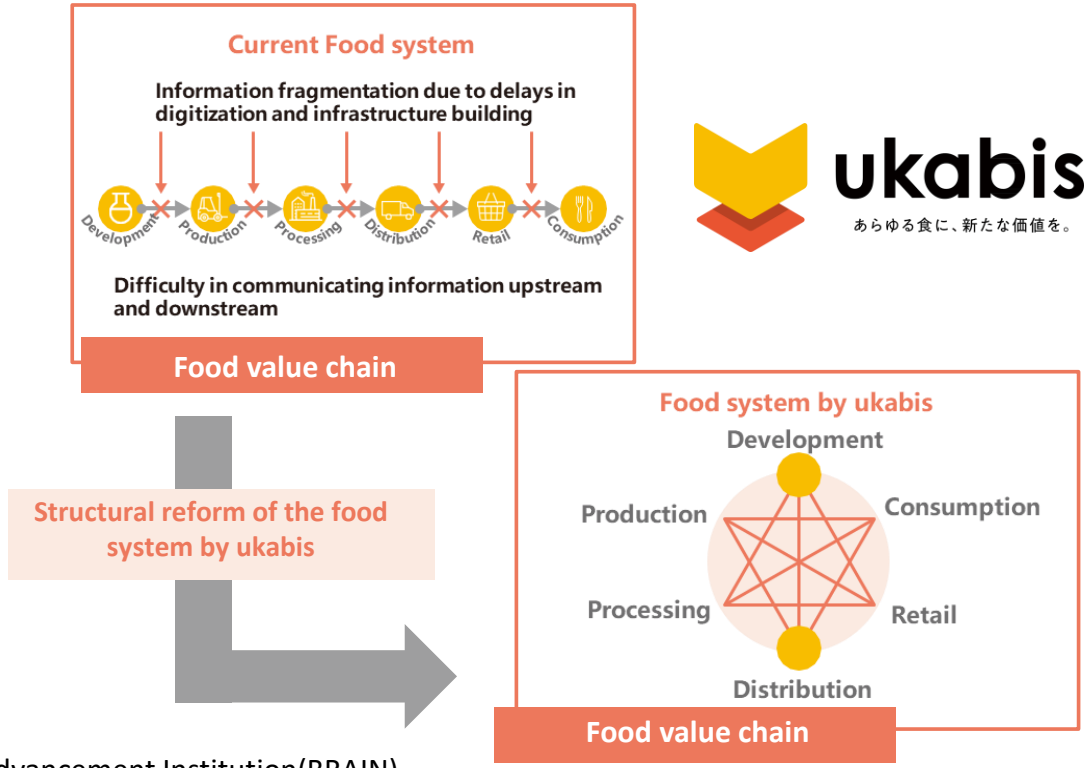
Creation of the Industry That Enables Sustainable Global Food Supply by Exploiting Unused Biological Resources by 2050.

Food Consumption Systems Realizing Zero Food-loss and Waste



○Cross-ministerial Strategic Innovation Promotion Program

the smart food chain platform「ukabis」



Source: Bio-oriented Technology Research Advancement Institution(BRAIN)

Reference 2: NEDO/TSC Research and Analysis Report (2) (excerpt)

<Current Situation of Food Loss in the Food Chain and Technical Challenges for Food Loss Reduction>

- As food loss and waste reduction is considered an important challenge in achieving a sustainable food supply system, further efforts are needed as we look ahead to 2050.
- In Japan, food loss reduction is seen as a challenge for the entire food chain. To meet food loss reduction targets for FY2030, measures have been taken to streamline food distribution and promote behavioral changes among consumers. Reduction targets for businesses were also met in FY2022. To further minimize food loss, **there are high expectations for the matching of food supply and demand through the use of technologies that are difficult for individual companies to manage on their own, such as data platforms and technology-enabled dynamic pricing that links data on product conditions and other info during distribution**.
- It should be noted that the introduction of these technologies may affect the whole structure of the food-related industry, which involves many stakeholders, and therefore, optimal cooperation needs to be carefully explored through extensive discussions among stakeholders.

Source: NEDO

5. Conclusion

- It is important to build sustainable food systems to strengthen food security and become environmentally friendly.
- To build sustainable food systems, R&D and demonstration projects on low-carbonization /decarbonization and smart agriculture are underway.
- To reduce food loss, it is necessary that food demand and supply match through constructing data platform and utilizing date.
- NEDO has been working with companies and research institutions to implement various projects that contribute to carbon neutrality and promote cooperation between agriculture and industry. NEDO will continue to advance these projects while also taking international trends into consideration.

Thank you for your attention.

＜ **Reference : NEDO/TSC Research and Analysis Report** ＞

○Agritech Report
https://www.nedo.go.jp/library/ZZNA_100100.html

○Current Situation of Food Loss in the Food Chain and Technical Challenges for Food Loss Reduction
https://www.nedo.go.jp/news/other/ZZNA_100101.html