

PPFS Webinar on Sharing good practices on
Sustainable Agricultural Development through SEP
24/05/2022

**Toward the realization of
“Digitalization and Innovation” by
developing smart agriculture based
on the farm management
information system, Japan**

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- Introduction of NARO
- Society 5.0 & Smart Food Value Chain
- Technology Innovations toward the Goals Set by the “MeaDRI”
- Cross-ministerial Strategic Innovation Promotion Program (SIP)
- Automated agri-machinery test, IAM/NARO

Overview of NARO

- Conducts R&D for the development of Japanese agriculture and food industry.
- Established in 2001 by integrating the experimental research institutions of Ministry of Agriculture, Forestry and Fisheries (MAFF). ※ * Originated in 1893 (Meiji 26) as Agricultural Experiment Station.
- 3,300 employees (includes 1,830 research staff) (as of FY2020).

**New organization -
April 2021**

Headquarters

Core Technology Research Headquarters
Priority Research Centers
Research Support Centers

Central Region

@Tsukuba, Ibaraki

Western Region

@Fukuyama, Hiroshima

Kyushu Okinawa

@Koshi, Kumamoto

Hokkaido

@Sapporo, Hokkaido

Tohoku

@Morioka, Iwate

Bio-oriented Technology Research Advancement Institution

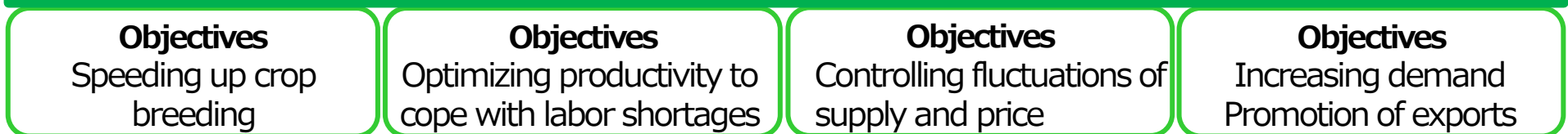
@Kawasaki, Kanagawa

Institute of Agricultural Machinery

@Saitama, Saitama

Smart Food Value Chain

- The entire process in the food value chain is made 'smart' by utilizing AI and 'WAGRI,' the Agricultural Data Collaboration Platform.
- Productivity optimization, total costs cut, food waste reduction, high value adding and technology matching are anticipated.



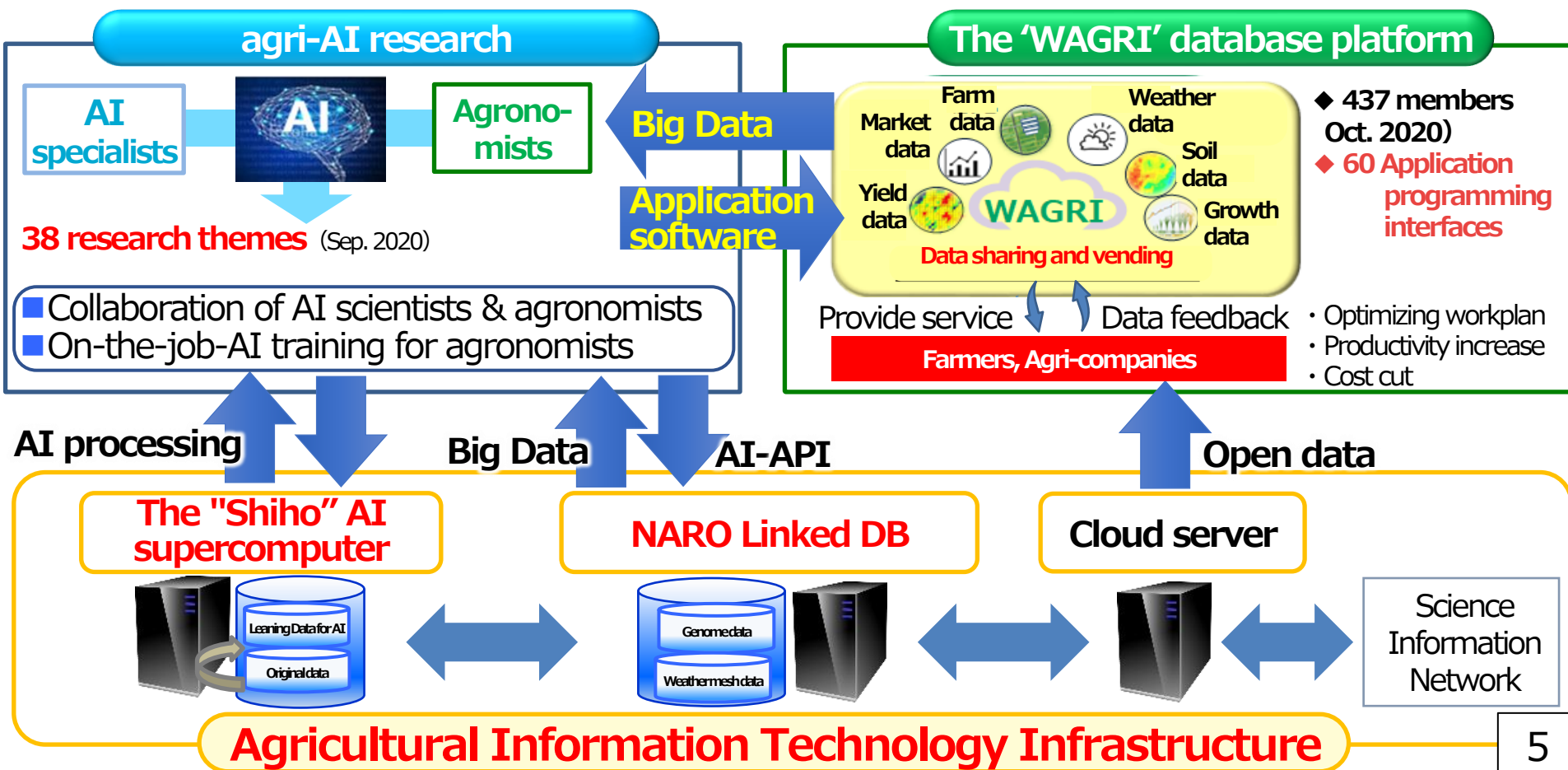
Feedback analyzed data  Data collection, AI analysis

The 'WAGRI' AI and Agricultural Database Platform

Basic Research for Agriculture
(plant/animal protection, GHG reduction, disaster prevention/mitigation, genetic resources)

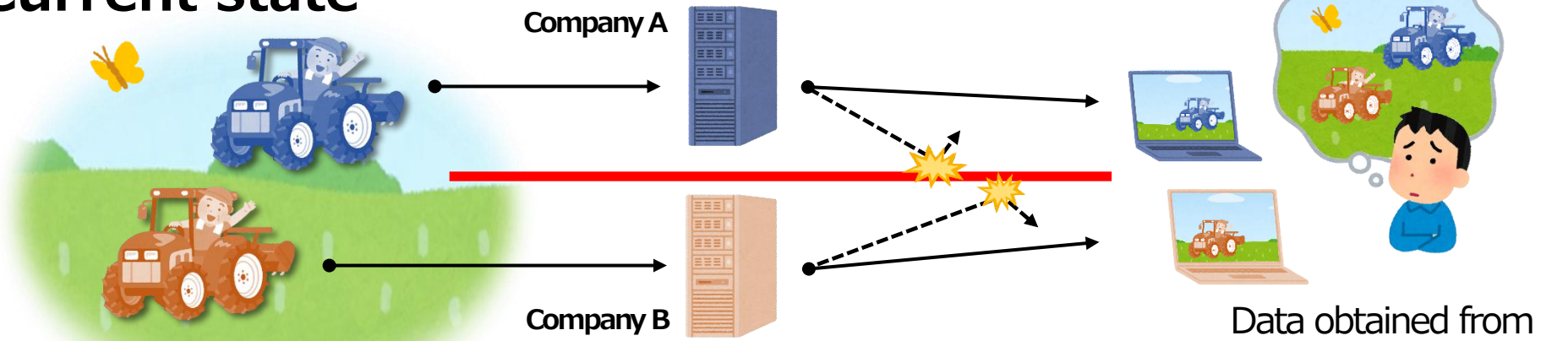
Research Center for Agricultural Information Technology (RCAIT)

- RCAIT was launched in October 2018 under the direct control of NARO's President
- Promoting application-oriented agricultural AI research
- Full-scale operation of the 'WAGRI' platform (started in April 2019)
- Infrastructure consisting of a supercomputer and a database for agri-AI research (started in 2020)

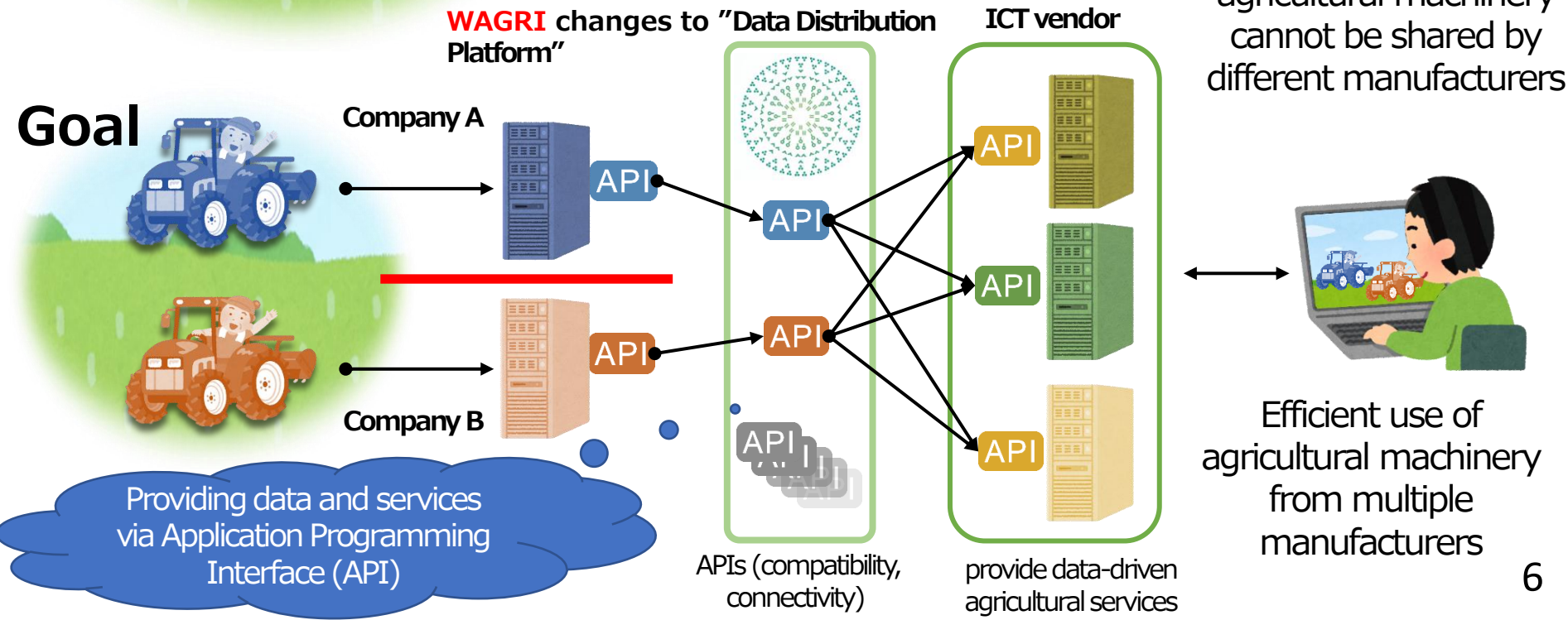


“Open API” is required in Japan

Current state



Goal



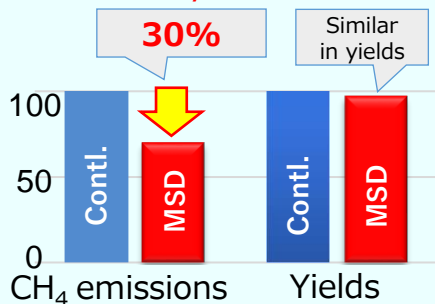
Technology Innovations toward the Goals Set by the "MeaDRI"

For example, Contribute to the reduction of chemical pesticides by 50% and chemical fertilizers by 30% through the development and the implementation of technologies to reduce chemical pesticides and chemical fertilizers using biological resources by 2050.

To reduce GHG emissions

Water Control in Rice Paddy

- Prolonged midsummer drainage (MSD) of paddy reduced CH₄ emissions by 30%



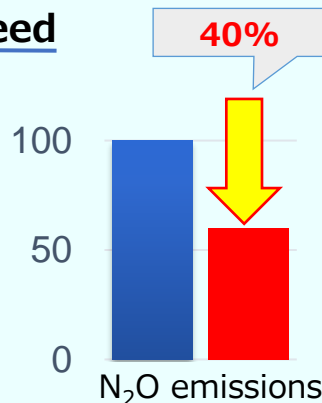
Midsummer drainage

CH₄ emissions

Yields

Amino Acid Balanced Feed

- The feed reduced N₂O emissions by 40% from livestock feces

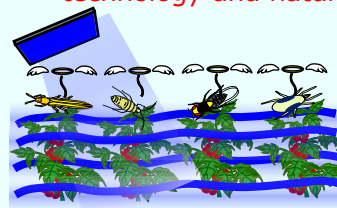


N₂O emissions

To reduce chemical pesticides and fertilizers

Innovative pest control not depending on chemical pesticides

- Reduction of the use of chemical pesticides by using biological resources such as advanced physical technology and natural enemies



Pest control by laser irradiation

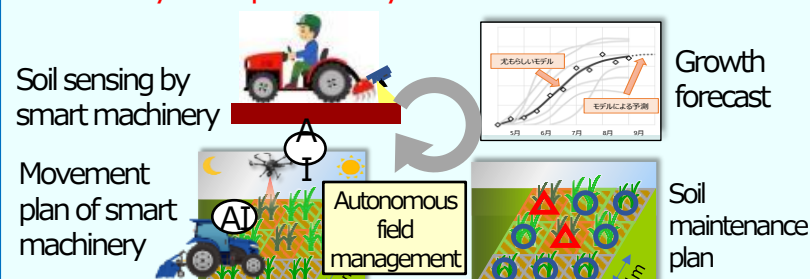
Materials supporting natural enemies, next-generation bunker materials



- Simplified natural enemy control
- Dealing with various insects

Data-driven soil management

- Optimal soil maintenance by sensing soil fertility and possibility of GHG emissions



Technologies for smart agriculture by SIP

- SIP is a Cross-ministerial project which Minister of State for Science and Technology Policy and the Prime Minister takes leadership



the cross-ministerial Strategic Innovation Promotion Program



Plowing and Puddling

Robot tractors



Transplanting

Robotic transplanter



Robot combine harvester

* Labor efficiency is 160% by use of two **robot tractors**.

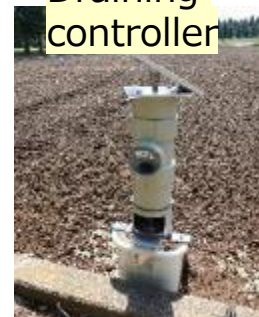
* Combined use of these four ICT agri-machines resulted in a **45% increase in one farmer's income through farm-size expansion.**[†]

* Automatic & remote **water management system** reduces working hours by 80%.

Water supply controller



Draining controller



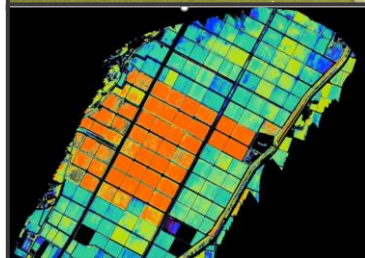
Automatic & remote water management system

[†] In the case of the field trials in Chiba.

An Example of Smart Agriculture in Paddy: Realization of Labor-saving by precision farming



Sensing by drone



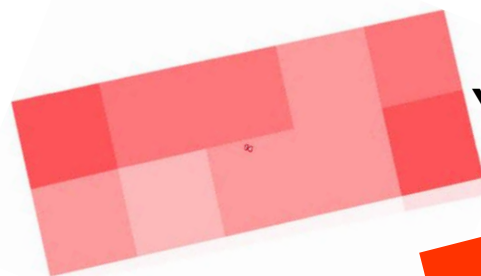
Plant growth mapping



Map-based variable rate fertilization according to growth



Combine harvester with yield monitoring



Yield mapping



Map-based variable rate fertilization according to yield



- Map-based variable rate fertilization resulted in the increase of productivity by 10% (400kg/ha) and the decrease of nitrogen applied per yield by 22% in one instance.

◆ In Japan, various automated agri-machines have been put on the market and are being introduced into agricultural fields gradually.

Autonomous Tractor



Cited from Yanmar Holdings Co., Ltd. Robot Tractor
<https://www.yanmar.com/jp/technology/robotics.html>

Autonomous Tea Harvester



Cited from MATSUMOTO KIKO Co., Ltd. Robot Tea Harvester MCRT12VF
<http://matsumotokiko.co.jp/custom.html>

Auto-steering Combine



Cited from KUBOTA Corporation. Auto-steering Combine WRH1200A
<https://agriculture.kubota.co.jp/product/combine/wrh1200a/>

Auto-steering Transplanter



Cited from ISEKI & CO.,LTD. Auto-steering transplanter NP-80D
<https://www.iseki.co.jp/products/taueki/taue-np80dz/>

- ◆ Publication of Certified Machines (as of Dec. 2021)
 - Auto-steering agri-machinery test :
38 types for 3 kinds of machines
 - Autonomous agri-machinery test :
3 types for 2 kinds of machines
 - If the machine passes the optional test, the machine will be able to indicate “Two Stars”.



- ◆ IAM will continue to revise the test based on the results of the MAFF's trial project for introducing automated agri-machinery.



Thank you for your attention!