

Japan's initiatives on Smart Agriculture

Masao Matsumoto

Deputy Director-General for International Affairs

Ministry of Agriculture, Forestry and Fisheries of JAPAN



SEAMEO
SEARCA

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with Utilization of Digital Technologies**

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Smart Agriculture

Advantage of agriculture of Japan

- Expert skills corresponding to local characteristics such as climate and soil
- Delicious breeds and brands with wide variety reflecting local characteristics
- Safe and secure agriculture products matching with consumers' needs

advanced technologies

Robot tractor



40% reduction of working time

Assist suit



Only a half of the usual power is required in lifting operation

Drone



Optimized manuring and pest control based on sensing data of the whole field

“Agriculture Technology” × “Advanced Technology”



Smart Agriculture



Effects of Smart Agriculture

- Automation of operation by advanced technologies such as robot tractors and water-management system operated by smartphones enables scale-up of business.
- ICT technologies enables succession of agricultural skills of expert farmers to young farmers.
- Highly managed agriculture will be realized by accurate prediction of growth and diseases to utilize and analyze sensing data, etc.

Outlines of a package of measures to promote Smart Agriculture-1

1. Demonstration, analysis and dissemination of Smart Agriculture

Analyzing costs and benefits of Smart Technology, these policies encourage the adoption of it in various crops and across the region, which includes Hilly and Mountainous Areas.

① Demonstration project of Smart Agriculture

- Implement 148 projects in various regions such as **Hilly and Mountainous Areas** and **remote islands**. Some projects are **in collaboration with agricultural high schools**.
- **Published cost-benefit analysis** according to crops as the achievement of 69 projects in 2019, which was the first year of the projects.
- **Experiment on agricultural-machinery-share and encourage demonstrations which aim to increase productivity of crops for export.**



Sugar cane production at 'Agri Support Minami Daito' in Okinawa prefecture

② Encourage strategic research and development

- **Pioneering development** such as robots that suit fruit and vegetables production, machines that can work in Hilly and Mountainous Areas and Smart Technology for organic agriculture
- Development of technology that allows further automation, e.g. **remote monitoring tractors that can drive across the field**
- Development of **high-quality agricultural drones** that ensures security and of its use.



Robots that suit fruit and vegetables production

③ Systematic approach to facilitate the widespread adoption of Smart Agriculture

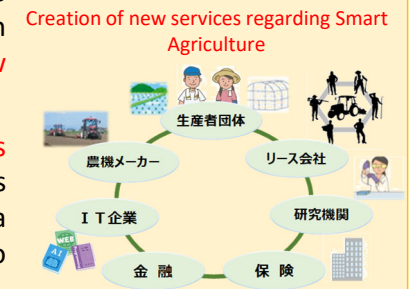
- Provide advice and assistance in **designing marketing strategy** by **agricultural extension centers**
- Facilitate adoption of Smart Agricultural Machinery by **giving priority support** to farmers

2. Creation and dissemination of new support services to farmers

In order for any farmers to use Smart Technology, create and disseminate new support services to farmers such as reducing the initial cost.

① Create a platform and enact program to foster support services

- Provide opportunities to find business partners and to exchange information on the platform named **'Creation of new services regarding Smart Agriculture'**
- Enact **'Program to foster support services regarding Smart Agriculture'** that gives directions and methods as to make a business model for support services to farmers



② Research on and analysis of support services to farmers, and facilitation of partnership creation

- Conducting case studies, **introduce technology to suitable farmlands**
- Issued guidelines which **standardize information** from companies about their services in 2020

③ Increase support for support services to farmers

- Planning to create further measures to increase service providers to farmers. For example
 - **Enrich finance** in collaboration within the framework of agriculture-industry partnerships
 - Support for companies **that just launch a new project** as well as support for **adopting smart-agricultural-machines**, which are essential to foster support services to farmers
 - Create a **funding for start-ups** that introduce **innovation and dissemination** by means of Japanese version of the Small Business Innovation Research (or SBIR) program

Outlines of a package of measures to promote Smart Agriculture-2

3. Creation of an enable environment

Addressing the creation of an enable environment by various policies such as policies on land and data.

① Facilitate the use of data on agriculture

- Increase data sets in **the agricultural data collaboration platform** and facilitate **data linkage between agricultural machines**
- Promote the appropriate use of data by drawing up 'Guidelines on contracts for AI and data in the field of agriculture'
- **Build a platform 'Smart Food Chain'**, which achieves data linkage throughout food supply chains

② Change Rural areas into those suitable to implement Smart Agriculture

- **Change rural areas to facilitate practice of Smart Agriculture**, e.g. enlarge farmlands that allows autonomous tractors to run easily; increase receiving stations which process remote sensing data acquired from instruments aboard satellite; make hills less steep in Hilly and Mountainous Areas
- Make maintenance of infrastructure in rural areas labor-saving and mechanized, which leads to the revitalization of rural areas and **an increase in Internet infrastructures that are essential to practice of Smart Agriculture**

③ Legal arrangement in relation to technological progress

- Amend 'Safety Guidelines' so that it can cover autonomous tractors that are controlled from the remote command station and small agricultural robots.



4. Provide extension services

Provide training in Smart Agricultural Technology for young people to attract interest.

○ Provide education about Smart Agriculture and more

- **Create content** for the purpose of teaching skills to be Smart Farmers and **deliver it** to students in agricultural high schools and universities, as well as farmers
- Collaborating on 'Project for Accelerating Installation of Smart Agriculture', provide students in agricultural high schools and universities with **opportunities for field experience** that practices advanced technology.

Opportunities
for field experience



5. Overseas promotion

While protecting intellectual property, do strategic promotion of Smart Agricultural Technology.

○ Expand the outreach to foreign countries and more

- Support for research and development with a view to overseas promotion of Smart Agriculture; publish information
- Collaborative projects and technical assistance for ASEAN member states



<Point of the Project>

To realize drastic increase of productivity of farmers, it is urgently requested to **install smart agriculture by introduction and utilization of advanced technologies such as robots, AI, IoT, etc.**, which have been markedly developed recently. This project promotes optimization of the smart agriculture technology by **installation and demonstration of the advanced technologies at the present time** and supports the efforts including providing information to accelerate promotion of the installation.

<Target of the Project>

Almost everyone involved in agriculture will be able to practice agriculture utilizing data (until 2025).

<Details of the Project>

1. Installation and demonstration of advanced technologies

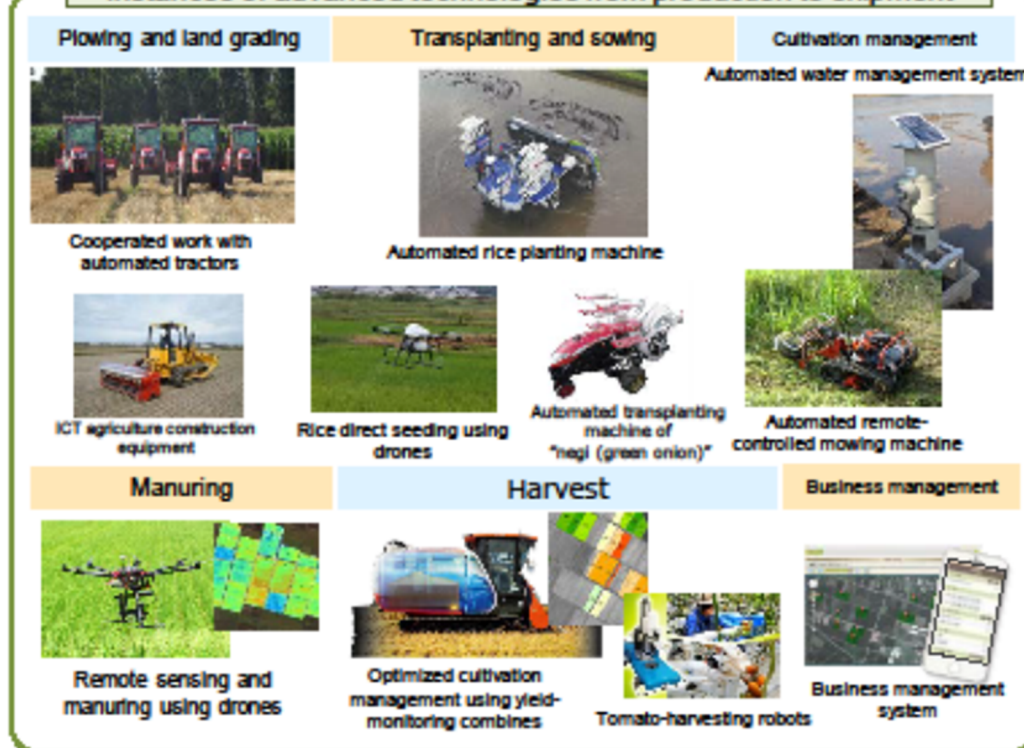
- To optimize the smart agriculture technologies, in cooperation with NARO, farmers, private companies, local governments, etc., the program supports **installation of technologies of robots, AI, IoT, etc.**, which are the advanced technologies at the present time to the production sites, and efforts to **demonstrate ideal smart agriculture**.

2. Provision of information to promote installation

- NARO will arrange the **data and activity records** thus obtained as preceding cases in the aspects of technology and management, and will provide them as **information to support management decision** to introduce the technologies by farmers. NARO also supports efforts to contribute consultation and technical training of farmers.

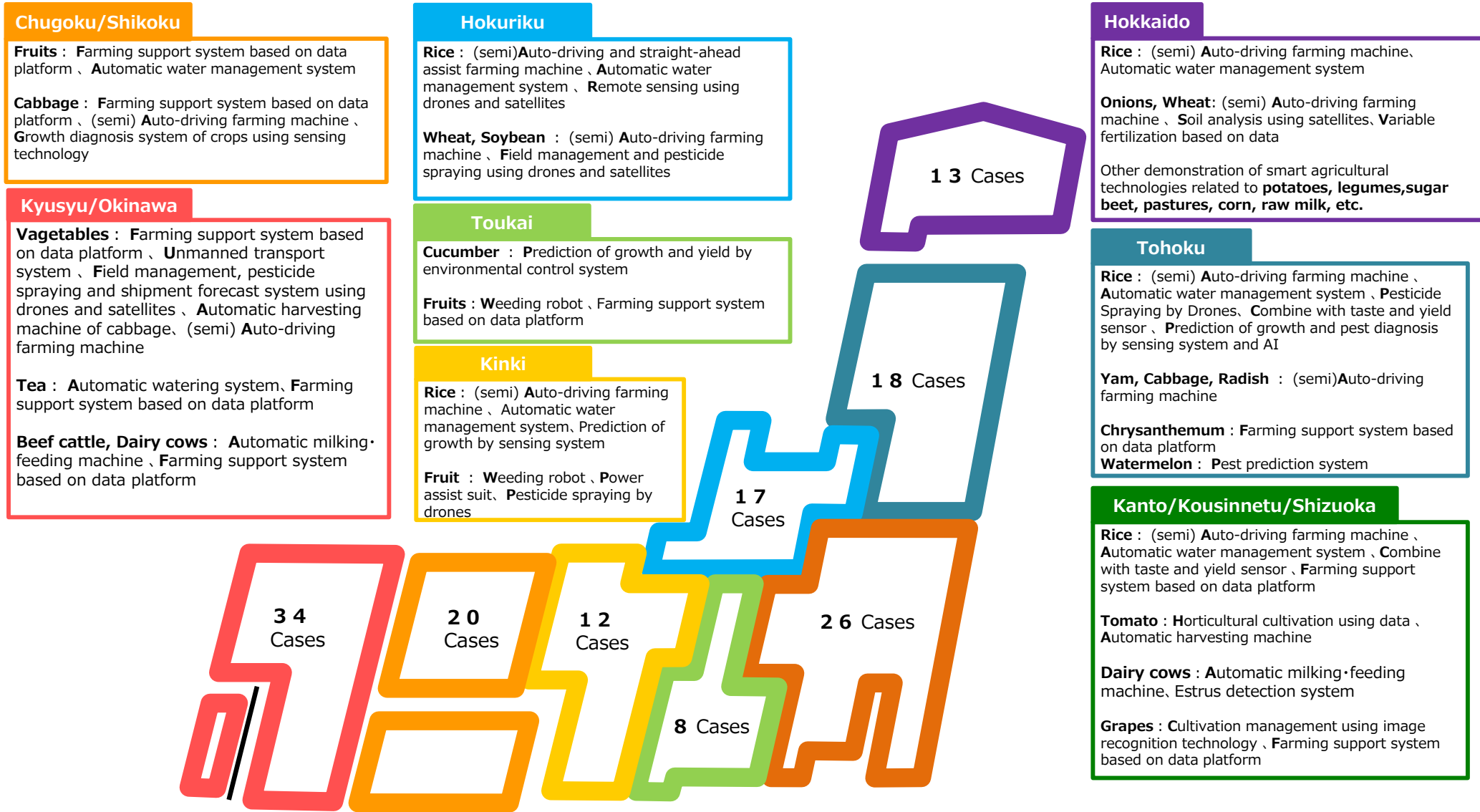
<Image of the Project>

Instances of advanced technologies from production to shipment



Accelerating installation of "smart agriculture"

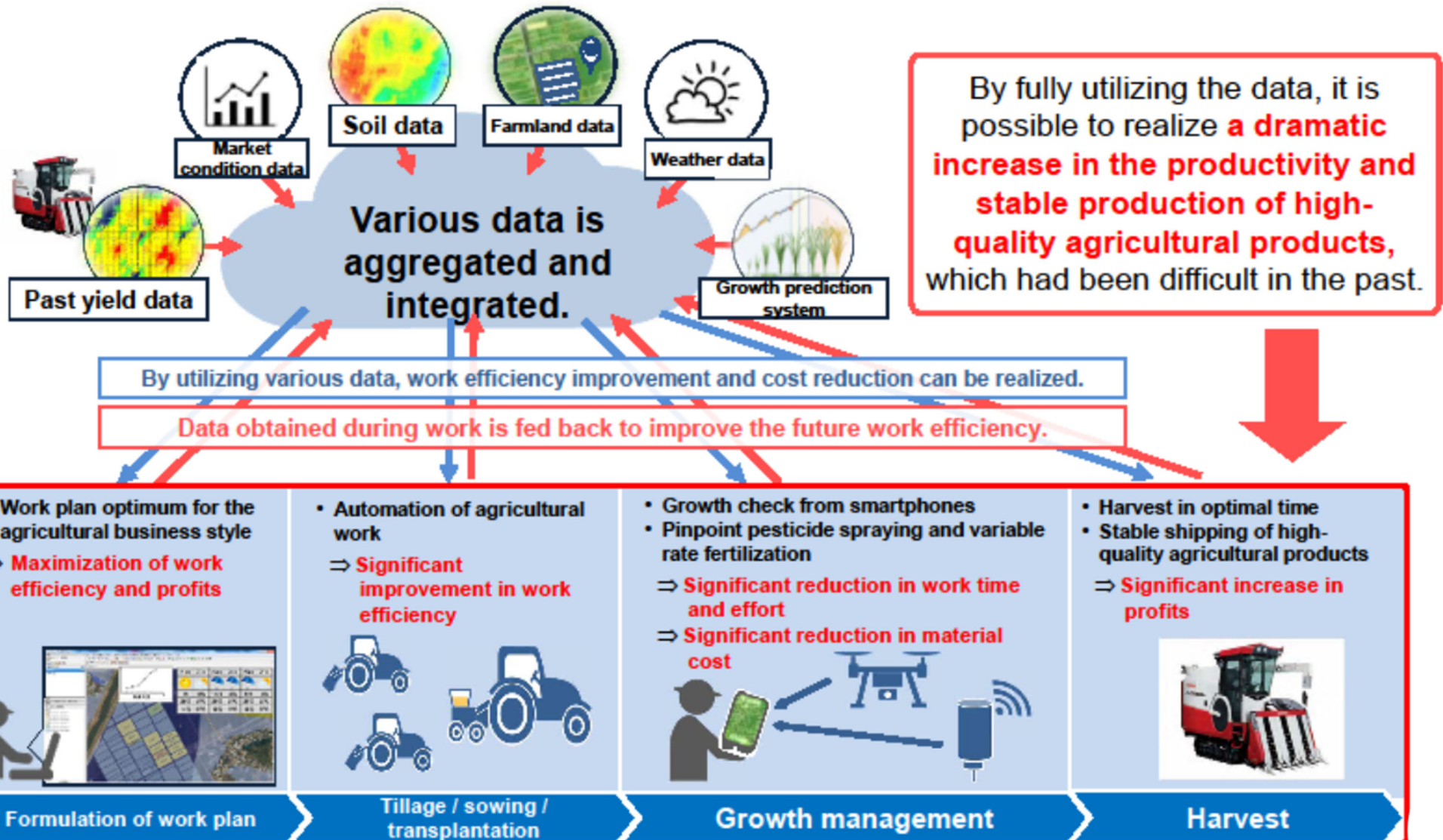
Demonstration of smart agricultural technologies (2019~2020) 2021.4 MAFF



Puddy field **42** district Upland field **14** Open field **31** district Horticulture **17** district
 Fruits **22** district Livestock **13** district Other **9** district

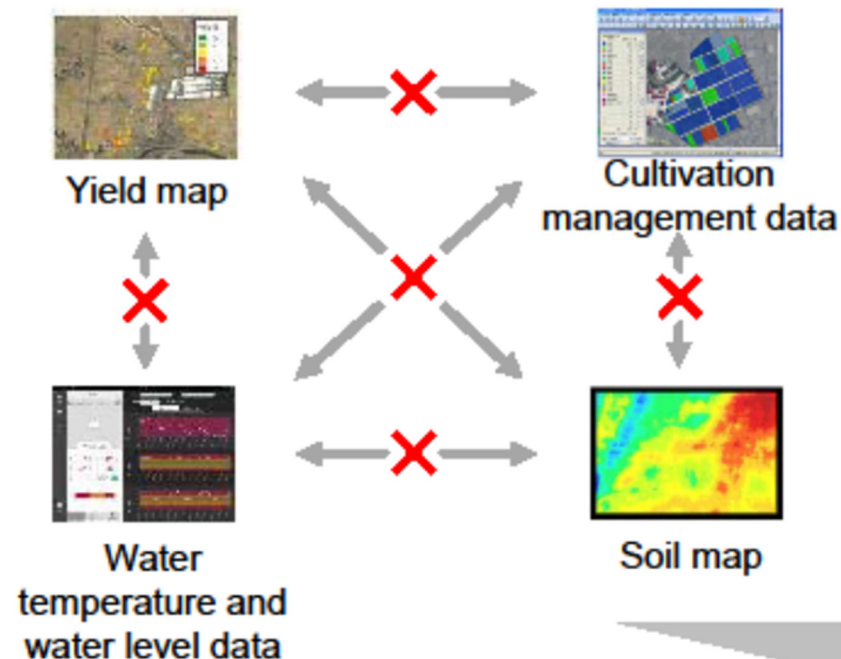
Total 148 Cases

To **dramatically increase the productivity** at agricultural sites, it is essential to improve the environment where **data can be fully utilized.**

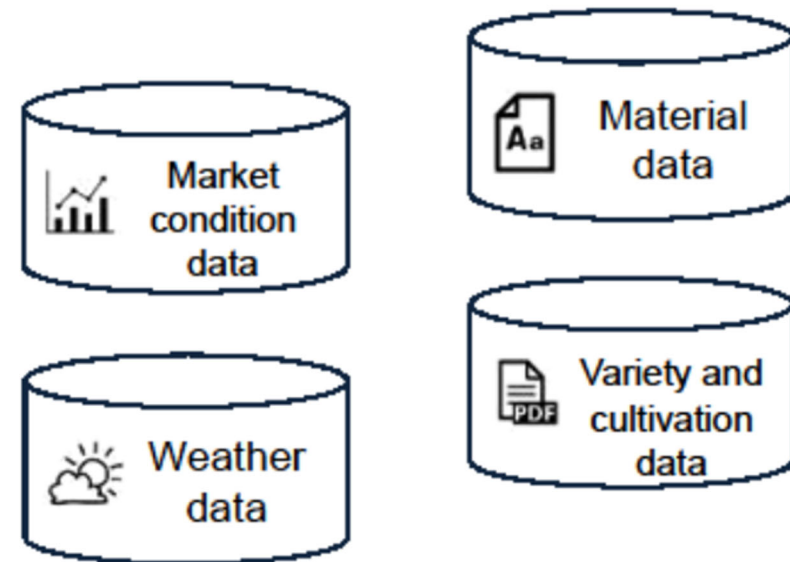


Although the use of ICT is essential to practice agriculture based on data, **data is not being fully utilized** because **there is no mutual collaboration of data and services and various data is scattered.**

There is no mutual collaboration of data and services.



Data is scattered, and the formats are not integrated.



A data platform that allows sharing and utilizing of various data is necessary.

- To solve the issues of ICT and to create an environment where business farmers can work toward improving productivity and management by using data, a data platform (Agricultural Data Collaboration Platform: WAGRI) having data collaboration, sharing, and providing functions was constructed. The operation started in April 2019 by the National Agriculture and Food Research Organization (NARO).
- A service utilizing WAGRI for farmers was developed and provided by a private operator.

Three functions of WAGRI

Data collaboration function

The function allows data collaboration of various agricultural ICTs, agricultural machinery, and sensors beyond the of vendors and manufacturers.



Data sharing function

Data can be shared under certain rules, enabling provision of data comparison and service that leads to productivity improvement.



Data providing function

Various data including soil, weather, and market conditions is managed, and useful information is provided to farmers.

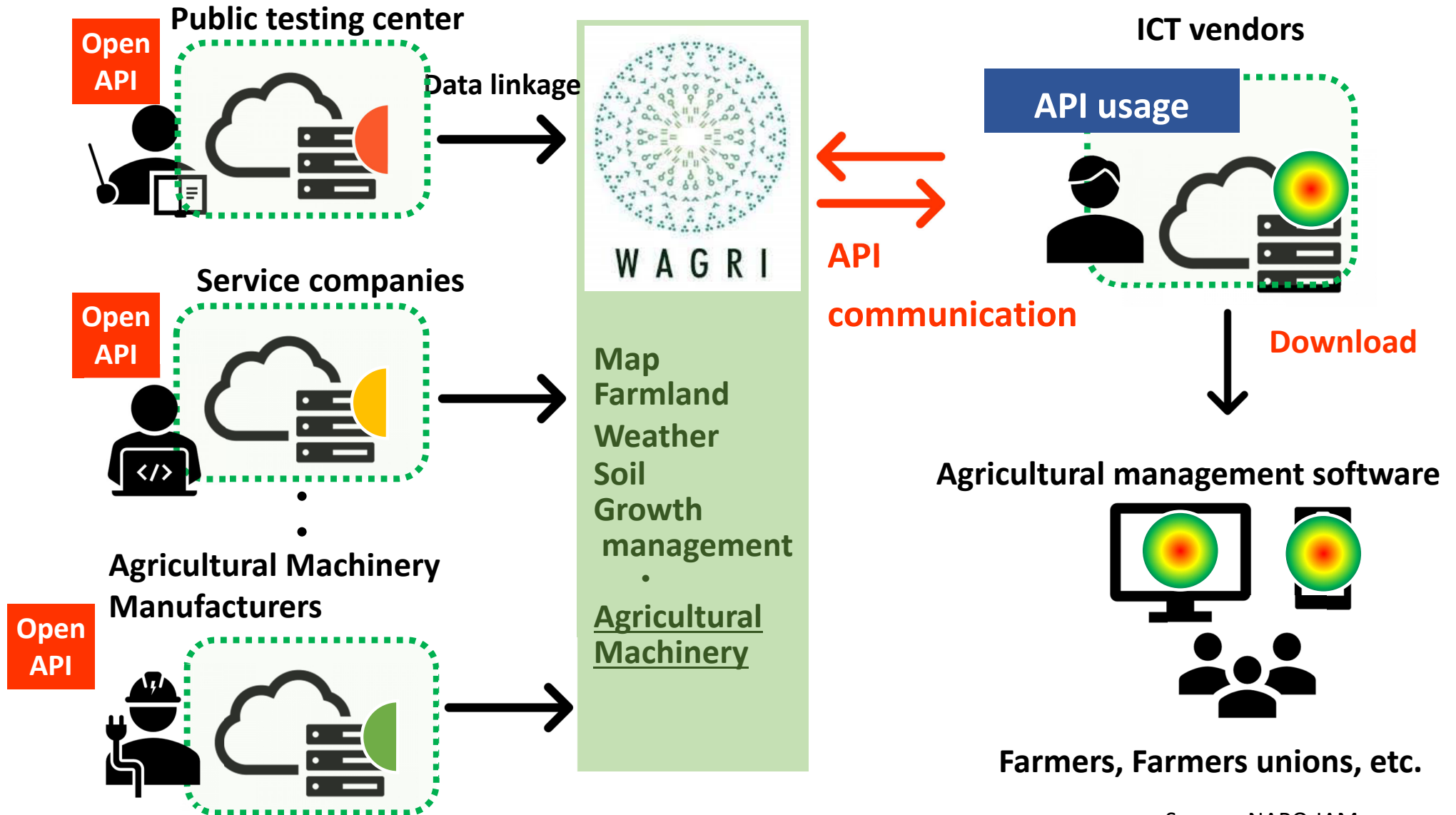


The productivity and management can be improved by utilizing various data.

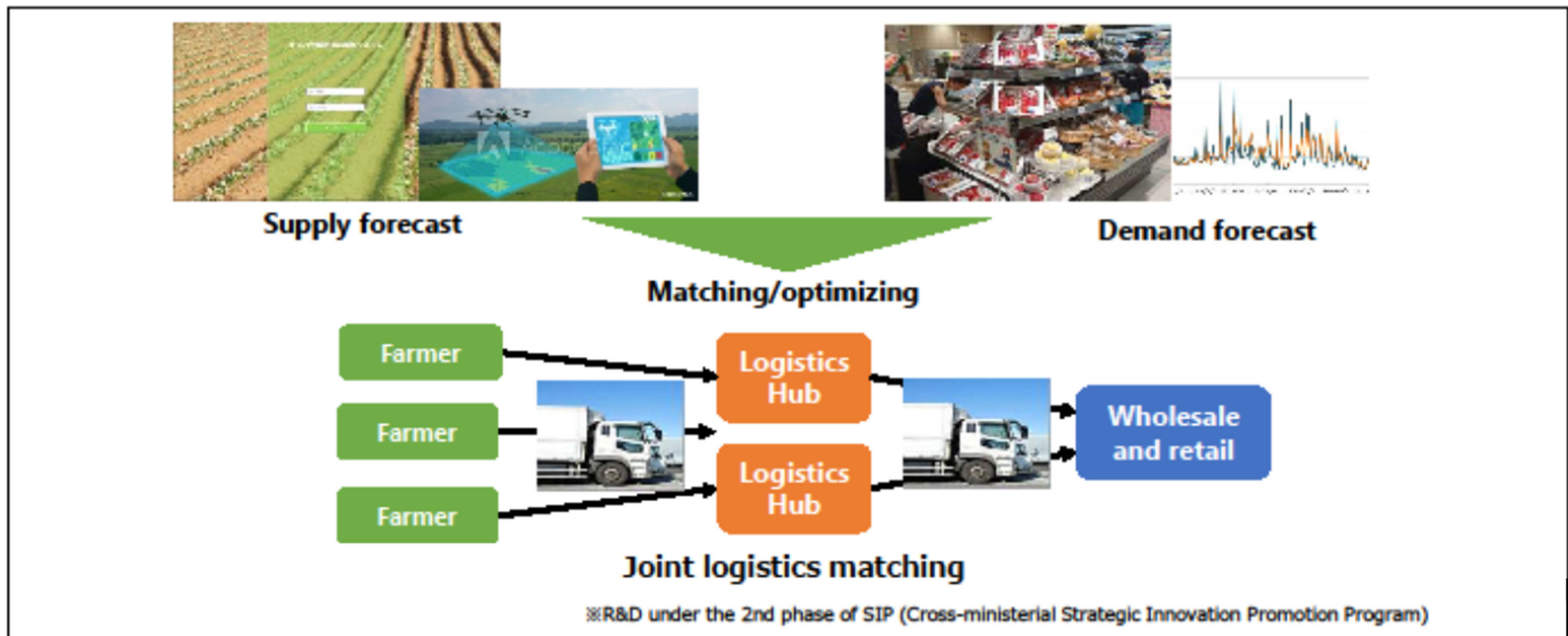
Open API + Connecting WAGRI

2021.4 MAFF

- WAGRI is a collaborative area for private companies providing agricultural ICT-services
- Promoting a uniform control of various farming-related data through WAGRI.



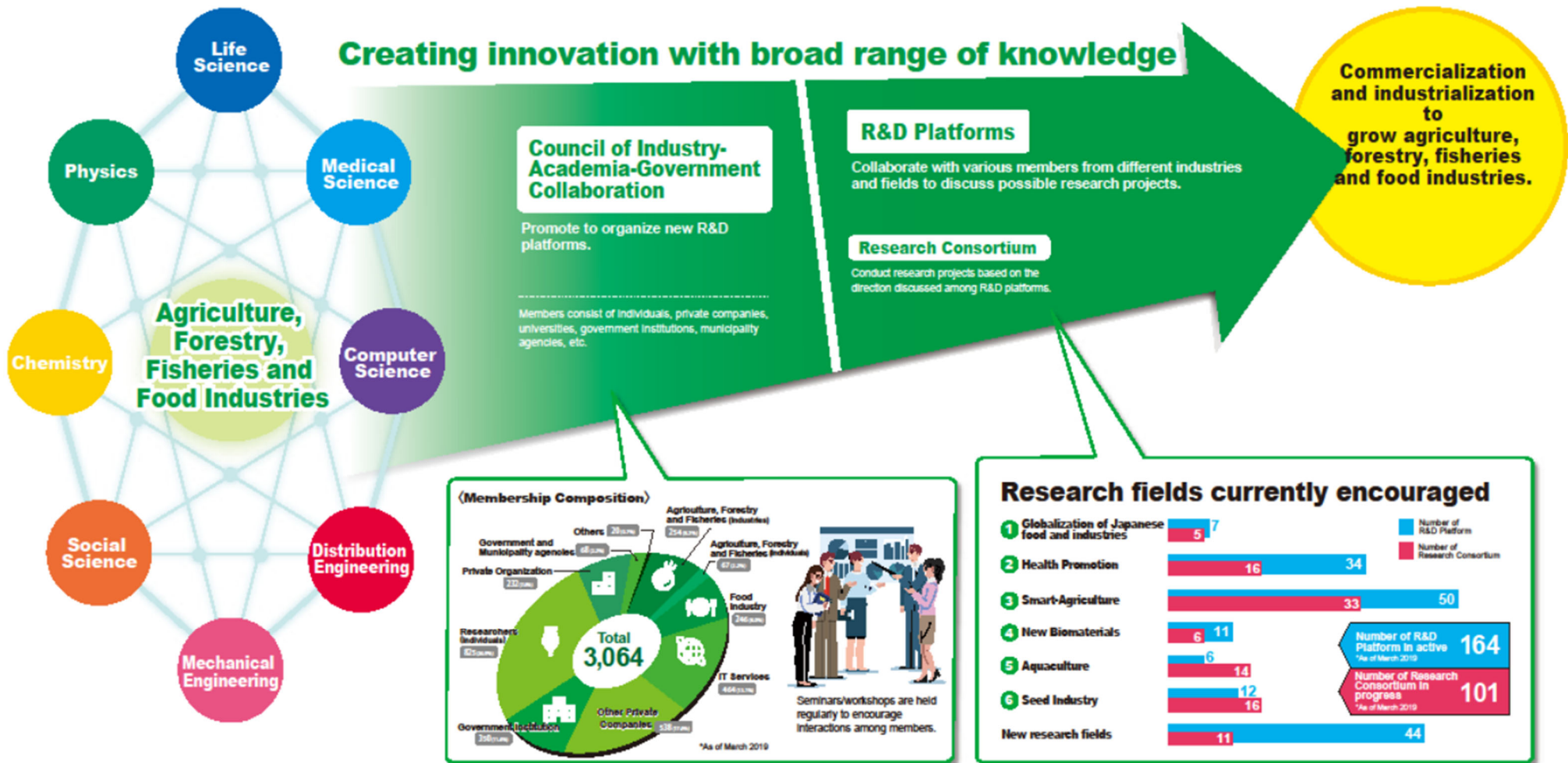
- AI can optimize matching between farmers and wholesalers, with:
 - better forecast of supply and demand,
 - less food loss and waste, and,
 - maximize producer's profit.

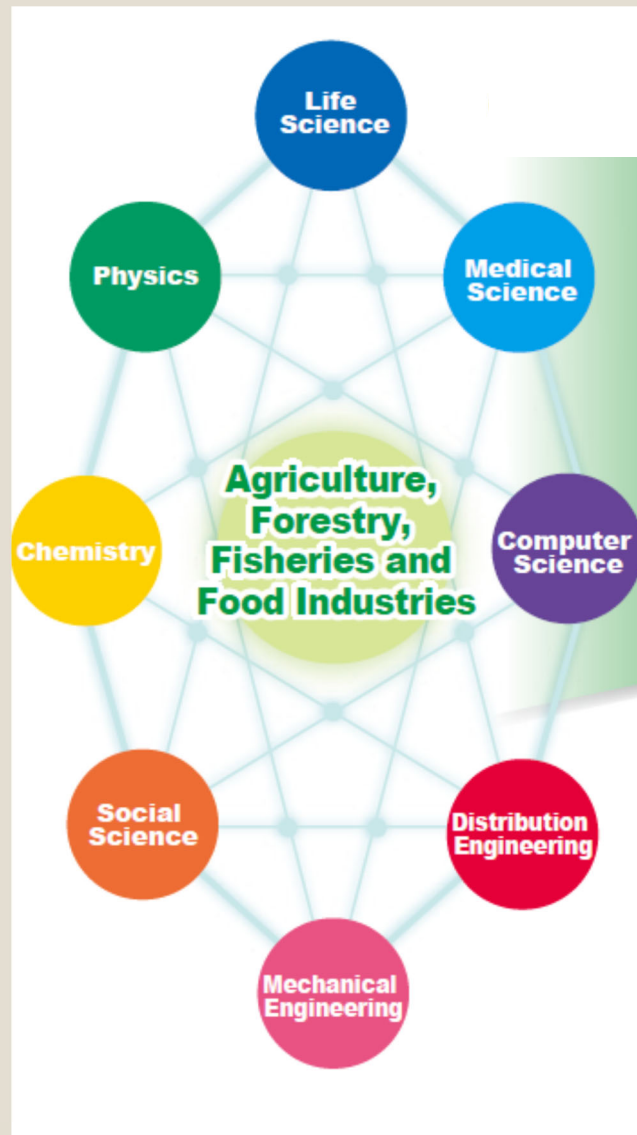


Field for Knowledge Integration and Innovation (FKII)

Council of Industry-Academia-Government Collaboration

Introducing new ideas/technologies to agriculture, forestry, fisheries and food industries is expected to strengthen the competitiveness of their products in the domestic and international markets, and to promote further industrialization. In April 2016, the Council of Industry-Academia-Government Collaboration launched to encourage the networking and collaboration among various industries and fields.





Involving Various Industries



Exchanging ideas for possible future collaboration



Research Group



Research Project



Activate Agriculture, Forestry, Fisheries and Food Industries

Measures for achievement of Decarbonization and Resilience with Innovation (MeaDRI)

- Measures for achievement of Decarbonization and Resilience with Innovation (MeaDRI), is the **national strategy** to achieve SDGs and sustainable food systems,
 - (1) enhance production potentials and ensure its sustainability,
 - (2) with numerical goals toward 2050 on core elements,
 - (3) by innovation and behavior changes of all the players.

- Interim summary has been announced in March, followed by the final version in May.

What is “sustainable food system”?

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- Thriving on;
 - food, agriculture, forestry and fisheries, (ECONOMY)
 - our civil society (SOCIETY) and
 - global environment (ENVIRONMENT)
- Sustainable food systems can lead to;
 - enhance potentials in agriculture, forestry and fisheries,
 - reduce environmental loads from related sectors

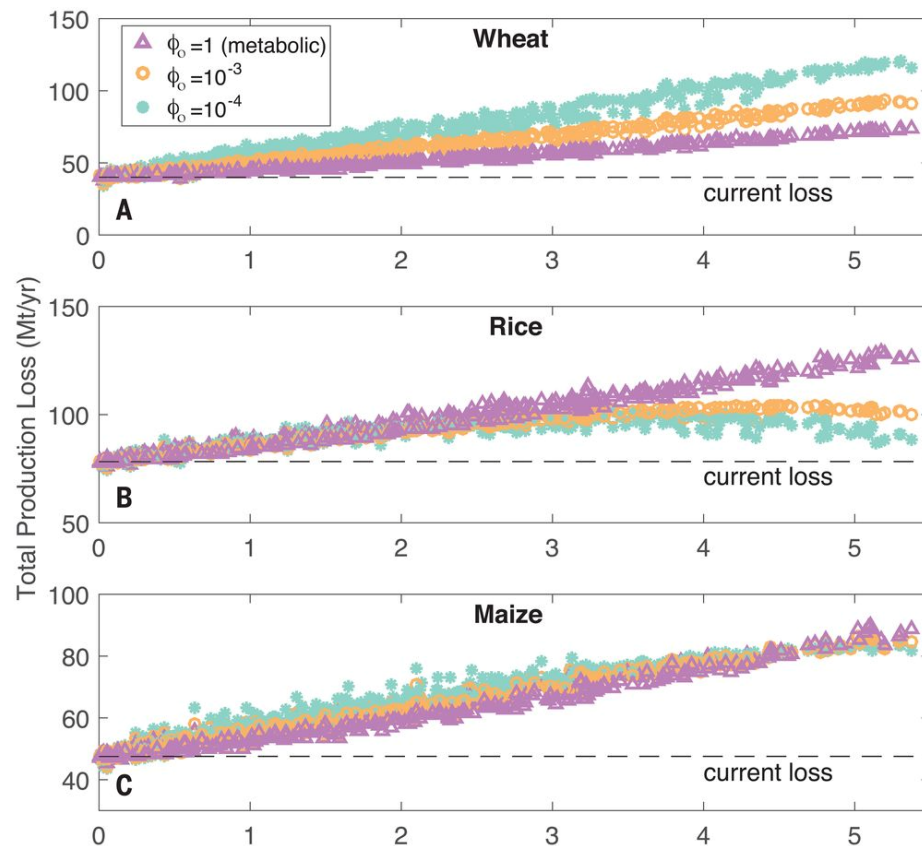
Enhance potentials of
agriculture, forestry
and fisheries

COMPATIBLE

Reduce
environmental loads
generated from
production

- Numerical goals on core components towards 2050
 - **GHG ZERO-EMISSION** from agriculture, forestry and fisheries
 - **50% ↓** in overall use and risk of chemical pesticides
 - **30% ↓** in chemical fertilizer use
 - **Organic farming ↑ to 25%** of farmlands (1million ha)
 - **30% ↑** of labor productivity in food manufacturing industries
 - **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.
- **INNOVATION** and **BEHAVIOR CHANGES** of players are the keys to achieve these goals.

- Asia-Monsoon climate is known for its high temperature and humidity, where pests and diseases occurrence is likely to be high.
- One of the challenges for the sustainable agriculture in this region is to control pests and diseases appropriately.

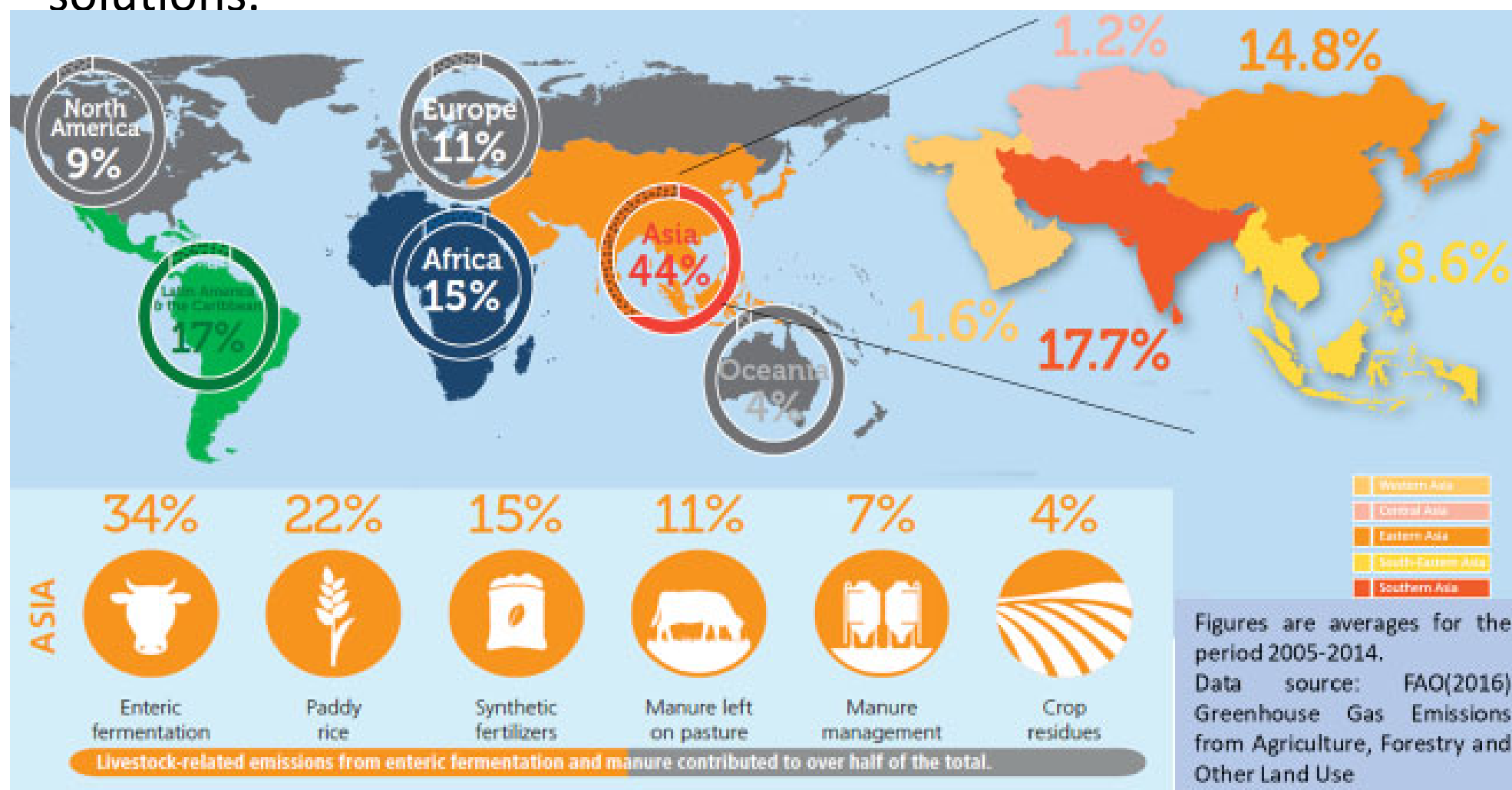


10-25% increase of yield loss of the crops due to insect pests is estimated, per degree Celsius of warming.

“Increase in crop losses to insect pests in a warming climate”, Science, 2018

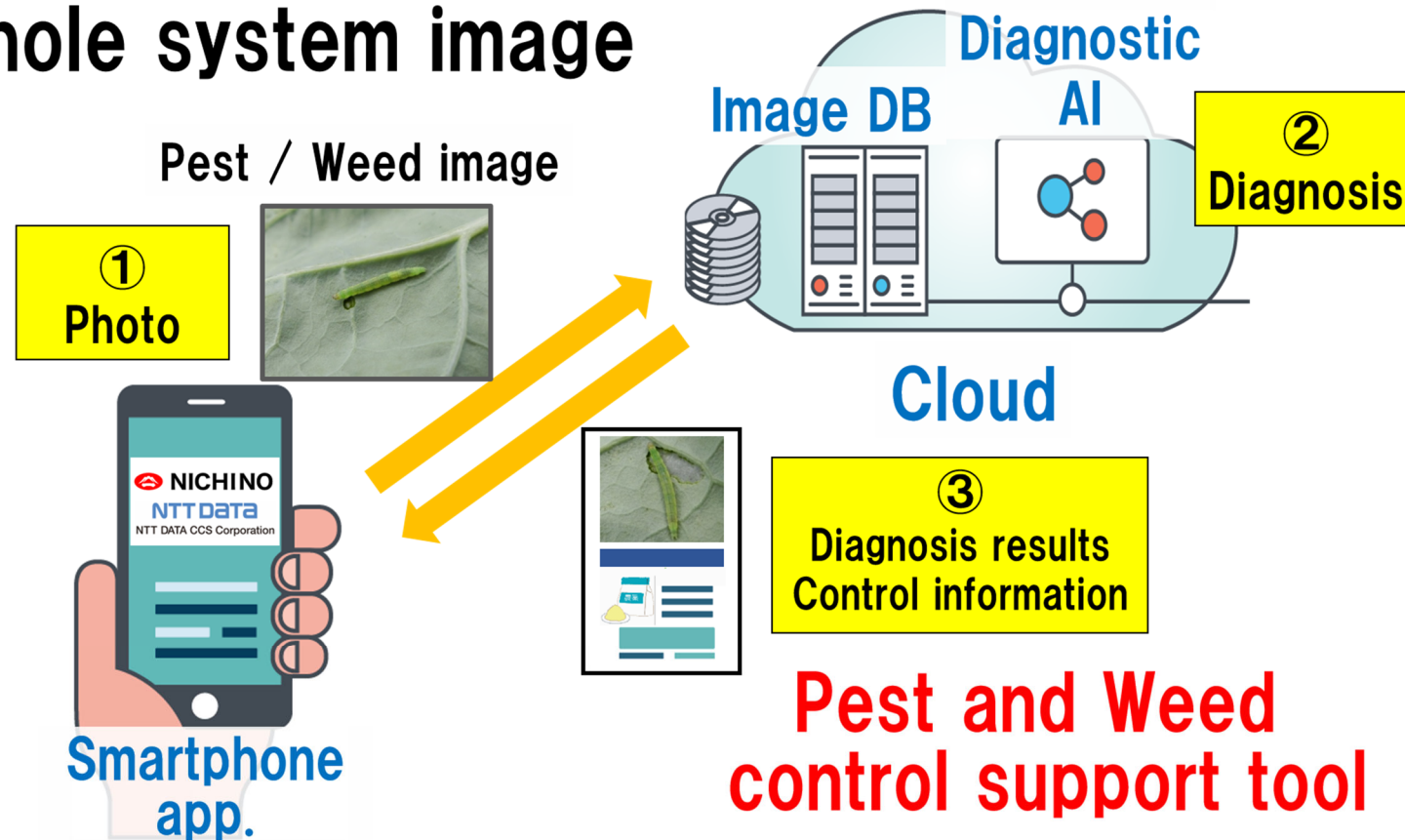
Challenges for Asia-Monsoon region (2) 2021.4 MAFF

- Asia, where paddy field farming is prevalent, accounts for about 44% of the GHG emissions from the world agricultural field.
- Reduction in these emissions is another challenge we strive for solutions.

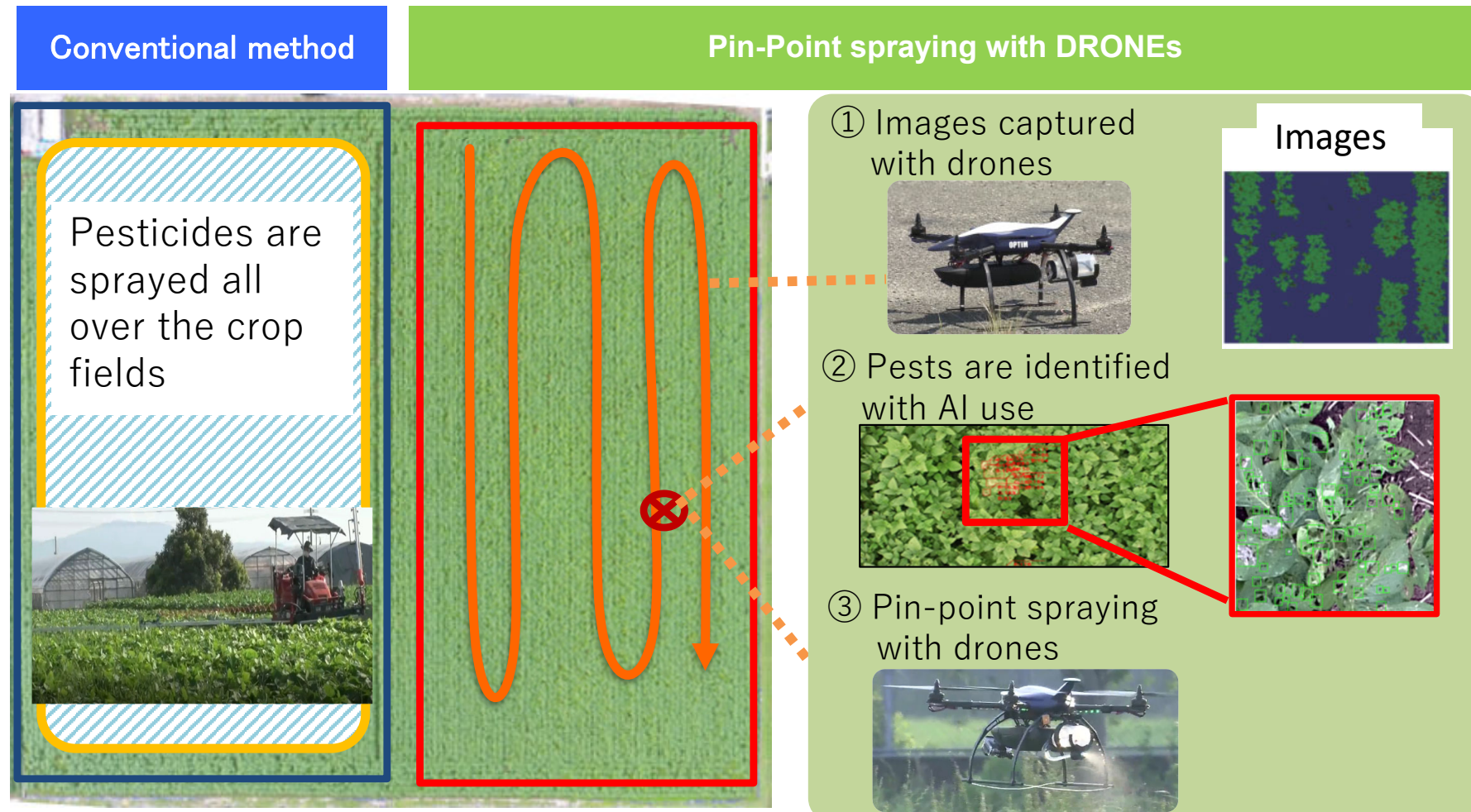


- A number of promising technologies are on track, including:
 - Integrated Pest Management (IPM) with less pesticide use
 - Pest diagnosis with AI assistance

Whole system image



Pest diagnosis and pin-point spraying can also reduce pesticide use.

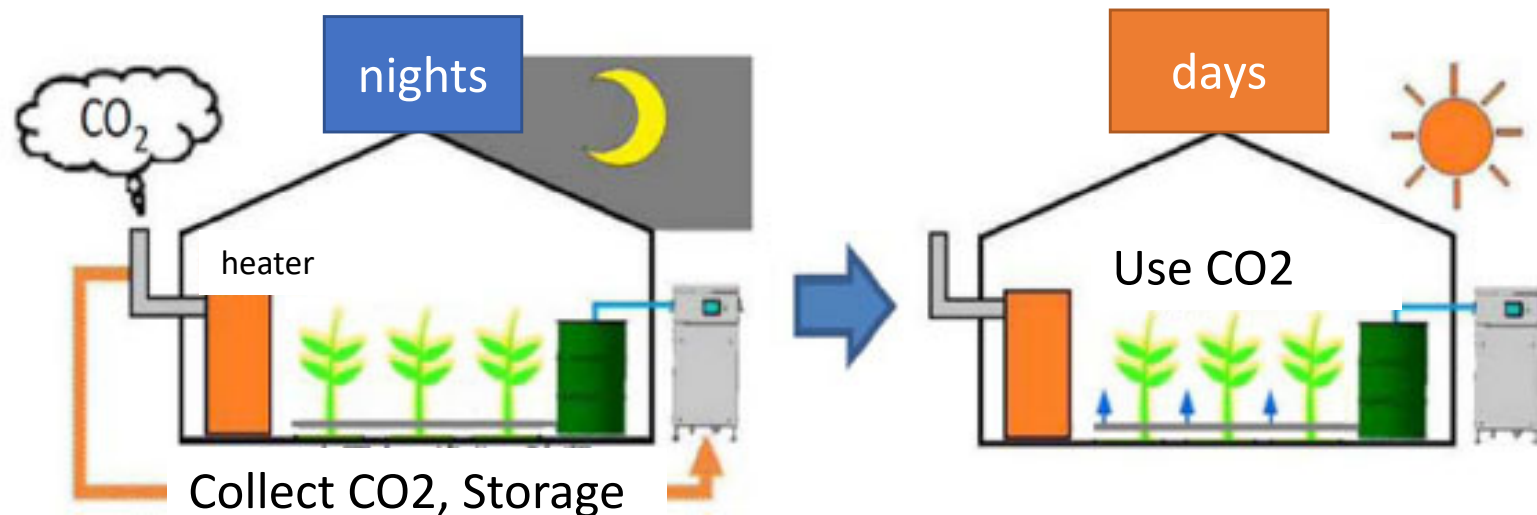


Avoid uneven growth of crops, reduce pesticide use (↓around 10%)

- Zero-emission can also be achieved by innovation .
- Also contributes to save energy and cost.

“Energy-saving” green houses

- Heat-pump, Wood-biomass heating, natural energies
- Data-based cost saving with monitoring and controlling (temperatures/other conditions)
- Increase heat retention with new covering materials
- CO₂ collection and reuse of exhaust fumes



- There is **no “one-size-fits-all” solution** leading to sustainable food systems, and each country has its own priorities.
- In Japan’s case, the focus is on **INNOVATION**, but each country should find **its own priorities and solutions**, taking geography, climate, farming/other conditions into account.
- Technologies developed in Japan (e.g. digital tools and pest controls) can help countries facing in similar challenges. For example, rice producing countries in Asia may find them useful, which have similarity in climate.
- The goal is to realize the world where humans can live with sustainable environment. **Japan is ready to address these challenges**, in collaboration with the international society.