

Agricultural Data Collaboration Platform

WAGRI

- * **WAGRI** is a coined word for the agricultural data platform combining “WA (which means circle in Japanese)” that links various data and services and “WA (which means harmony in Japanese)” that promotes further harmonization of various communities, resulting in expectation for innovation in the agricultural field (WA + AGRI).

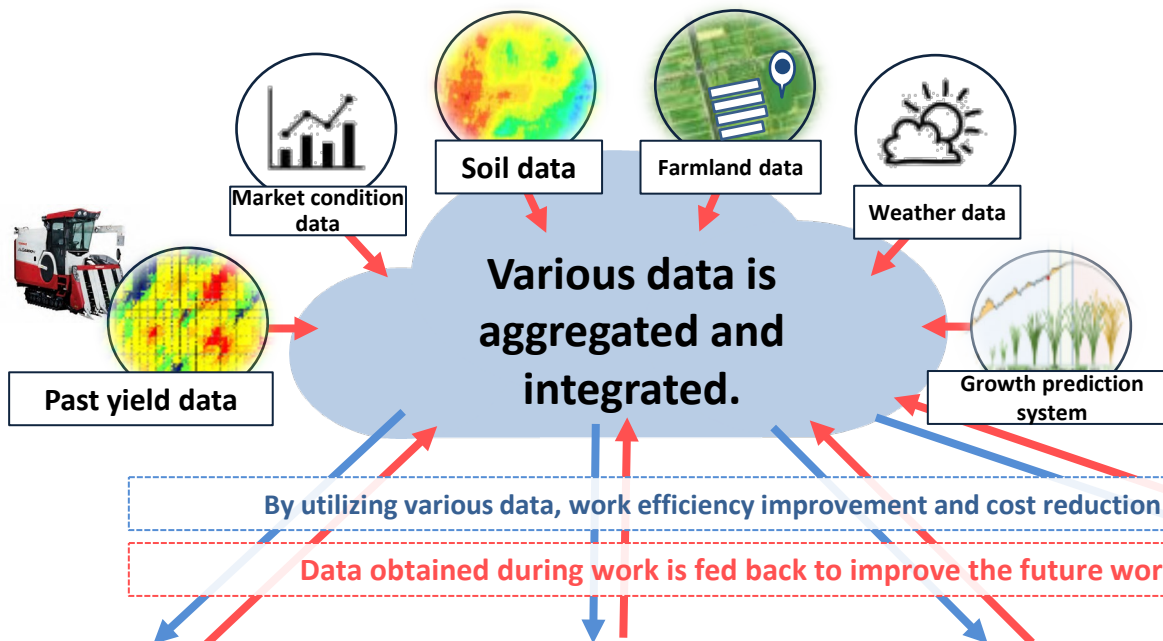


MAFF

Ministry of Agriculture, Forestry and Fisheries

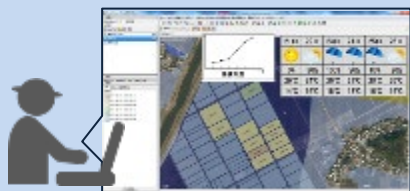
Future image of agriculture that utilizes data

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



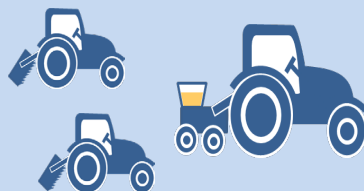
By fully utilizing the data, it is possible to realize **a dramatic increase in the productivity, stable production of high-quality agricultural products, and environmentally friendly agriculture.**

- Work plan optimum for the agricultural business style
- ⇒ **Maximization of work efficiency and profits**



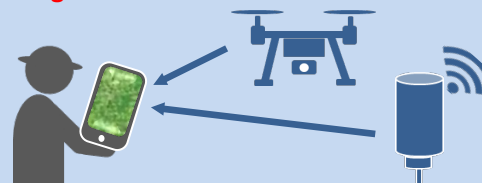
Formulation of work plan

- Automation of agricultural work
- ⇒ **Significant improvement in work efficiency**



Tillage / sowing /
transplantation

- Growth check from smartphones
 - Pinpoint pesticide spraying and variable rate fertilization
- ⇒ **Significant reduction in work time and effort**
- ⇒ **Significant reduction in material cost**



Growth management

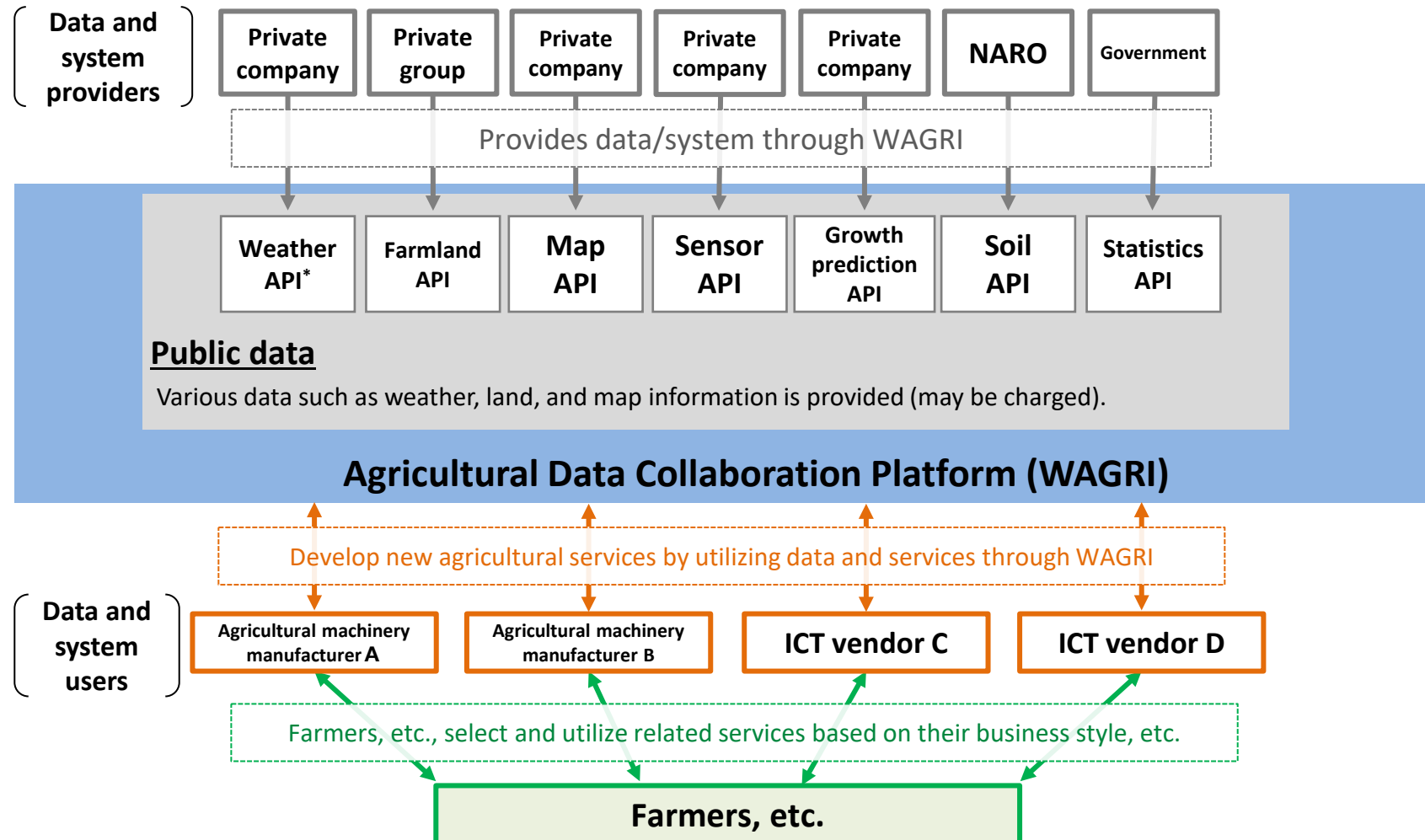
- Harvest in optimal time
 - Stable shipping of high-quality agricultural products
- ⇒ **Significant increase in profits**



Harvest

Overview and structure of WAGRI

- In order to solve the problems of agricultural ICT and create an environment where farmers can use data to improve productivity and improve management, we created a data platform (**Agricultural Data Collaboration Platform:WAGRI**) as a **collaborative area with data linkage, sharing, and provision functions** and **started operation from April 2019 with NARO as the operating body**.
- **Private companies** are using WAGRI to **develop and provide services for farmers**.



*API: Application Programming Interface. Coding conventions that stipulate programs necessary for connecting (linking) several applications.

Main APIs under WAGRI

As of the end of August 2024, **186 APIs are available for use**. APIs are provided as basic data system APIs, which provide farmland data, weather data, etc., and predictive/identification program system APIs, which are capable of making growth predictions and carrying out disease and insect pest diagnosis.

◆ Basic data systems

Data category	Description	Features
Farmland	Integrated farmland data	Integrated data of farmland lot data (parcel polygon data), farmland pin data, and digital soil maps from across the country, and which can be acquired in whole batches
Weather	1 km mesh weather data	1 km mesh long-term forecast data that enables the seamless acquisition of 14 types of confirmed values (past values), forecast values, and normal values by specifying a date
Market conditions	Market data for fruits and vegetables	Data, by date, of the volume of fruits and vegetables received, selling prices, etc.
Agricultural chemicals	Agricultural chemical info	Provides agricultural chemicals registration information published by the Food and Agricultural Materials Inspection Center (FAMIC)

◆ Predictive/Identification program systems

Data category	Description	Features
Growth prediction	Growth and yield prediction tool	Programs to predict the growth and yield for vegetables grown outdoors, greenhouse horticulture crops, etc.
Disease and insect pest diagnosis	Disease and insect pest identification recognition program	Programs that are able to identify diseases from images of parts photographed using smartphones, etc., and which collect these images

Main data and programs currently available through WAGRI (1)

Data category	Description	API provider* The name of developing and providing organization is in parentheses.
Fertilizer	Registered fertilizer info (This information is linked to the MAFF (Ministry of Agriculture, Forestry and Fisheries) fertilizer registration system)	WAGRI Administration Office (MAFF)
Agricultural chemicals	Registered agricultural chemical info (About 7,400 types of agricultural chemicals are registered)	WAGRI Administration Office (Food Agricultural Materials Inspection Center (FAMIC))
Map	Map data and aerial image data	NTT InfraNet
"	Digital soil maps (information on soil types and distribution)	NARO
Farmland	Farmland lot data (Parcel polygon data)	WAGRI Administration Office (MAFF)
"	Location and lot number of farmland, land category, area, lease type, etc. (farmland pin data)	WAGRI Administration Office (MAFF)
"	Integrated farmland data (Integrated data of parcel polygon data, farmland pin data, and digital soil maps from across the country)	NARO
Weather	Hourly weather forecast for up to three days in the future (1 km mesh data)	Halex
"	Daily weather forecast for up to 26 days in the future (1 km mesh data)	Life & Business Weather
"	Broad range weather forecast (prefectures, etc.)	WAGRI Administration Office (Japan Meteorological Agency)
Market conditions	Market data for wholesale fruits and vegetables (daily and historical data) (Fruits and vegetables market information, wholesale fruits and vegetables market research)	WAGRI Administration Office (MAFF)
"	Market condition data (daily and historical) for the Central Meat Wholesale Market (pigs and cattle) (Wholesale Meat Market Survey)	WAGRI Administration Office (MAFF)
Livestock	Number of pigs and cattle slaughtered at major slaughterhouses (daily and historical data) (Statistical data of slaughterhouses)	WAGRI Administration Office (MAFF)
"	Number of cattle and facility (Nationwide and by prefecture and by month) (National livestock cloud data)	WAGRI Administration Office (National Livestock Cloud Data Promotion Council)

*The data and programs provided by WAGRI can be found on the website of the Agricultural Data Collaboration Platform (<https://wagri.naro.go.jp/>).

Main data and programs currently available through WAGRI (2)

Data category	Description	API provider *
Growth prediction	Growth prediction program for rice, wheat, and soybeans	Vision Tech Inc.
"	Growth and yield prediction program for protected horticulture (Tomatoes, paprika, cucumbers)	NARO
"	Growth and yield prediction program for vegetables grown outdoors (Cabbage, lettuce, broccoli, spinach, onion, leek)	NARO
"	Persimmon growth prediction model (Predicting the best harvest time)	Kindai University
"	Growth and yield prediction program for strawberries	NARO
Cultivation support	Technological system in rice growth diagnosis and additional fertilization (Indication of additional fertilizer requirements)	NARO
"	Input-output API of learning content so that users can acquire cultivation techniques (Strawberry)	Keyware Solutions Inc.
"	Strawberry cultivation support system	Fukuoka Agricultural Research Center
Shipment prediction	Shipment prediction model (predictions of total yield and time of shipment) (strawberry)	Green inc.
"	Shipment prediction model (Shipment prediction for wholesalers and retailers and crop amount prediction for farmers) (Cabbage, tomatoes, cucumbers, onions)	Seraku
Price and demand prediction	Market price and demand prediction model (lettuce, tomatoes, etc)	Farmship Inc.

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Main data and programs currently available through WAGRI (3)

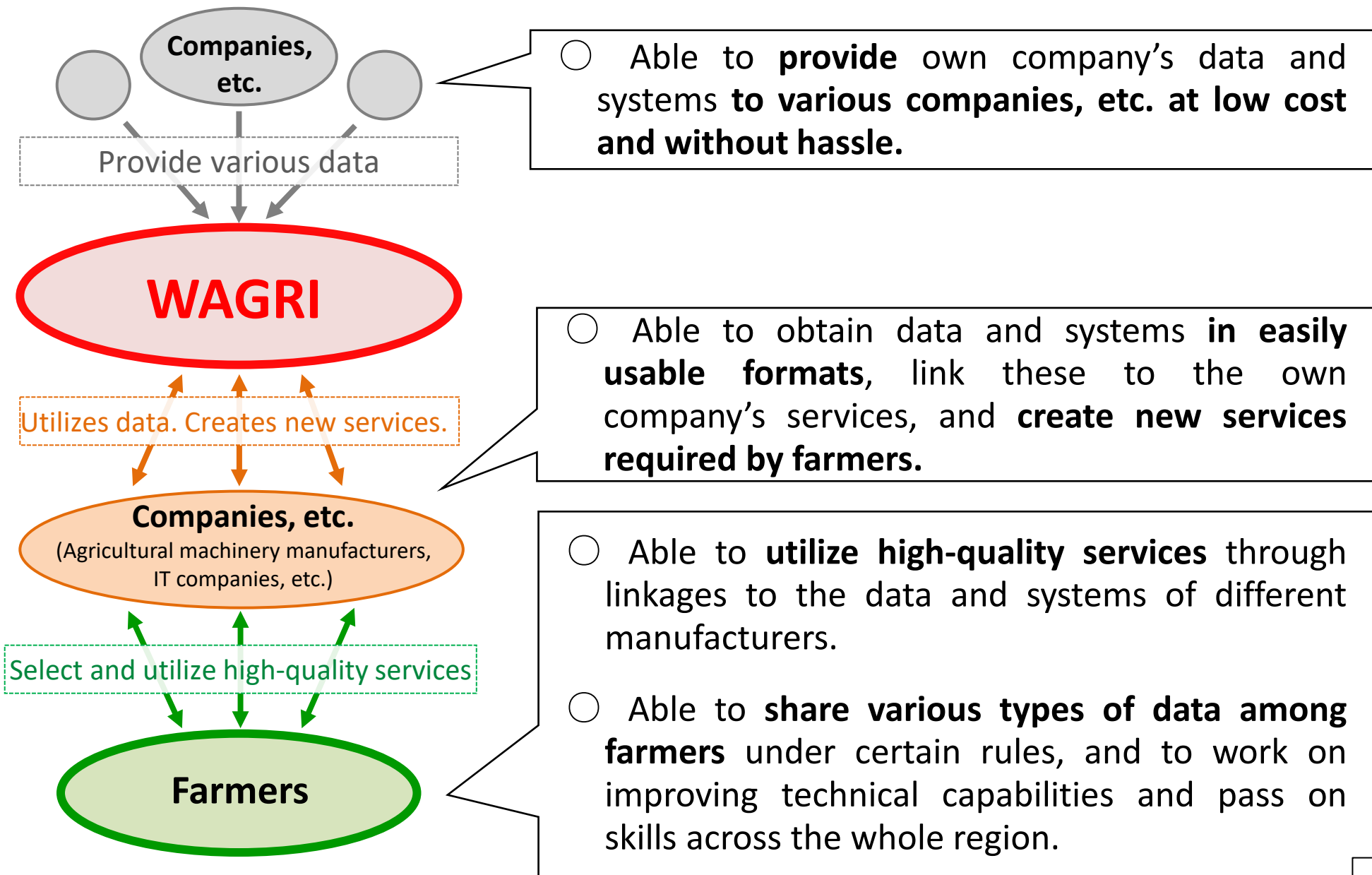
Data category	Description	API provider*
Soil environment	Soil temperature and moisture estimation API	NARO
"	Fertilizer nutrient supply API (Prediction nutrient supply of fertilizer)	NARO
"	API for visualization of efficacy of organic fertilizer	NARO
Disease and insect pest	Crop disease and insect pest image recognition program (Tomato, cucumber, strawberry, eggplant, peach, grape, bell pepper, soybean, potato, squash, chrysanthemum, and onion : Ability to identify disease and insect pest damage for 12 types of agricultural products)	NARO
"	Small reference book of diseases and insect pests (Tomato, cucumber, strawberry, eggplant, peach, grape, bell pepper, soybean, potato, squash, chrysanthemum, and onion: basic information of disease and insect pest for 12 types of agricultural products)	NARO
"	A program for estimating fungicide spray timing for rice false smut.	Vision Tech Inc.
"	Disease and pest outbreak forecast (Prediction of disease and pest outbreaks in Japan)	Farm Alliance Management
"	Prediction of generation of insects (Prediction of control timing for stinkbug and butterfly species)	NARO
Sensors	Sensor data conversion (convert various formats of sensor data)	TERRACE MILE, Inc.

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Data and programs planned to be offered in WAGRI

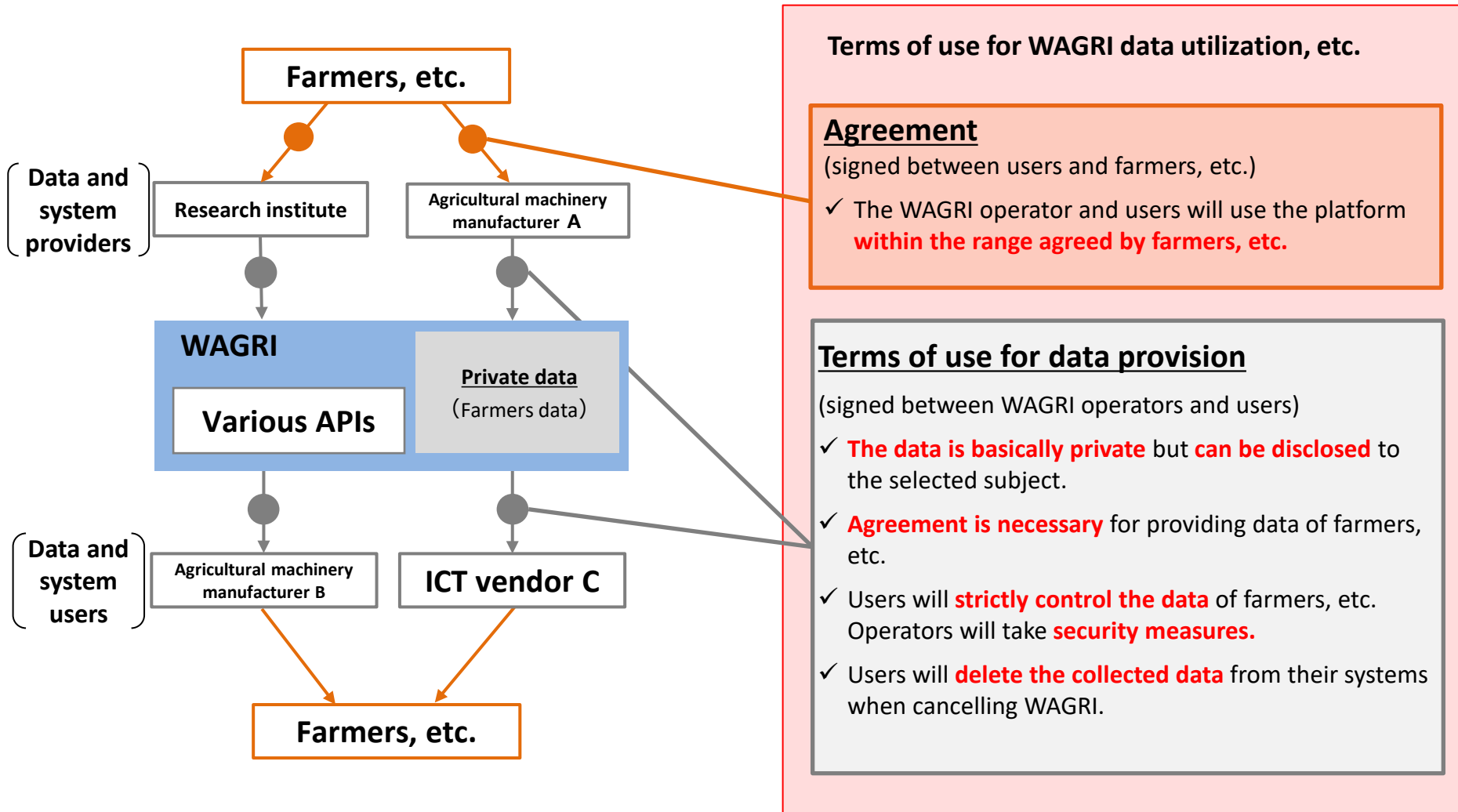
Produce type	APIs to be implemented in WAGRI	Notes (Research title etc.)		
Tomatoes, strawberries	Supply and quality predictive model	Establishment of an efficient production and distribution system with demand-based planning, as well as provision of a price-optimization platform to attract consumers	NARO	FY 2021 supplementary budget project: Project for development, demonstration, and implementation of smart agricultural technologies “Development and Improvement of Strategic Smart Agricultural Technologies” (Planned to be offered in WAGRI by the end of FY)
	Cultivation plan management tool that optimizes the yield to meet the demand			
Grapes and apples	Prediction model for coloring defect occurrence of grapes and apples	Global warming damage predictive system for fruit trees	NARO	
Citrus Unshiu, apples	Prediction model of sunburn damage to citrus Unshiu and apples			
Apples, pears, peaches, grapes, etc.	Late frost damage prediction model for apples, pears, peaches, grapes, etc.			
Grapes and persimmons	Prediction model for germination and flowering dates of grapes and persimmons.			
Tomatoes	Shipping quantity prediction program for tomatoes by production area	Shipping quantity prediction for tomatoes by production area	NARO	NARO’s research results
All produce types	Smart agricultural standard management index data	Analytical results of management data collected through Smart Agriculture Demonstration Project		
All produce types	Prediction data of agriculture management entities by municipality	Predict number of people continuing to farm through 2030		

Benefits of WAGRI



Data handling in WAGRI

To provide an environment of safe data collaboration and sharing, terms of use between the WAGRI users and operators (terms of use for data provision) and an agreement between the WAGRI users and farmers, etc., were developed based on “Guideline on Contracts Regarding Utilization of AI and Data in Agricultural Sector” established by MAFF.

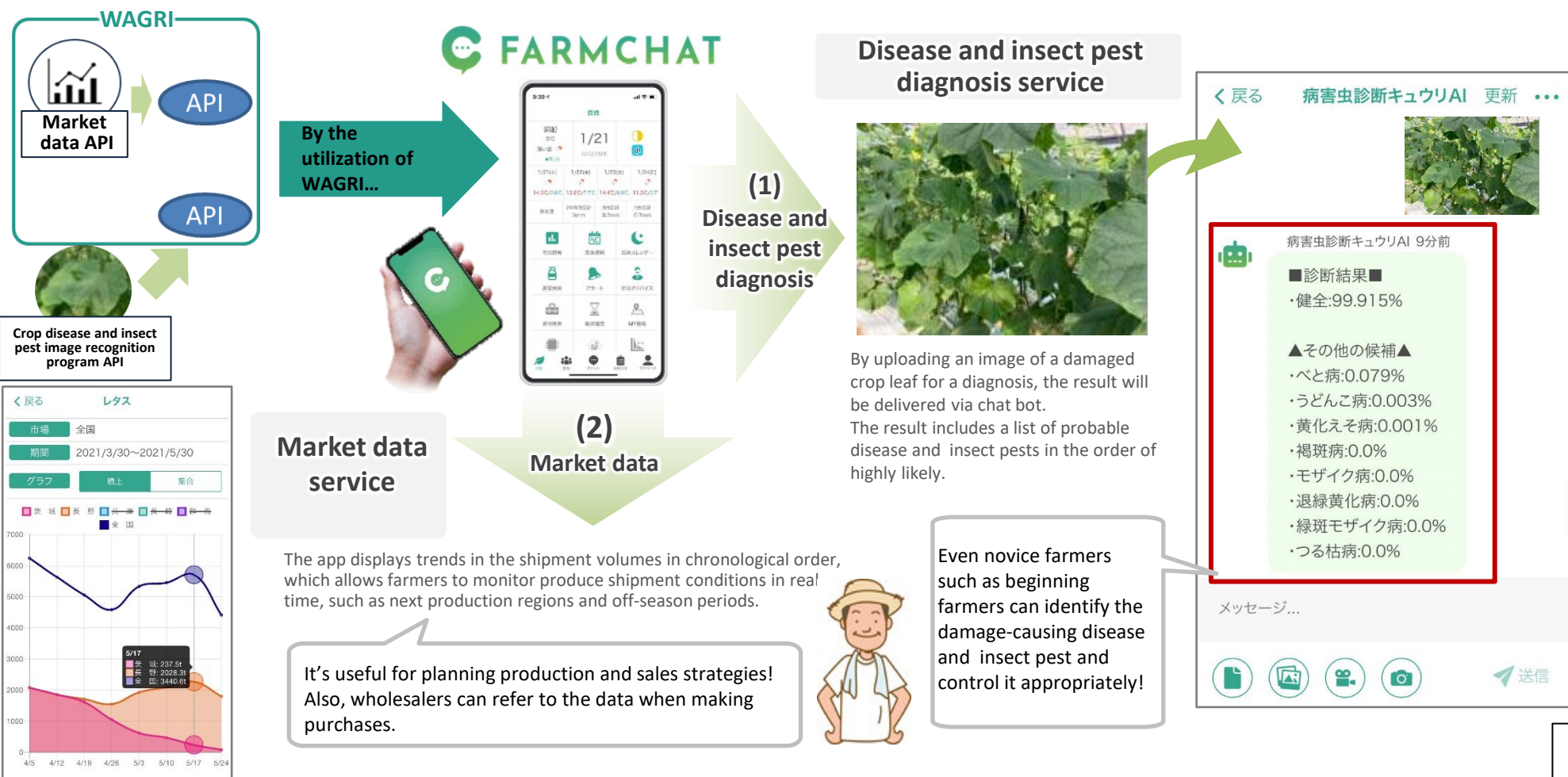


Example of utilization by private enterprise

- “FarmChat” for Farm Alliance Management, Co.,Ltd.-

- Linking WAGRI’s crop disease and insect pest image recognition program and market data for wholesale fruits and vegetables to FarmChat*.
- The app enables farmers to identify insect pests and diseases using images of crop leaves taken with smartphones, and to take appropriate control. (Compatible with 12 types of agricultural products as of October 2022)
- It enables daily checking of market data and monitoring of next production regions and off-season periods. Linking with APIs enables ICT vendors to reduce labor cost and human error.

*This smartphone app for farmers has a chat function, offers various agricultural information, and enables efficient farming.



Example of utilization by private enterprise

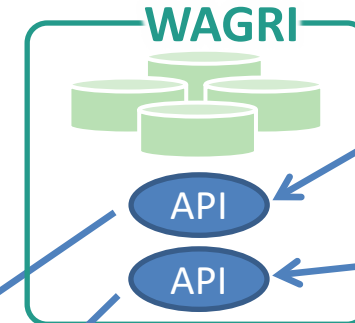
- “AgriLook” for VisionTech Inc. -

By linking weather data on WAGRI and satellite images and growth prediction models of VisionTech Inc., “AgriLook” allows detailed cultivation management including fertilization and measures against pests in accordance with the growth stage.



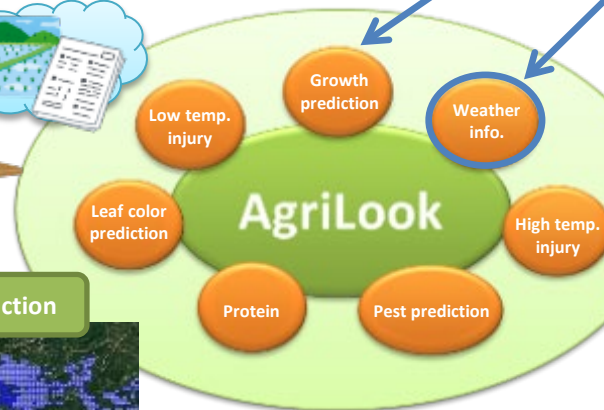
I want to manage cultivation in more detail using various data.

By the utilization of
WAGRI...

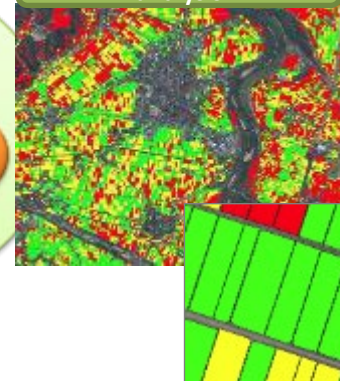


AgriLook

It is possible to check growth information and pest information that combine and use satellite data and weather data.



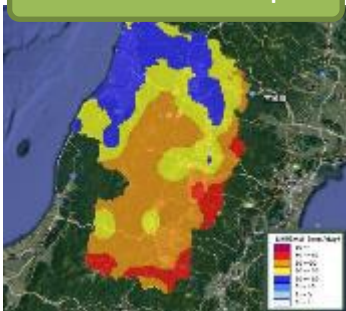
Additional fertilizer analysis



Accumulated temperature (after ear emergence)



Weather mesh map



Pest prediction

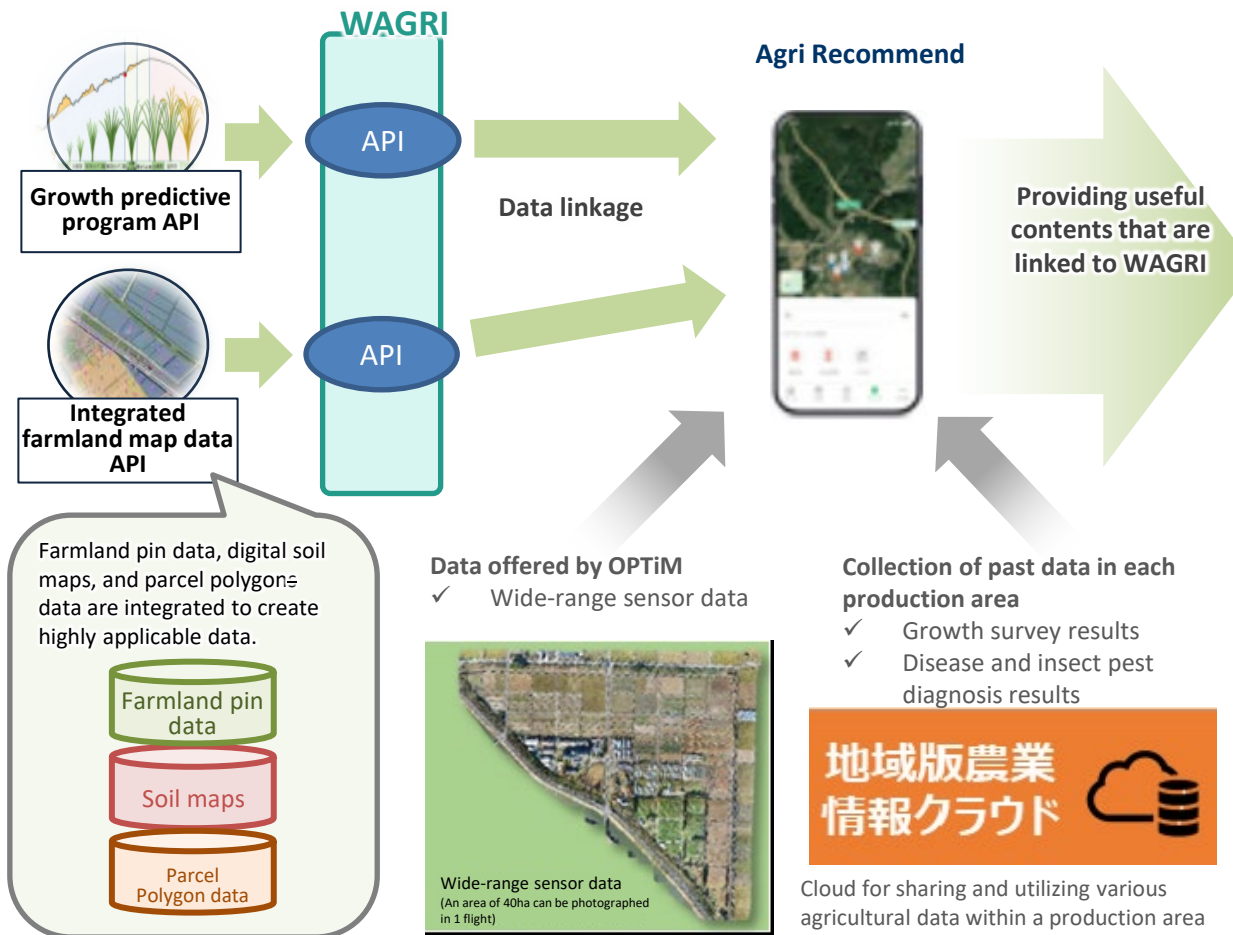


By combining weather data with AgriLook, farmers can manage cultivation in detail such as fertilization and measures against pests.

Example of utilization by private enterprise

“OPTiM Corp.” for Agri Recommend

- WAGRI’s growth prediction program, digital soil maps and farmland pin data are linked to “Agri Recommend”.
- The service **provides timely information on optimal crop production timing** by corresponding to the growth prediction. Also, it supplies soil information and past growth data **which can be used to determine the time and amount of additional fertilization of the field**. It also **simplifies farmland registration**, since it is linked to integrated data of farmlands.



<FY 2021 Smart Agriculture Demonstration Project> (JA Matsutou, JA Nomi, and others)

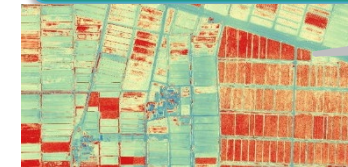
As part of the Smart Agriculture Demonstration Project, Agri Recommend was used to demonstrate a new support service for farmers which shares data to assist wheat and soybean production.

Notifications are sent to let farmers know the optimal timing for each farming task in a timely manner.

Based on the growth prediction program and weather data, farmers are notified of optimal timing for each farming task.



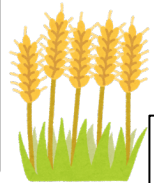
Accurate judgment on the timing and amount of additional fertilization



By using the wide-area sensor data and growth data, appropriate fertilizer application is possible!

Outcome goals

We aim to improve the yield of wheat and soybeans by more than 10% with the data.

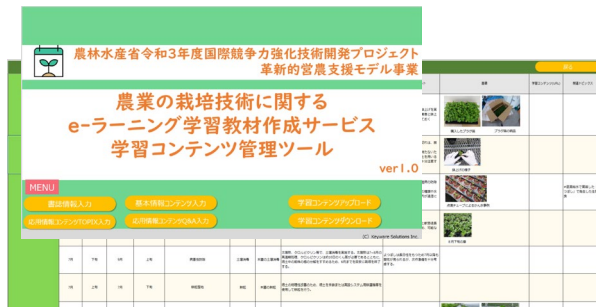


Example of utilization by private enterprise

- Keyware Solutions Inc. E-Learning Service -

- Extension and farming instructors, who provide training for producers, **developed tools for making education materials to allow people to learn agricultural cultivation technology in an e-learning format, just by registering their daily activity logs, responses to inquiries from producers, etc.**
 - **Not only were the educational materials made with these tools released and available for websites and smartphones,*1 it is also possible to use WAGRI API to provide information from the education materials to other services**
- *1 It is also possible to limit who could view the materials.

(1) Educational contents management tool



Service Structure

(1) Register daily records

(2) Released and viewable as educational materials



(2) Educational contents viewing tool



Educational Contents Management Tool

- Can be edited as a Microsoft Excel File
- Complies with the Educational Content Creation Guidelines*2

- Can display educational information linked to cultivation calendar
- Can be used to compare multiple cultivation calendar

Educational Contents Viewing Tool

- Can display summarized educational information by theme
- Can search for educational information

世帯による気象データの除去に努める。

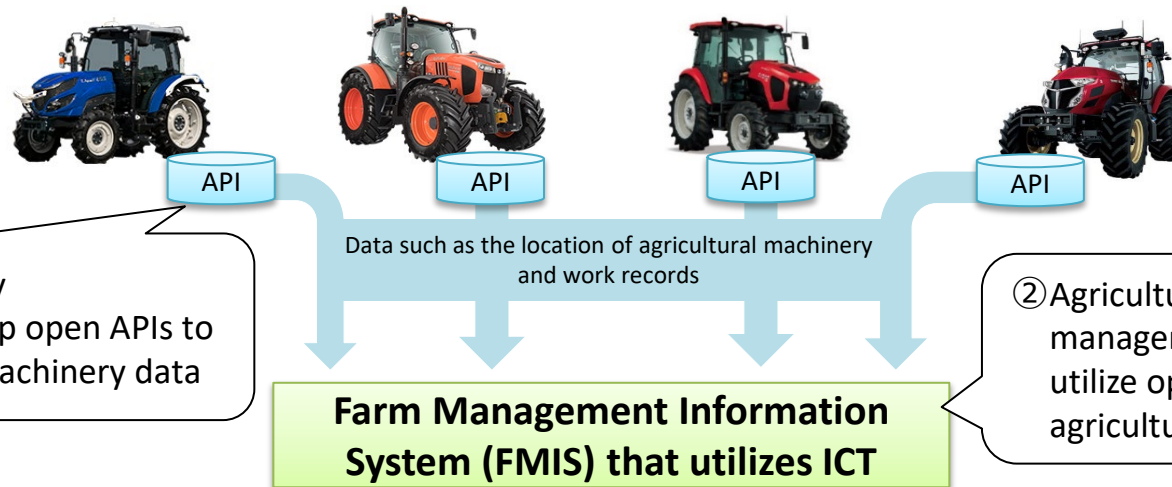


*2: The Educational Content Creation Guidelines stipulate the creation policy of agricultural cultivation technology information by the innovative farming support model development under the Project to Strengthening Technology Development the International Competitiveness (FY2020 supplementary budget project).

Promoting collaboration of data of agricultural machinery that transcends corporate boundaries (Open APIs)

- As smart agriculture becomes more prevalent, farmers and ICT vendors are increasingly interested in the interoperability of data from different manufacturers' agricultural machinery.
- The Ministry of Agriculture, Forestry and Fisheries (MAFF) is promoting the development of an open API that enables the linkage of agricultural machinery data across company boundaries.

<Image>



- ③ Farmers can view and analyze data from multiple machinery they own in a single farm management system



Examples of using agricultural machinery data

【Agricultural machinery data】

- Latitude and longitude
- Date and time
- Type of work (cultivation, sowing etc.)



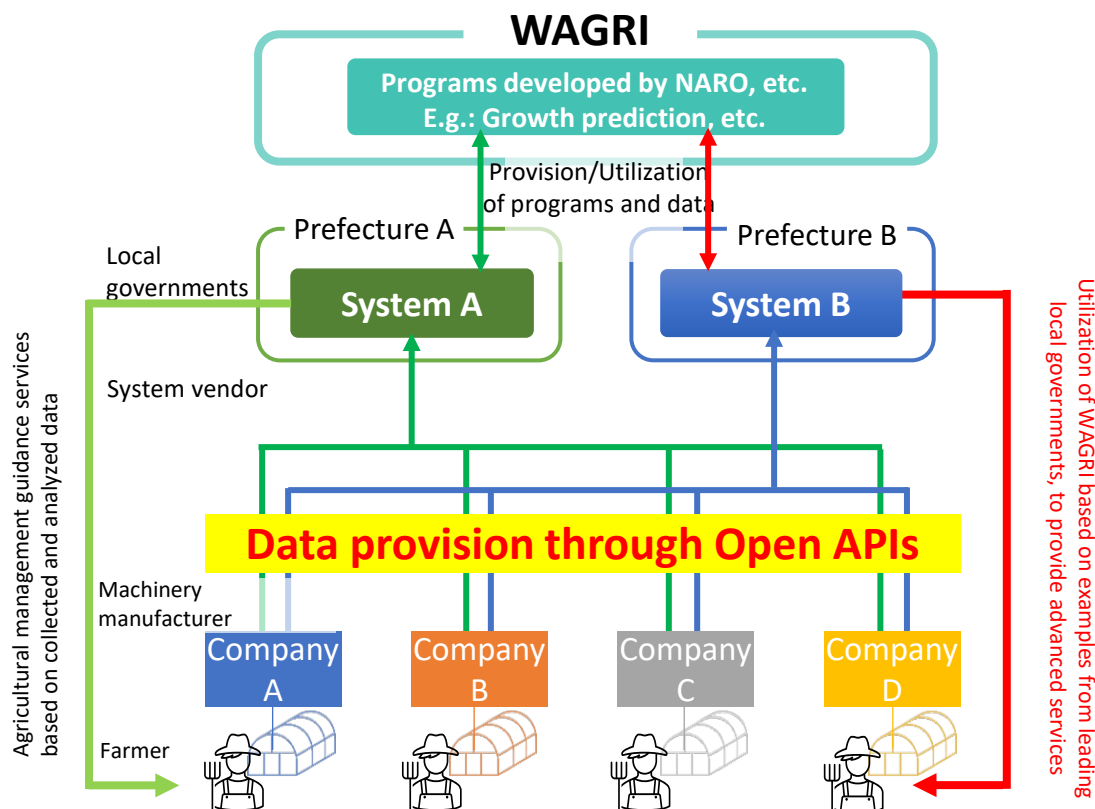
【FMIS】

- Farm work trajectory
 - Working hours by field/work
- Automate and centralize work records

Overview of how Open API (Nouki API) is used

- Under the Data Management and Utilization Infrastructure Strengthening Project established by the Ministry of Agriculture, Forestry and Fisheries (MAFF), we have been working on standardizing data formats and developing Open APIs (Nouki APIs) to enable the integrated use of data, such as the operating hours of major agricultural machinery such as tractors, temperature and CO2 concentration in facility environment monitoring equipment, through various Farm Management Information System (FMIS) with the consent of the farmers themselves.
- The utilization of Nouki APIs in the data sharing systems that are being promoted by various local governments makes it possible to integrate communication procedures for data acquisition and the format of the acquired data, thereby reducing development costs for both data providers and users. Furthermore, by utilizing crop growth prediction programs developed by the National Agriculture and Food Research Organization (NARO) and other entities through WAGRI, we expect to be able to provide, at low cost, advanced services that can contribute to improving productivity for farmers.

<Overview>



<Vision of what we aim to achieve through the utilization of Open API and WAGRI>

By utilizing Open APIs and WAGRI, farmers can receive advanced services at low cost, thereby improving productivity.

(1) Utilizing Open API can **reduce costs associated with data connection** to local government systems for machinery manufacturers

(2) The **data formats provided to the system by various machinery manufacturers are standardized** to facilitate the centralized management of data by local governments and systems.

(3) Utilizing crop growth prediction programs developed by NARO and other entities through WAGRI **enables the provision, at low cost, of advanced services** that can contribute to improving productivity for farmers.

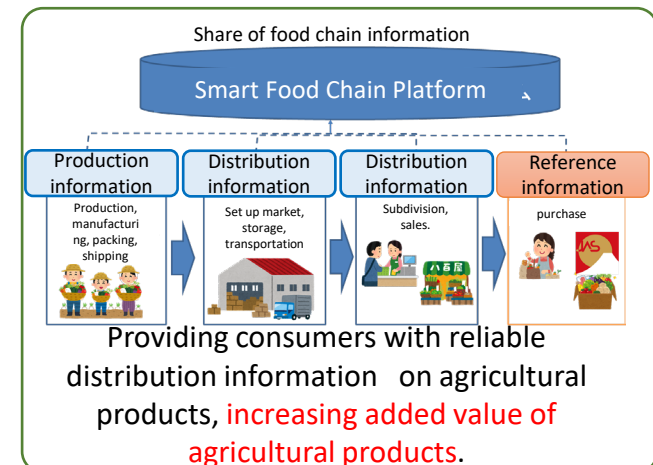
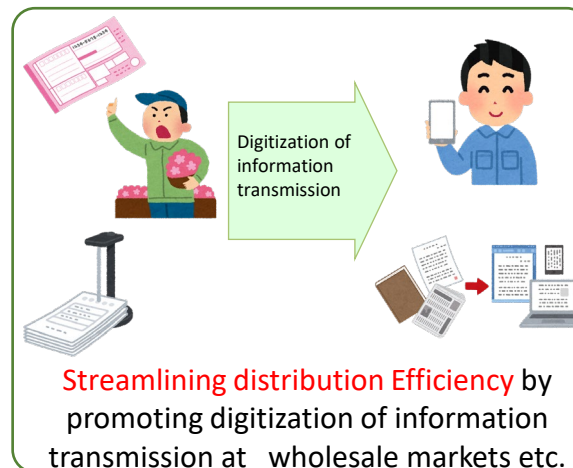
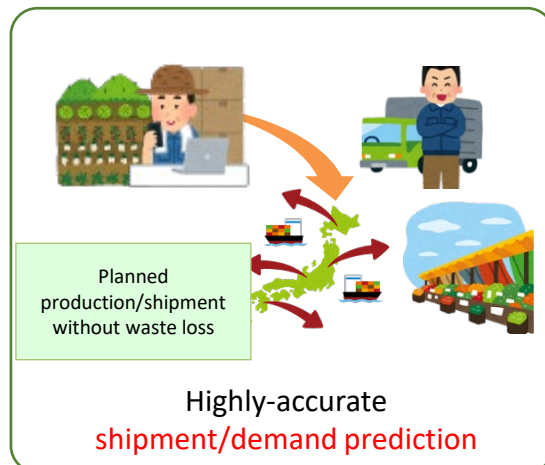
Overview of “Smart Food Chain”

- “Smart Food Chain” is food chain that **connects information from production to processing, distribution, sales and consumption.**
- It is expected to contribute to **sophisticating of production, increasing added value in sales, and optimizing distribution** etc.
- In the 2nd SIP, “**Smart Food Chain Platform(ukabis)** was constructed (OSS version of system software), various functions were demonstrated, JAS standard was set to provide consumers with reliable distribution information on agricultural products, and a system maintenance for social implementation was developed.

Construction of “**Smart Food Chain**” that enables mutual utilization of data from production to processing, distribution, sales and consumption

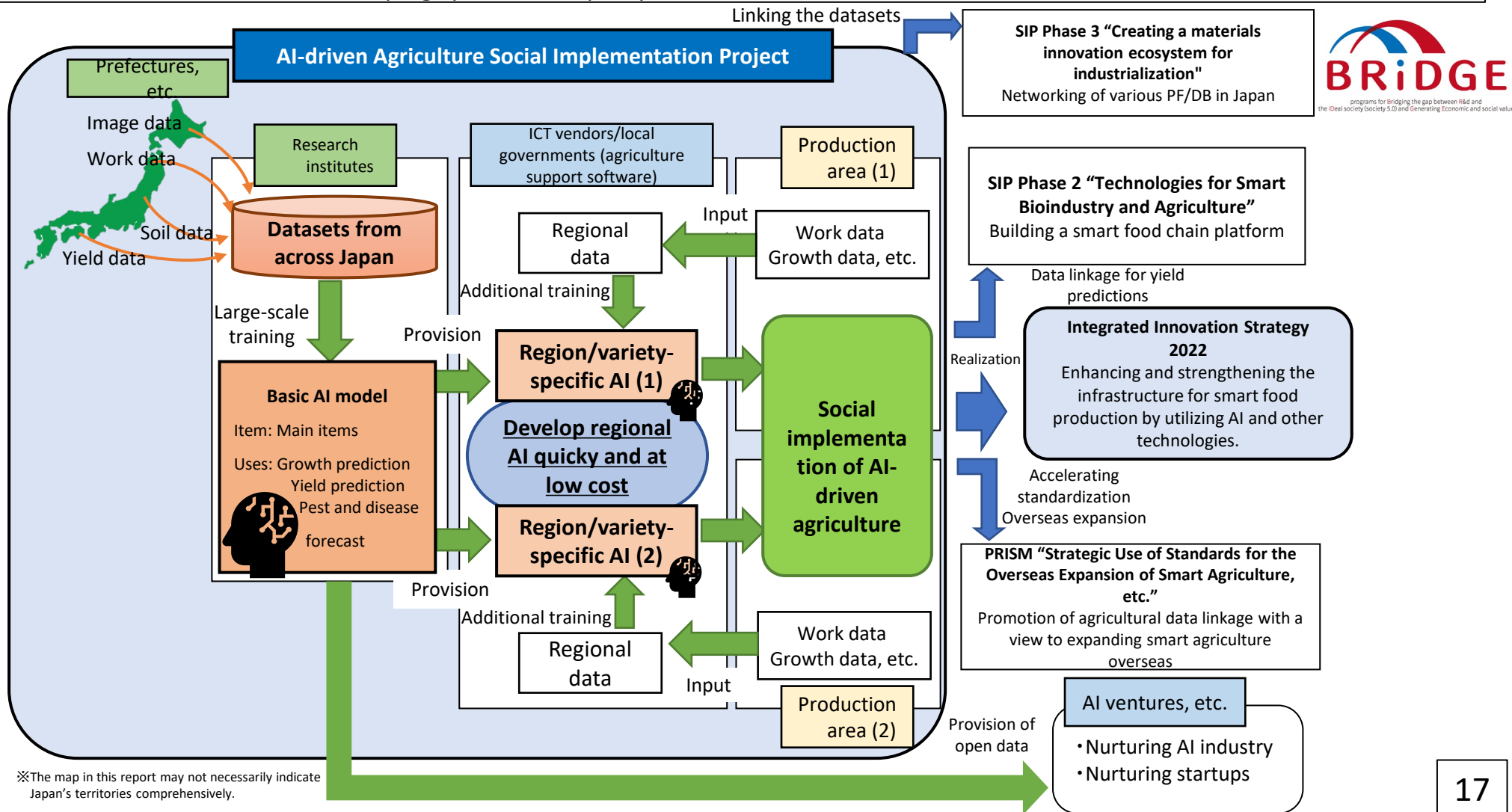


Examples of activities realize by the construction of the Smart Food Chain



Using the Cabinet Office's budget to promote the social implementation of AI

To enhance and strengthen the infrastructure for smart food production by utilizing AI and other technologies, we will make use of the Cabinet Office's "Programs for Bridging the gap between R&d and the IDeal society (society 5.0) and Generating Economic and social value" ("BRIDGE") to publicly collect data from across Japan for AI training, and develop and release basic AI models for growth prediction and forecasting the occurrence of pests and diseases, trained on constructed datasets. In addition, we will create an environment in which private companies and other entities can utilize the datasets and basic AI models to develop highly accurate AI quickly and at low cost.

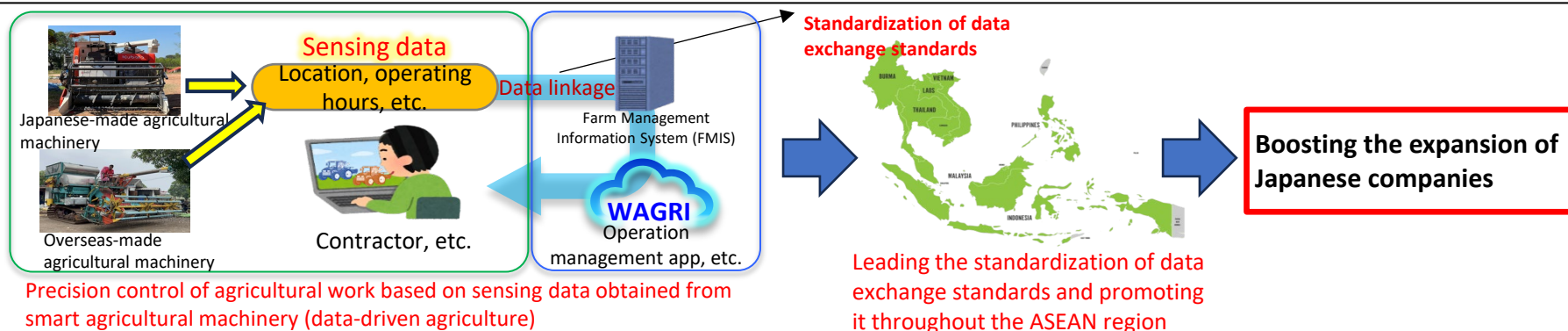


Initiatives toward the overseas expansion of Smart Agriculture

1. Aims of international standardization

To take advantage of Japan's agricultural characteristics in the aspects of climate and geographical location, such as the Asian monsoon climate and paddy field farming, and to accelerate the expansion of Japan's strengths in smart agriculture technology (data-driven agriculture) throughout ASEAN, Japan is leading the standardization of data exchange standards for sensing data obtained from smart agricultural machinery developed under the Cabinet Office's Strategic Innovation Promotion (SIP) Program.

This will boost the expansion of Japanese agricultural machinery manufacturers and agriculture-related startups into ASEAN.



[Achievements to date]

- A Japanese startup in Thailand has demonstrated data-driven rice paddy agriculture (precision fertilization management, etc.) through the utilization of Japanese-made smart agricultural machinery. It has demonstrated that it is possible to increase rice crop yields by just under 20%* and reduce fertilizer use by 15%*.
- *: Data from experiment results in a single fiscal year.
- In cooperation with European and American forum standardization organizations (AgGateway, etc.), we are now working on promoting the development and standardization of data exchange standards for small and medium-sized smart agricultural machinery suitable for use in Asia.
- The Thai government also has high expectations for the introduction of Japan's advanced smart agriculture technology. A memorandum of understanding on future technical cooperation was concluded at the Japan-Thailand Vice-Ministerial Level Meeting held in 2022. Furthermore, the ASEAN-Japan MIDORI Cooperation Plan was adopted at the ASEAN-Japan Ministers of Agriculture and Forestry Meeting (AJMAF) in 2023.



Local agricultural business operators experiencing the operation of a precision fertilizer management system (ride-on management machinery)

2. Future schedule

