



Rural Development Administration
Rep. of Korea

Building Resilience through Digitalizing Agriculture

- Innovating Agriculture by Opening & Utilizing Big Data -

2021. 11. 23.



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I . 4th Industrial Revolution and Agriculture

Digital Transformation based on Data·AI

Intensifying Competition
as national and corporate competitiveness depends on utilization of data



Transition to Digital Economy

'National AI Strategy(2019)', 'Activation of Data and AI Economy (2019)', 'Korea New Deal (2020)'



Global Transition to Digital Agriculture

Multinational Company

Google, Bayer

Growing investment

* Global investors put \$6.4 billion in Agtech (2019)

Japan, Europe

Developing data-based technology for each sector

Current Issues



Growing damages by abnormal weather

Agricultural loss
: ('15) 67.8 billion won → ('17) 362.5 → ('19) 1140.8



Low birth rate & population aging

Rural population: ('14) 2.75million → ('19) 2.25million
45% of city/county facing extinction (Statistics Korea)
Young farmer under 40: ('14) 9,947 → ('19) 6,859 households



Countries reinforcing policies for food security

FAO warns a new virus, 'starvation virus', would threaten humanity (2021)

Big Data & AI as an alternative for Sustainable Agriculture



II. Vision & Goal

Vision

Sustainable Agriculture by Data-based Digital Agriculture

Goal

Improve agricultural productivity, convenience and environment by digital agriculture

Strategy



Build data ecosystem
for collecting, utilizing and sharing data



Digital innovation
in production by automation & AI



**Support supply chain,
consumption and policies**
through digital agriculture

Programs

Data Ecosystem

- Collect and manage data
- Build AI service platform
- Open and share data

**Digital Innovation
in Production Tech.**

- Base tech. for automation & AI
- Digital tech. for breeding
- Digital tech. for grain production
- Digital tech. for horticultural crops
- Digital feed management tech.

**Support Distribution &
Consumption & Policy**

- Support decision-making on crop selection, distribution & consumption
- Support rural & agricultural policies



1. Data Collection & Management

Goal

Increase collection, standardization and quality management for research & on-farm data

Data type

Production

Soil, Climate, Disease/Pest, Cropping

Distribution

Traceability, Wholesale price, Export statistics

Consumption

Consumption, Brand, Food & Nutrition, Public health

Agricultural data have various factors (weather, region, variety), so standardization and systematic management are important!

The Government must play a proactive role.



Collection

• Increase data collection

Research

('21) 20 → ('25) 250 (accumulative)

On-farm

('21) 14 items 406 farm households
→ ('25) 30 items 1,000 farm households



Standardization

• Standardization of agricultural research data & ICT devices

* Standardized a registration form for research data on green-bio (with Ministry of Science & Technology)

Statistics (accumulative)

* ('20) Standards of private sectors (SPS) 8 cases, Korean industrial standard (KS) 2 cases → ('21) SPS 10, KS 4 cases



Quality Management

• Quality Management for the entire data lifecycle

* Agricultural research services, technology centers operating a day for data management

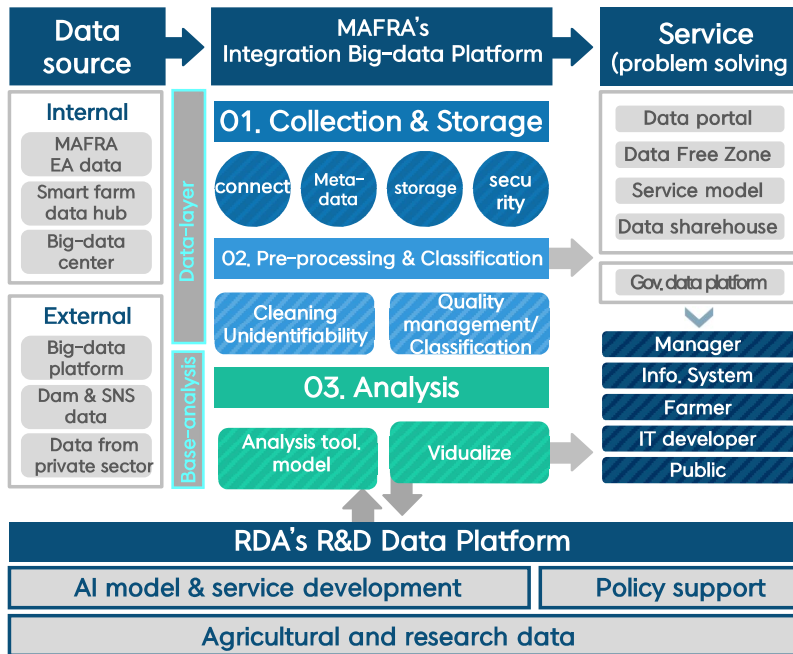


2. AI Service

Goal

Support farmer's decision-making through AI service

AI Service Platform Structure



Growth management

- Further apply AI models for productivity and growth management to crops in open fields and livestock sector

Greenhouse

- * ('20) Tomato → ('21~) Strawberry, Paprika, Melon, Cucumber, Watermelon, Chrysanthemum

Open field/Livestock

- * ('21~'23) rice, wheat, soybean, onion, cabbage
→ ('24~) 5 including apple, Korean native cattle, milk cow

Decision-making support

- Decision-making support model for crop/site selection and shipment


Support to select crops and build marketing plan by connecting bigdata on soil, weather and consumption



3. Data opening, sharing & utilization

Goal

Support start-ups & cooperate with other organizations



Open & share

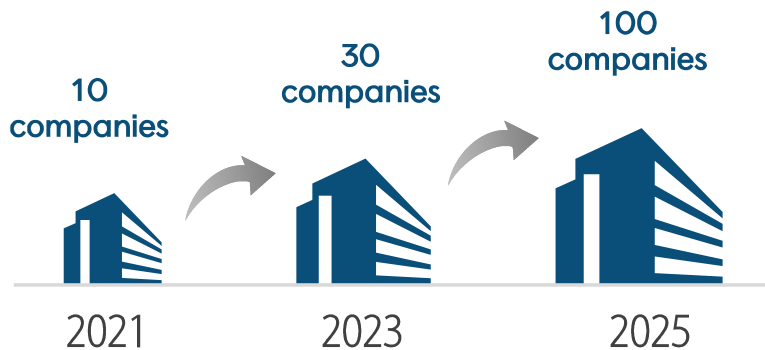

- Support start-ups and cooperate with relevant organizations by opening and sharing data

- * Open bigdata on weather, soil, disease, pest : ('20) 143 cases → ('21) 241 cases

- * Data for AI learning in the agricultural and livestock : build image database of pest/disease, etc.

Current agri. start-ups in Korea

Farm8(plant factory), nThing(smart farm), AIS(growth management), etc.

Data Center

- Data Center for systematically storing, managing & sharing

- * (Phase 1)Field Data Center → (Phase 2)Research Data Center → (Phase 3)Integrated Platform



Regional hub

- To promote of local agricultural research services/technology centers as a regional hub for collecting and sharing data



1. Digital Technology for Grain Production

Goal

Enhance food self-sufficiency and save labor

Field application



Apply field trial test to counties/cities first, and then spread across the nationwide



Rice

- Drone seeding/disease control, and self-driving machinery for labor saving
- Precision tech. for stable production to respond to abnormal weather



Wheat

- Recommend a flour variety(for noodle) based on weather/soil data
- Precise management of each growth phase for improving productivity and self-sufficiency
* ('22~) 20% yield increase model



Soybean

- Precision fertilizer recommendation and water management for each growth stage to improve productivity
- Early warning service for abnormal weather



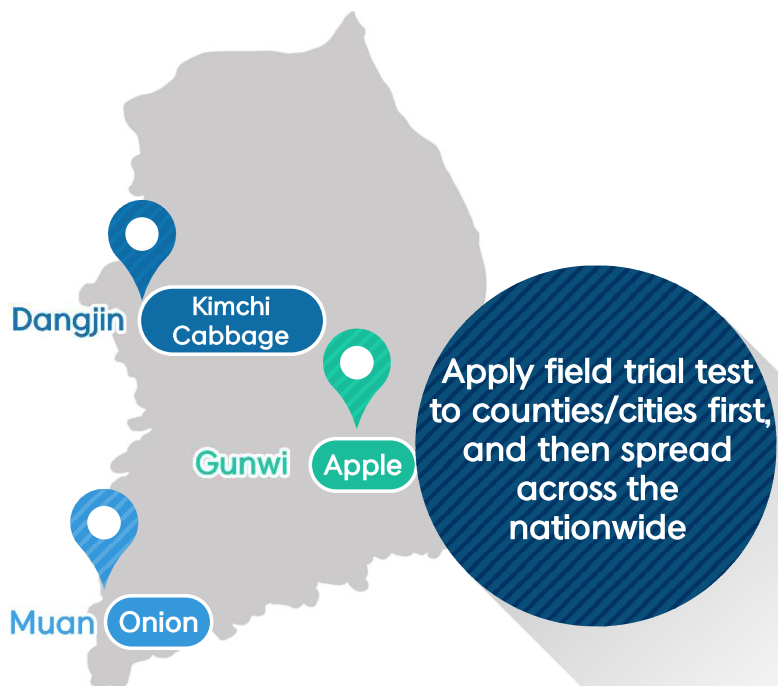
2. Digital Technology for Stable Supply & Quality of Horticultural Crops

Goal

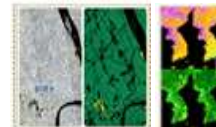
Stabilize demand-supply of vegetables

* kimchi cabbage, radish, onion, garlic, pepper, etc.

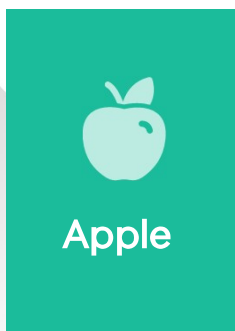
Field application



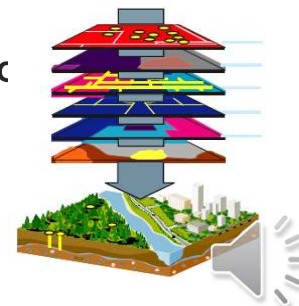
- Early yield forecast using drone or satellite image for stable supply



- Forecast the yield of major onion producing area
- Technology for storage, processing & inventory management



- Recommend the suitable site/crc prepare for the climate change
- Technology for new value-creating crops

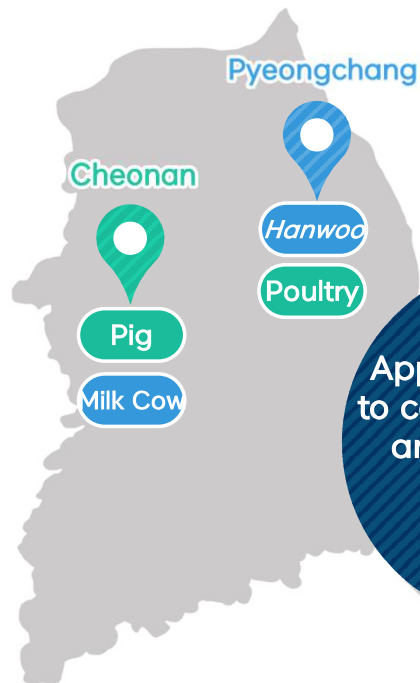


3. Digital Technology for Precision Livestock Farming

Goal

Prevent diseases and enhance productivity

Farm Application



Apply field trial test to counties/cities first, and then spread across the nationwide

Hanwoo Milk Cow

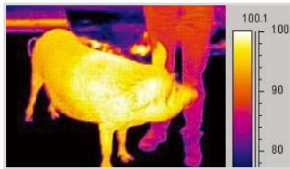
Swine Poultry

- Predict estrus, fertilization and delivery time for each cow
- Data-based Precision Feeding Technology for meat quality and productivity
- Develop Korean automated feeder, milking robot



Swine Data-based optimal growth and disease prevention model based on feed intake or activity

Poultry Selecting abnormal individual through image analysis, Intelligent management

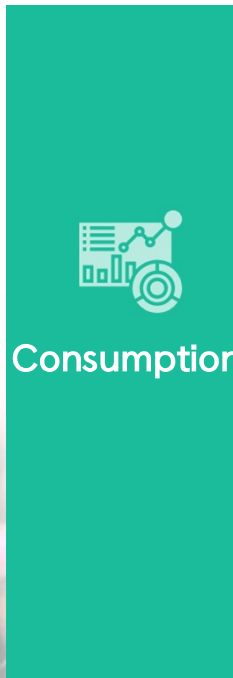
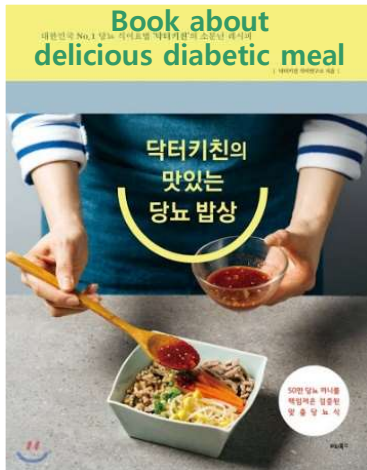


1. Decision-making on Crop & Distribution & Consumption

Goal

- Replace oversupplied crops with profitable introduced crops
- Support consumer choose agricultural products

Field Application



- Recommend profitable crops for each region by linking data on soil, climate and profitability



- Personalized healthy diet



- Research on the relation between food, health and genetic factors (with MOHW)



III. 3 Programs & 10 Tasks

2. Support for Rural Community and Policies

Goal

Inspect farmers' compliance of fertilizer use regarding direct payment policy

Policy support using drone, satellite

Check farm's compliance and predict demand-supply using satellite



Direct Payment

- Settle direct payment system by checking farms' compliance of fertilizer use by crop

* Connect the information on soil, farm management and fertilizer sale



Safe Products

- Develop an integrated hazardous substances management system

* Hazardous materials : pesticide, heavy metal, food-poisoning bacteria



Revitalizing Rural Community

- Predict fallow/abandoned land and support new farmers with customized management model



Establish the foundation for promoting agriculture

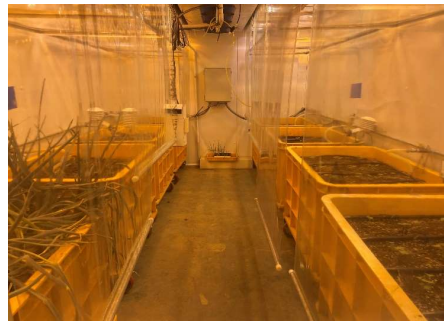
Agricultural R&D integrated platform

Combining agricultural and lab. Data R&D integrated platform

- Expand/standardize data collection for major
 - * Data collection('21, 15item 300farm), group standard('21, 5item)
- Establishment of specialized data ('21. Aug.)
- Building a digital lab.('21, 20 sites)



〈ag field data like as smartfarm〉



〈weather research facilities etc.〉

Ag. AI service development and provision

Developing a productivity model, service

- Model for improving by factor analysis of excellent farmhouse, * tomato, strawberries, paprika, etc.

Effectiveness of smartfarm AI service

- smartfarm(avg. 4.7ton/10a) vs. **6.0ton/10a product(28% ↑)**
- At 10a, 12thousand income increase(1.3ton10a increase)
 - * The last 3 years('18~'20) avg. wholesale price (9.5\$/kg)

The screenshot shows the '스마트팜 최적환경설정 안내서비스' (Smartfarm optimal environment setting guide service) website. It features a '생산성 향상 모델' (Productivity improvement model) section with a table of data. The table lists various crop types and their corresponding productivity metrics.

수확량(10a)	당면율	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)	당면율(%)
1,370~1,500	3.9	21.5	12.3	24.9	19.9	77.4	4.38	14	2.6	5.8	100								
1,370~1,500	1.1	17.3	11.5	16.6	20.2	76.3	4.10	16	2.5	3.4	101								
1,220~1,370	2.8	22.7	8.7	22.8	19.5	75.3	4.80	19	2.6	5.4	96								
1,220~1,370	1.6	25.1	11.1	16.4	19.3	75.8	4.59	19	2.6	6.4	98								
1,030~1,220	3.3	17.6	9.1	12.8	17.4	65.8	4.55	8	2.3	5.5	1*								
1,030~1,220	0.3	26.9	10.9	22.1	19.6	84.3	4.93	10	2.4	6.0									

〈smartfarm guide service〉

〈smartfarm improvement model〉

Food dig. tec. reduces labor / increases convenience

Dron sowing and pest control

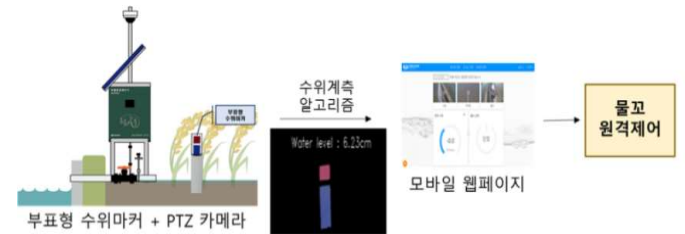
- Drone utilization tec. to reduce labor costs
 - (sowing) uniform spraying
 - (pest control) auto-driving and scattering reduction
 - * efficiency : 0.25hr/ha, vs. power sprayer labor 87.5%, cost 95.3% down



〈rice sowing by dron〉 〈pest control by dron〉

Real time remote irrigation control

- Remote irrigation control for labor saving and reduce the greenhouse gas
 - Irrigation monitoring, control for rice growth monitoring
 - Construction cost 50% ↓, labor saving 30%



〈irrigation control system〉

Auto driving of rice transplanter

- Development of auto driving rice transplanter and distribution
 - Location by CAN(RTK-GPS), steering, driving control
 - * Labor saving and reduce personnel expense 50%

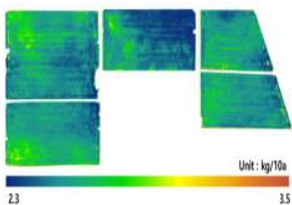


〈auto driving rice transplanter〉

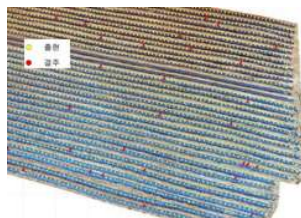
Horticulture·livestock digital tec. to support and demand stabilization and realize localization

Crop prediction using drone·satellite

- **Growth status and crop prediction using drone and satellite**
 - Open field crop additional fertilizer recommendation
 - agricultural land observation information system.
 - Cabbage cultivation area, growth abnormalities etc.
- **Meteorological administration long-term weather forecast data**
 - Probability outlook about temp. rainfall etc.



〈recommendation map〉



〈cabbage composition analysis〉



〈web. service〉

Milking robot

- **Securing industrial property rights milking robot**
 - Recognition of nipples, manipulator, cup etc.
- **Digital milking system**
 - Integrated management of the entire device of robot milking system.
 - Data sharing with RDA cloud



〈milking robot〉



〈milking cup〉

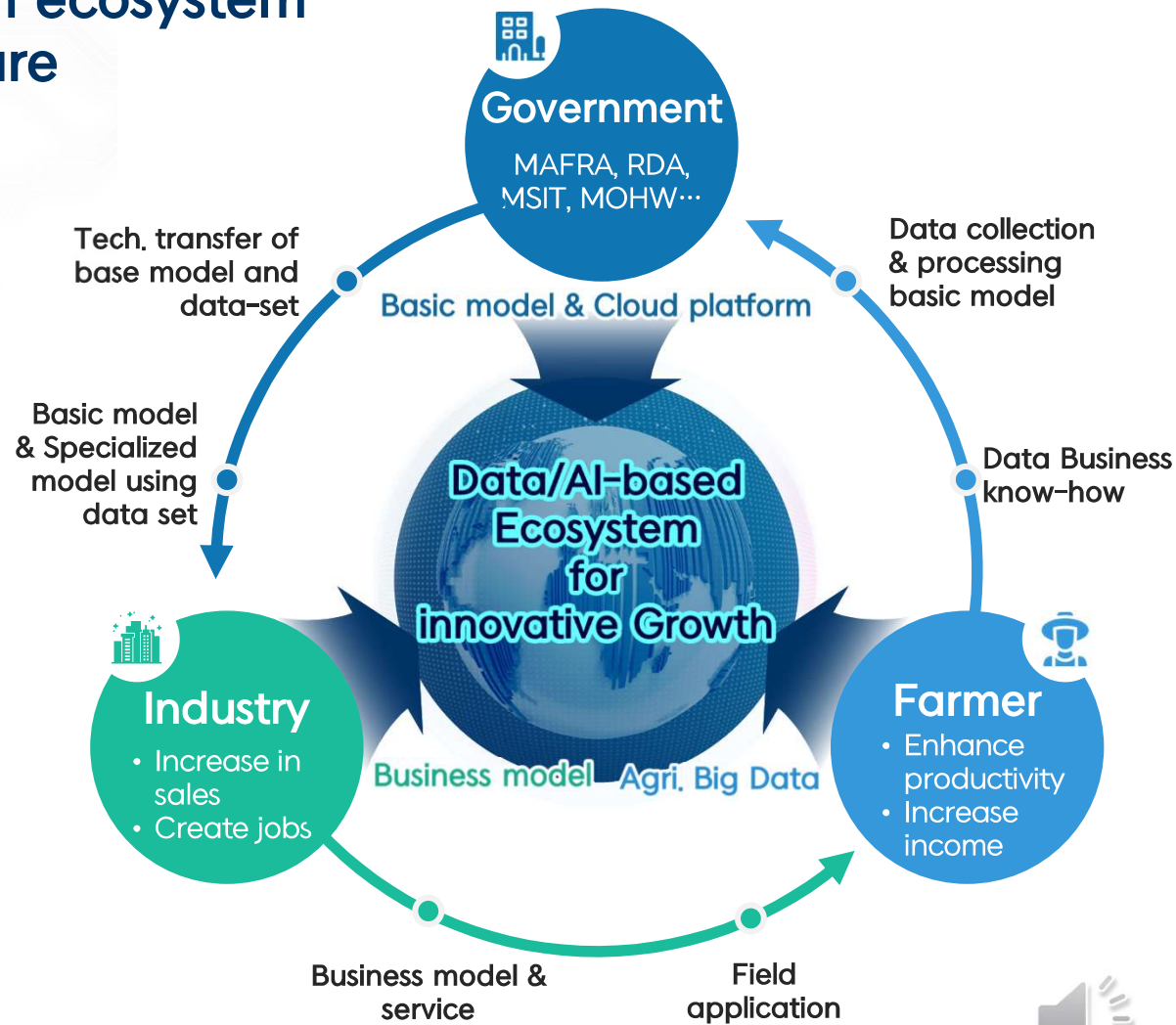


V. Implementation Plan

Cooperation system to create an ecosystem for digital innovation in agriculture

Build network with other government organization (e.g., MAFRA, MSIT) to promote digital agriculture

Cooperate with relevant government organization for data collection, connection and utilization for early establishment of agro-data ecosystem (production-distribution-consumption)



VI. Expected Outcome

Farmer

Transition from experience and intuition-based decision-making to **Data-based Tech.**

- Help ICT-savvy young or beginning farmers start new business and successfully settle in rural life
- Increase farmer's income by enhancing productivity/quality and assisting marketing

Realizing sustainable agriculture
• rural community by increasing convenience, productivity and income



Consumer

Promote Consumption
through price stabilization & traceability system

- Contribute to stabilizing price by reducing price fluctuation of agricultural commodities (e.g., vegetables)
- Make reliable and trustworthy production and distribution system for agricultural products

Promote the consumption of domestic farm produce



Corporate

Innovate Technology
by linking data on production, distribution & consumption

- Create new business model by opening and using agricultural data
- Create jobs to revitalize rural community

Promote the innovative growth of relevant industries
by linking data in value chain



Thank you !!

Q & A



Rural Development
Administration

