Dissemination of Smart Farm in Korea
For Innovation in Agriculture
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1. Introduction of EPIS
Introduction of EPIS

Under 2 of Article 11 of the Framework Act on Agriculture, Rural Community and Food Industry, established for efficient promotion of the development of human resources for agriculture, promotion of information services, spread of the value of rural culture, and enhancement of the capabilities of farm management.

- Established in 2012
Introduction of EPIS

A public agency which is specialized in ICT in Agriculture and capacity building for the existing and potential farmers.

Main Function

- Informatization in agriculture, rural communities and food industry
- Developing culture in agriculture and rural areas and spread and promotion of its values
- Improving technical skills and management capability of farm enterprises
- Developing human resources including training professions in agriculture, rural areas and food industry
- Providing safety information about agricultural products, promoting information exchange and protecting intellectual and industrial property rights
- Providing information about trade policies and international cooperation in agriculture, rural areas and food industry
- Providing the knowledge and information service in the area of agri-food
Introduction of EPIS

- Organization

Board of Directors

President

Vice President

Non-Executive Auditor

Audit Division

Management

Innovation

Department

HR&D Department

Agri-Food Consumption Department

Knowledge Convergence Department

International Cooperation Unit

Beginning Farmers Center

Management Planning

HR&D Department

Agri-Food Consumption Department

Knowledge Convergence Department

International Cooperation Unit

Beginning Farmers Center

Management Support

Human Resources Planning

Value PR

Smart Agricultural Planning

International Trade Cooperation

Beginning Farmers Planning

Financial Management

Professional Human Resource

Consumption Strategy

Smart Agriculture

International Agriculture Cooperation

Beginning Farmers Support

Social Value PR

Future Human Resource

Consumption Culture

Big Data

Agricultural Administration Information

Job Support

Urban-rural Connection

Urban-rural Connection
Successful Implementation of ICT in Agriculture (ODA)

- **Adaptable technologies & cost**
- **Cooperation with partners**
- **Analysis of local environment & localization**

**On going projects**
- 2020~2023 (Mindanao, Visayas)

**New smart farm projects**
- 2021~2024 (Da Lat, Ho Chi Minh)
- 2021~2025 (Bogor, Batu)
- 2021~2024 (Kadal)

**Preparation of new smart farm projects**
- (3 countries)

**2020**

**2021**

**2022**
2. Backgrounds of Applying ICTs
Overview of Korea’s Agriculture Sector

Declining and Aging Farm Population

- Farm population: ('95) 4.85 mil → ('16) 2.49
- Farm owners aged 65 & above: ('95) 24% → ('16) 55%

Shrinking Agricultural Investment

- Sluggish formation of net fixed capital in agriculture since 2006, ‘investment of debt’ continues (except for ‘08, and ‘13)

Stagnant Agricultural Growth

- Real GDP in Agriculture: ('07) 27.1 trillion KRW → ('16) 28.4

Liberalization & Aging Population → Discouraged Investment → Stagnant Agricultural Growth, Income, Export
Overview of Korea’s Agriculture Sector

Wind of Change in Agriculture and Rural areas

Rural Population:
- ‘05: 8,764,000
- ‘17: 9,629,000

No. of Employed:
- ‘05: 8,758
- ‘10: 9,392
- ‘15: 9,629

Change in the number of employees in Agriculture, Forestry and Fisheries (year-to-year):
- 1st Half of 2017: -12.3
- 2nd Half of 2017: 24.6
- Jan~Nov 2018: 58.6

Share of Farm Operators by Age group (‘17):
- 65~74: 58%
- 75+: 9%
- 40+: 35%

(Example)
- No. of Graduates from Korea National College of Agriculture and Fisheries: 4,700
- Average Age: 31.8
- Average Income: 90 million KRW

Increased Employment in Agriculture, Forestry and Fisheries

Ageing, Hope in Youth Farmers
Smart Farm automatically controls the optimal growth environment by utilizing ICT such as the IoT, big data, etc.

**① Enhanced Productivity**

Optimal Environment for Growth → Savings in input and labor → Enhanced Productivity (production per person 40%↑)

- **Data collection**
  - Temperature, Moisture, CO2
  - Growth rate

- **Optimal Environment**
  - Big data analysis
  - Growth Management S/W

- **Precise and Automatic Control**
  - Provision of CO2, nutrients + feed
  - HVAC, Window

**Farms with Smart farm technologies (%)**
- Production: 27.9%
- Production per person: 40.4%
- Labor Cost: 15.9%
- Occurrence of Insects and Pests: -53.7%

**② Increased Exports**

Stable production throughout the year in a controlled high-tech facilities

→ Matching Customer’s demands (safety, homogeneity, stable supply)

→ Increased exports

**③ Job Creation**

More jobs (Smart farm operators, professionals, etc)

Creation of jobs in relevant industries (System developers, consultants, etc)

Case: ‘A’ Smart Farm

In a 5-ha smart farm, **28 employees** work **full time** and hired **24 local residents**
Application of smart farm for over 5 years . . .
How’s it going so far?

**Size of Market**
- Due to the development of smart farm-related ICTs and its spread, domestic and foreign markets continue to grow.
  - World market: 197.4 bil USD
  - Korean market: 3.65 bil USD ('16p)
    * Average annual growth of 10% over the last 5 years

**Policy**
- Gov’t considers a smart farm as a key growth engine, so it has supported HRD, funding, and technology development for smart farm since 2014.
- Provided smart farming-related ICT equipment to horticultural greenhouses and stock farms since 2014.

**Status**
- Area of smart farm is rapidly increasing due to positive perception of its performance and gov’t assistance.

### Smart Farm related budget (100 mil. KRW)
- 2014: 220
- 2016: 468
- 2018: 761

### Annual supply of smart farm (unit: ha, household#)
3. Concept and Achievement of Smart Farm
What is Smart Farm?

GiGA infrastructure

Cloud Server

Router

PC

CCTV

Greenhouse Control System

GiGA infrastructure

External Weather Sensor

Recording Device

Ceiling, Side Window, Light shading and heat reservation

curtain traction motor

Nutriculture Control System

Soil Information Sensor

Control Panel

HVAC Control
<table>
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<th>Types of Smart Farm</th>
<th>Example and Applied Technology</th>
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<tr>
<td>Environment control of greenhouse</td>
<td>Automated air circulation, environment monitoring (temperature, humidity, CO2), nutrition supply using PC or mobile to provide ideal environment for crop production</td>
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<tr>
<td>Intelligent livestock farm</td>
<td>Automated monitoring (temperature, humidity), feeding and water supply management using PC or mobile for livestock production</td>
</tr>
<tr>
<td>Smart orchard</td>
<td>Automated monitoring (temperature, humidity, climate), water and disease &amp; insect control using PC or mobile for fruit production</td>
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</table>
Effects of Adopting Smart Farm

Productivity improvement through data-based scientific greenhouse management

Case: Tomato in Hwasun region (multiple span 1.3ha)

↑ Productivity: (Before) 65kg/3.3m² → (After) 101kg, 55%  
↓ Labor: (Before) 8hrs/day → (After) 4hrs, 50%  
↓ Energy: 35%

Improve productivity through modernization of facilities, installation of smart farms, and expert consulting

Measurement of environmental, growth data ➔ Analysis, expert consulting ➔ Precise growth management ➔ ↑ Productivity Good outcome
Effects of Adopting Smart Farm

- Labor cost (0.15 mil USD)
- Greenhouse management fee
- Shipment time shortened by 1 week
- 87% ↑ compared to existing production
- 17% ↑ in sow productivity
- 20% ↓ in Packaging/inspection time (2hrs)
- 20% reduction in management cost
- 20% ↓ in farm household income

Paprika (Gyeongnam)
Flower (Gyeonggi)
Pig-farming (Jeonbuk)
Horticulture (Jeonnam)
Local Food (Jeonbuk)
School Catering (Gyeongnam)
4. Ways to Promote Smart Farm
Dissemination of Horticulture Smart Farm

Goal: 7,000ha by 2022 (70% of the modern greenhouse 10,500ha)

- Construction of integrated and large high-tech agricultural complexes
  - Build a large complex to secure export competitiveness by improving the productivity and quality of the agricultural industry

- Establishment of vertical farm, demonstration of smart farm for upland crops
  - Diversification of smart farm types other than existing greenhouses by distributing new models

- Expansion of smart farm fund of NH (agricultural bank) and budget of supply projects
  1) Expand the current project volume 2 to 4 times by 2022.
  2) Expand the scale of the NH smart farm fund

- Ease the burden of farm households and support facility modernization
  - 60% of horticulture support projects -> ICT related facility (nutrient system, auto switching)
Dissemination of Livestock Smart Farm

Goal
5,750 households by 2022 (25% of total)

- Step-by-step expansion of livestock through model development and analysis of private cases
  - 44% of pig, 55% of poultry, 16% of cow, 29% of dairy farming

- Connection with the modernization project of livestock facilities and preferential support for smart farms
  - Fund for modernization of facilities shall be provided preferentially to farmers who wish to apply smart farming
  - Where facility modernization is insufficient, funding for smart farms is provided after modernizing livestock facilities
Nurture specialists and train farmers (’17)
- Training on-site consulting experts by stages (500ppl),
  Training of farmers on smart farm application (10,000 ppl)
- E-learning(4,000ppl), Basic(4 sections, 500ppl),
  Professional(9 parts, 270ppl), Advanced course(3 courses, 30ppl)

Establish a foundation for technology diffusion
- Expansion of pilot projects : 26 items 196 places, Horticulture(11), Livestock(11), Upland(4)
- Establishment of on-site training places in the Agricultural Technology Center :
  (’17) 22 places → (’18~’19) 40 places
- Site manual by items(9 items), SNS usage consultation(year-round),
  Best Practice Competition(Nov)

Create 20,000 jobs a year as people return to farming and create new value in farming; ppl experience the effects of smart farm
Operation of On-Site Support Team

Organization of on-site support team including RDA, Agricultural Research & Extension Services and related companies

MAFRA (EPIS)
- Expert consulting
- Onsite Training
- Support system by region
- SW for farms

Training on professional crop-producing techniques
ICT education
Evaluation
Research on smart farm technology

RDA
Central support team (7)

Teaching crop-producing techniques
Education, consulting
Assisting after-care
Dissemination of best examples

Regional center (11)

Company (Consultation, Installation)
Consulting about installation
Education for use of ICT and operation
Assisting after-care
Dissemination of best examples

Practical training
Consulting, assist the onsite use

Provision of onsite support system
Training on professional crop-producing techniques
Teaching onsite techniques

Smart farms
Installation of Smart Farm Facilities

Support to solve difficulties in the installation and operation of smart farms through consultation from specialized agencies

- Preliminary inspection (Application stage)
  - Onsite inspection
  - Assist the selection of project

- Installation of facility (On progress)
  - Contract confirmation
  - Check installation progress

- Checking (Completion stage)
  - Completion check
  - Analysis for expected effects

↑ Productivity
Before application
after
Cutting Edge Practical Education by Regions

Practical Training Sites by Level

Beginner
• Practical Education Farm (11)

Intermediate
• Cutting Edge Practice Center (3)

Advanced
• Tomato College (3 months)

Gyeongnam ATEC

Jeonbuk JATC

Cheonan Yonam College (site for pig farming practice)
Post Installation – After Service

Small smart farm company → Difficult to have nationwide A/S network

Simple breakdown
ICT company, experts of Regional Onsite Support Center

Structural problem
Collaborative A/S of manufacturers, strengthening the convergence of expertise among companies

Case of Jeonnam (regional) Onsite Support Center

RDA
Research support for ICT convergence

Research & Extension Services (Tech center)
• Growth env monitoring, info-collection
• Consulting, virtual monitoring
• Training

Support Center
• ICT convergence quality improvement and cost savings

22 City ATCs

Private consulting firms

Collaborative A/S among manufacturers by strengthening each expertise

Cooperatives of domestic middle-sized firms

Conclusion of MOU (9 companies including SKT)

Farms

Consulting
5. Establishment of Smart Farm Innovative Valley
Establishment of Smart Farm Innovative Valley

1. Overview

- Secure global competitiveness related Smart farm
- Develop solutions suitable for our agriculture

Purpose

*Contributing* to the win-win growth of front and rear businesses as well as farmers,
*Encouraging* youth entrepreneurship and job creation through smart farm technology innovation and localization
*Helping* Korean companies to try overseas markets.
Establishment 4 Smart Farm Innovative Valley until 2022

2. Specifics

- Gyeongsangbuk-do
- Jeollanam-do
- Gyeongsangnam-do
- Sangju
- Gimje
- Miryang
- Jeollanam-do
- Goheung
Establishment of Smart Farm Innovative Valley

2. Specifics

View map (Example)

- Smart farm - for lease
- Smart APC
- Demonstration Complex
- Incubation Center
- Village
- Energy Facility
- Smart farm Complex
- Agricultural industrial Complex

View map (Example)
Establishment of Smart Farm Innovative Valley

2. Specifics

Start-up Incubation Center

Demonstration Complex

Smart farm (For lease)

Innovative Valley serves as a base to create synergy among farmers, companies, and research institutes, focusing on the integration of smart farms, youth start-ups, technological innovation, and market development.

2 sites (Gimje and Sangju) selected through the 1st public contest in Aug 2018
2 more sites (Miryang and Goheung) selected through the 2nd public contest in Mar 2019
## Establishment of Smart Farm Innovative Valley

### 2. Specifics

#### Secure competitiveness of front and rear businesses based on the smart farm demonstration complex

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<th>Demonstration Complex</th>
<th>R&amp;D connection</th>
<th>Showcased products</th>
<th>Demonstration service</th>
<th>Guide tour and PR</th>
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<tr>
<td></td>
<td>• Smart farm R&amp;D demonstration (including tests)</td>
<td>Product demonstration (with experts as well)</td>
<td>Showcase of products</td>
<td>Guide tour and PR</td>
</tr>
<tr>
<td></td>
<td>• Providing vouchers</td>
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#### Support Export

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<th>Smart farm export support program</th>
<th>International tech cooperation</th>
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<tr>
<td>• Participation from enterprise, Research institution and public institution</td>
<td>• Technical cooperation with Middle East and Central Asia</td>
</tr>
<tr>
<td>• Support related technology research and actual export process</td>
<td>• Research on applying smart farm in desert climate zones</td>
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</table>

#### Standardize Big data

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<th>Collect and Share data</th>
<th>Disease/insect/pest service</th>
<th>Standardize smart farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve data collection system</td>
<td>Analyze disease/insect/pest data</td>
<td>Standardize ICT facility</td>
</tr>
<tr>
<td>Secure and share high quality data through innovative valley</td>
<td>Develop decision-making service for forecast and prevention of disease/insect/pest (~’19)</td>
<td>Secure quality with smart farm facility standardization</td>
</tr>
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</table>
Establishment of Smart Farm Innovative Valley

3. Assisting Youth Start-ups

At Business Incubation Center: Education → Training → Support entire cycle

**Youth incubation center**
- Establish 4 centers by 2022
- Goal: Produce 600 youth professionals

**Curriculum**
- Long-term curriculum matching the needs of the users (20 months)
- Include managerial trainings based on self-accountability
- Special lectures from overseas experts

**Related Support**
- Provide job referral service
- Provide vouchers
- Link trainees to venture start-up centers’ consulting services

3 Pilot agencies have selected 60 trainees (’18)
Without any concerns on initial investment in facilities, pay a reasonable rent and start own business

- Establish 30ha until 2021
- Minimum 3-year lease to youth
- Rent at a reasonable rate based on operation costs, expected income
Establishment of Smart Farm Innovative Valley

5. Demonstration Complex

Demonstration Service
- Demonstration of Smart Farm equipment and technologies
- Test and certify quality and compatibility
- Joint Farmer-Research Institute-Company R&D

Exhibition and Experience
- Exhibit Smart Farm equipment and provide consulting service to buyers, investors and farmers
- Smart Farm experience program for farmers and students

Start-up · Business Support
- Provide demand-matching R&D Voucher
- Provide A/S for equipment
- Provide consulting sessions to support attraction of private investment
- Provide economic viability analysis
- Provide space for start-ups
# Establishment of Smart Farm Innovative Valley

## 6. Demonstration Complex

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<th>Entity</th>
<th>Functions and Roles</th>
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<td><strong>MAFRA</strong></td>
<td>Overall planning, provision of guidelines, grant of budget/subsidy, project evaluation, planning of R&amp;D</td>
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<tr>
<td><strong>Local gov't</strong></td>
<td>Construction of complex, managing the regional demonstration complexes</td>
</tr>
<tr>
<td><strong>RDA, FACT</strong></td>
<td>Providing public demonstration services, connection to verification and certification system and R&amp;D</td>
</tr>
<tr>
<td><strong>EPIS, IPET</strong></td>
<td>Collecting, analyzing, sharing big data and establishing a system for utilization Planning, managing, evaluating company-led R&amp;D projects</td>
</tr>
<tr>
<td><strong>KTC</strong></td>
<td>Construction of complexes(consignment)</td>
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Thank You