Agricultural Data Collaboration Platform
WAGRI

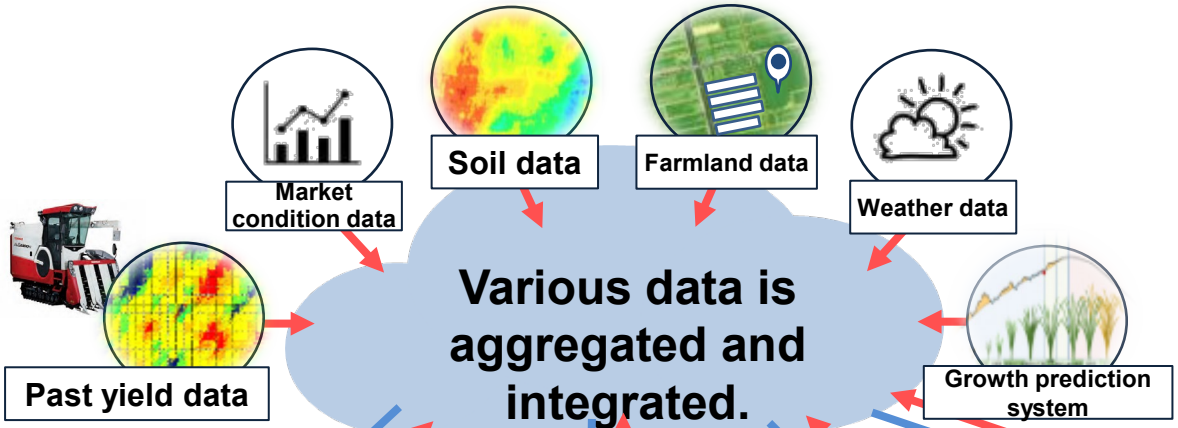
* **WAGRI** is a coined word for the agricultural data platform combining “WA (which means circle in Japanese)” that links various data and services and “WA (which means harmony in Japanese)” that promotes further harmonization of various communities, resulting in expectation for innovation in the agricultural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

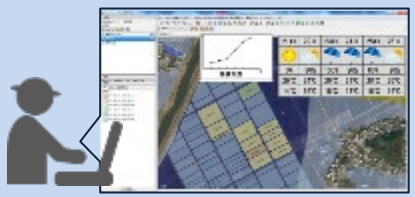
By utilizing various data, work efficiency improvement and cost reduction can be realized.

Data obtained during work is fed back to improve the future work efficiency.

Formulation of work plan

- Work plan optimum for the agricultural business style

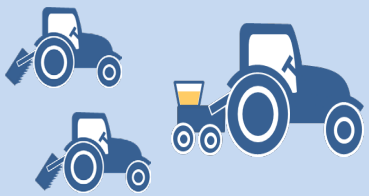
⇒ **Maximization of work efficiency and profits**



Tillage / sowing / transplantation

- Automation of agricultural work

⇒ **Significant improvement in work efficiency**

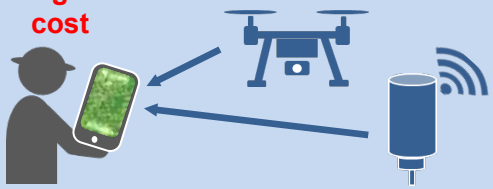


Growth management

- Growth check from smartphones
- Pinpoint pesticide spraying and variable rate fertilization

⇒ **Significant reduction in work time and effort**

⇒ **Significant reduction in material cost**



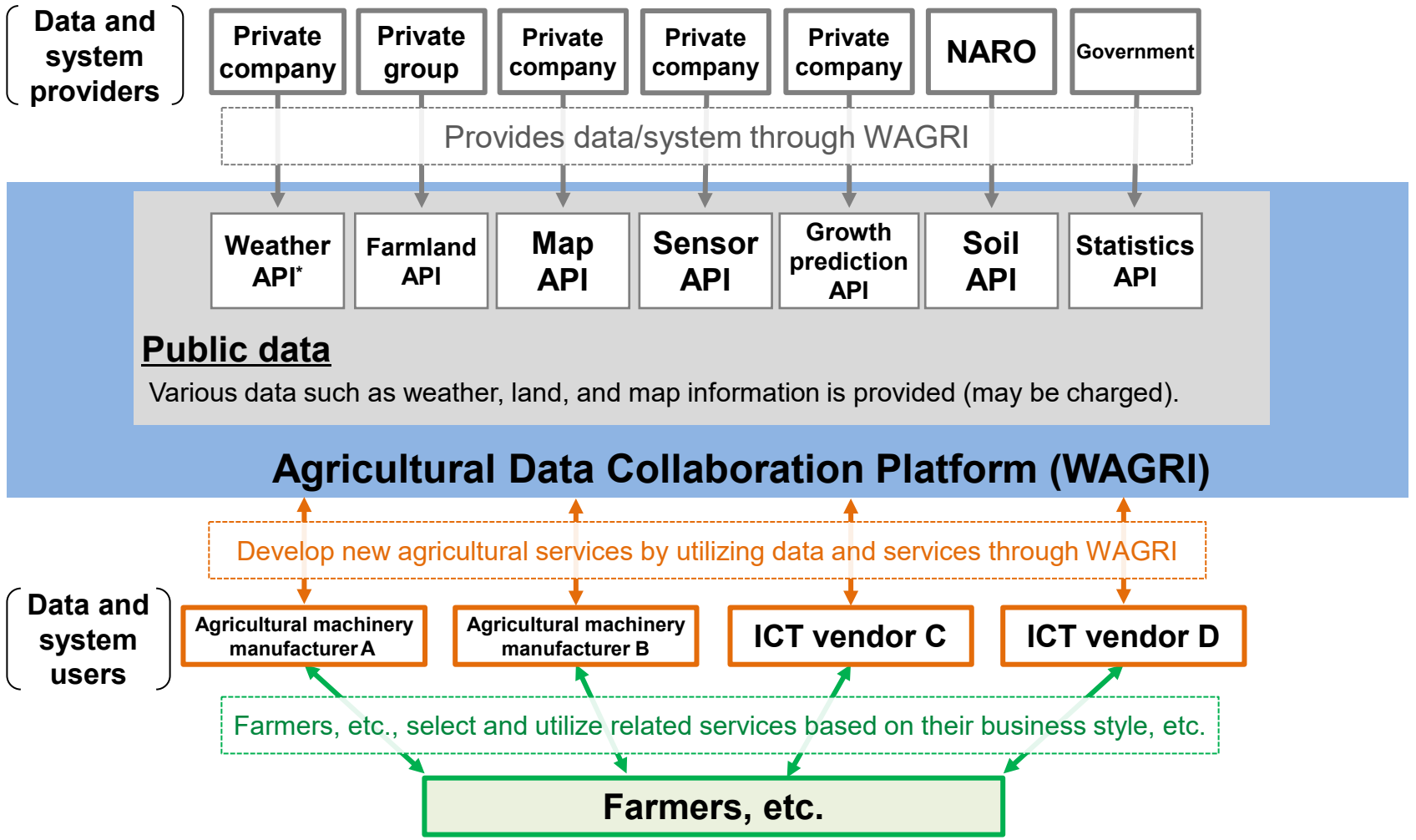
Harvest

- Harvest in optimal time
- Stable shipping of high-quality agricultural products

⇒ **Significant increase in profits**

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 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 (National Chamber of Agriculture)
〃	**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 * The name of developing and providing organization is in parentheses.
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 prediction program for vegetables grown outdoors** (lettuce)	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)	Fukuoka Agricultural Research Center
〃	**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 (2)

Data category	Description	API provider* The name of developing and providing organization is in parentheses.
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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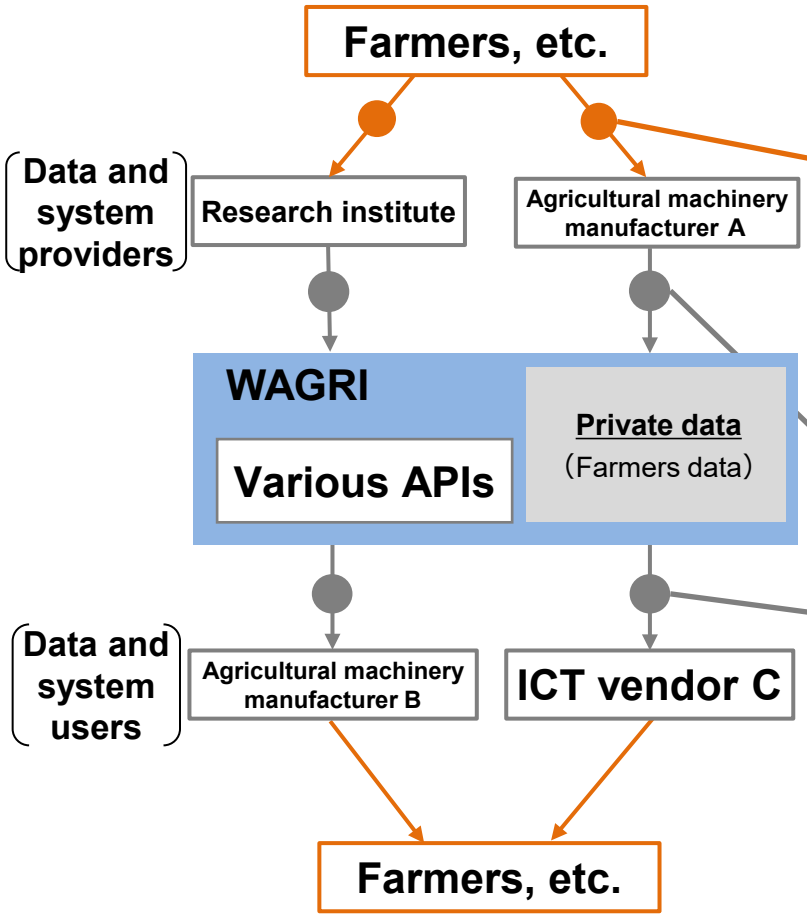
Data and programs planned to be offered in WAGRI

Produce type	APIs to be implemented in WAGRI (*)	Notes (Research title/Representative organization)		
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	Gurunavi Inc.	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 2024)
	Cultivation plan management tool that optimizes the yield to meet the demand			
	Supply and demand predictive model for production optimization			
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.**			
Strawberries	**Growth analysis program for strawberries**	Growth analysis	NARO	NARO's research results
Tomatoes	**Shipping quantity prediction program for tomatoes by production area**	Shipping quantity prediction for tomatoes by production area		
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		

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.



Terms of use for WAGRI data utilization, etc.

Agreement

(signed between users and farmers, etc.)

- ✓ The WAGRI operator and users will use the platform **within the range agreed by farmers, etc.**

Terms of use for data provision

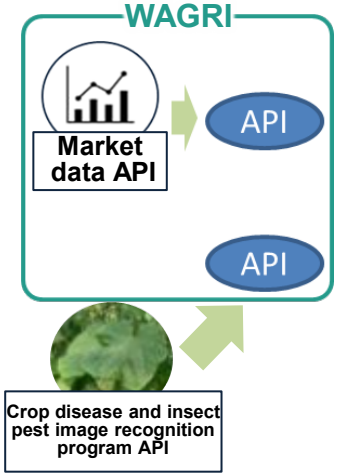
(signed between WAGRI operators and users)

- ✓ **The data is basically private** but **can be disclosed** to the selected subject.
- ✓ **Agreement is necessary** for providing data of farmers, etc.
- ✓ Users will **strictly control the data** of farmers, etc. Operators will take **security measures.**
- ✓ Users will **delete the collected data** from their systems when cancelling WAGRI.

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.



By the utilization of WAGRI…

(1) Disease and insect pest diagnosis

Disease and insect pest diagnosis service

By uploading an image of a damaged crop leaf for a diagnosis, the result will be delivered via chat bot.
The result includes a list of probable disease and insect pests in the order of highly likely.

(2) Market data

Market data service

The app displays trends in the shipment volumes in chronological order, which allows farmers to monitor produce shipment conditions in real time, such as next production regions and off-season periods.

It’s useful for planning production and sales strategies! Also, wholesalers can refer to the data when making purchases.

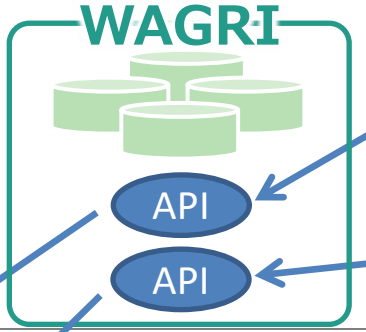
Even novice farmers such as beginning farmers can identify the damage-causing disease and insect pest and control it appropriately!

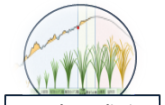
Example of utilization by private enterprise
- “AgriLook” for VisionTech Inc. -

○ **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…

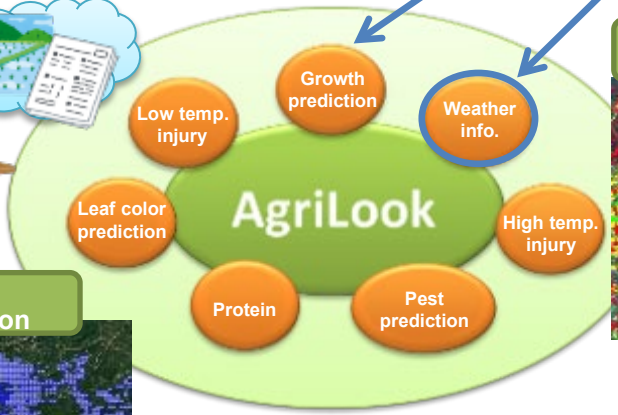



Growth prediction program API

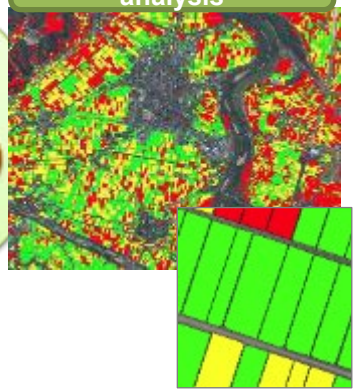

Weather program API

AgriLook

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

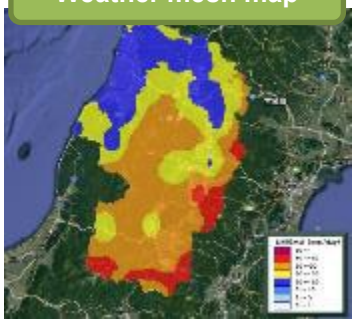


Additional fertilizer analysis



Accumulated temperature (after ear emergence)

Weather mesh map



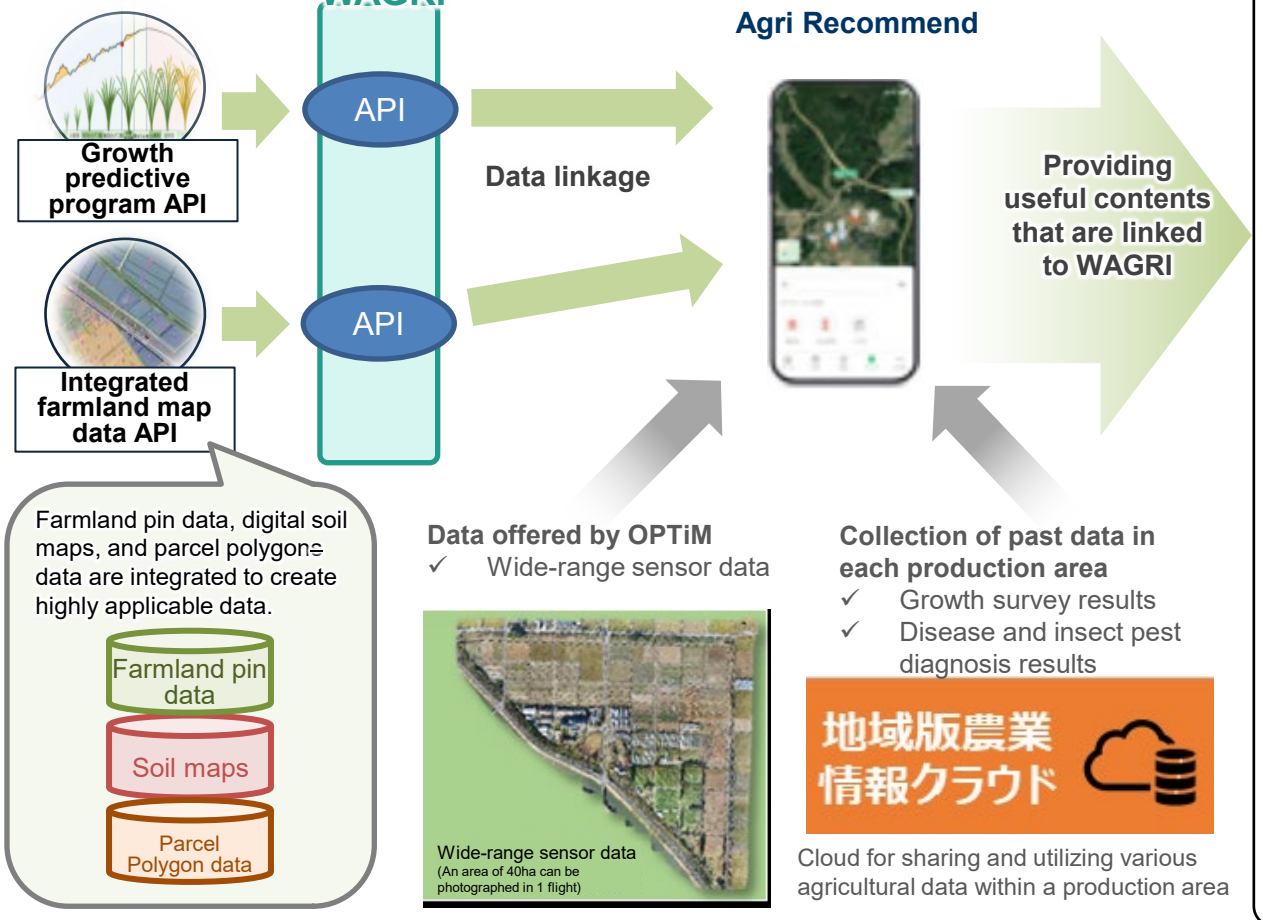
Pest prediction

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 Co" 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.

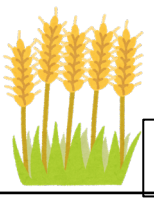
Based on the growth prediction program and weather data, farmers are notified of optimal timing for each farming task.

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.



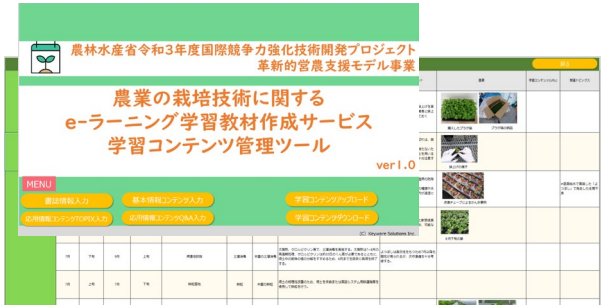
Example of utilization by private enterprise
- Keyware Solutions Inc. E-Learning Service -

○ 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.

Service Structure

(1) Educational contents management tool



(1) Register daily records

(2) Released and viewable as educational materials

API

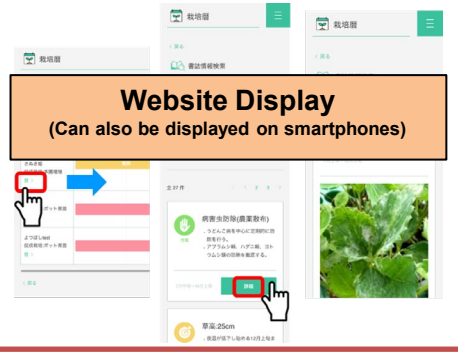
Register
Edit

WAGRI

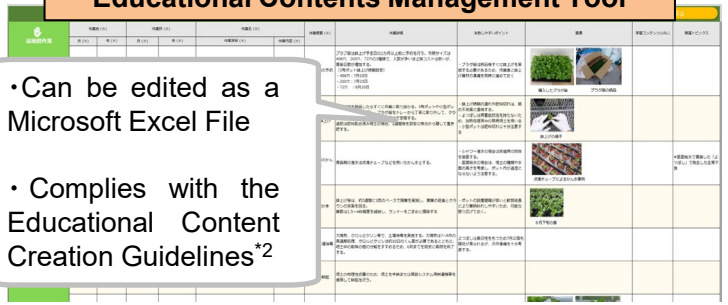
API

View
Share

(2) Educational contents viewing tool



Educational Contents Management Tool



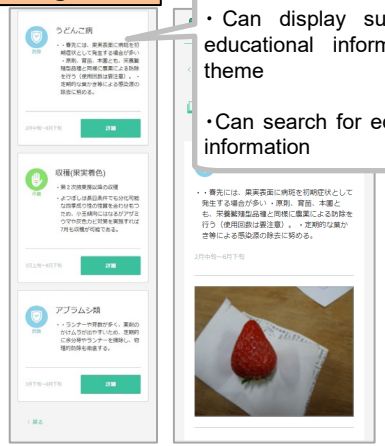
・Can be edited as a Microsoft Excel File

・Complies with the Educational Content Creation Guidelines[*2]

Educational Contents Viewing Tool

・Can display educational information linked to cultivation calendar

・Can compare multiple cultivation calendar



・Can display summarized educational information by theme

・Can search for educational information

*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).

Construction of smart food chain

By creating **a smart food chain that enables the mutual use of data, including production to processing, distribution, selling and consumption,** we realize **Society 5.0 (super-smart society) in agriculture.**

Construction of **"Smart food chain"** that allows mutual use of data including production to processing, distribution, selling and consumption

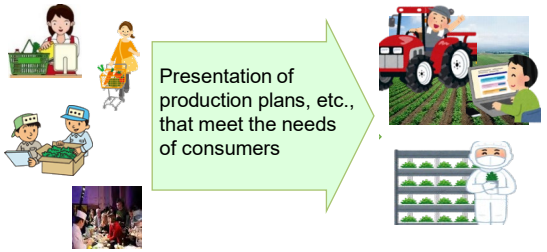
Production (upstream)
(production/harvest/sorting)

Processing/distribution (middlestream)
(collection/transportation/storage/processing)

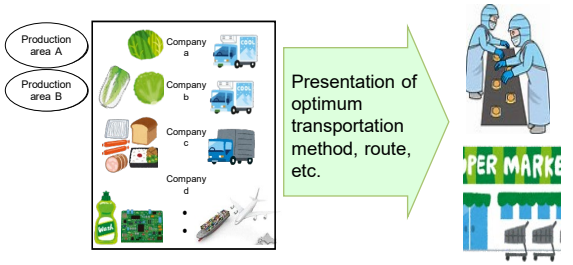
Selling/consumption (downstream)

Things that are realized by the construction of the smart food chain

High-precision **shipping/demand prediction**



Production/work plan support based on consumer behavior analysis



Optimum collection/shipping route based on information on production, receiving/placing orders, and inventories