



# Smart-use of Digital Technology for Sustainable Agriculture in Korea

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# The Advent of the Digital Age

- What is the **Digital Age**?
  - Defined as **INFORMATION AGE**
  - After introducing the personal computer and subsequent technology → Transfer information freely and quickly
- Living in the **Fourth Industrial Revolution**
  - Not only the technology-driven change
  - Opportunity to use converging technology to be inclusive and human-centered ⇔ Changed to **DATA ECONOMY**

# Change of Common Lives

- **Data + Network + AI**
  - Important factors of **INNOVATION & COMPETITIVENESS**
  - Post-COVID19, Digital capacity becomes more important

Land & Labor oriented

- Land/Labor/Capital + Technology



Data & Facility & Infrastructure oriented

- Facility & Infrastructure + Data + Sensor

# Korean New Deal Strategy

- **National Development Strategy** after COVID19
  - Introduced on July 14, 2020 → Korean New Deal 2.0 in 2021
  - Economic Chaser → **Economic Leader**
  - Carbon-dependent → **Low-Carbon Economy**
  - Inequality → **Inclusive & Fair Society**



# Digital New Deal in Korea

- Strengthening D.N.A. Ecology
- Advancing Un-tact Infrastructure
- Fostering new Hyper-connected Industries such as Metaverse
- Digitalizing S.O.C.



# Korean New Deal in Agri-food Industry

- **('21) Digital New Deal** includes 14 projects
  - Establishing smart farms, autonomous infrastructure, online auction system for agricultural and livestock products, etc.
- **('21) Green New Deal** includes 5 projects
  - Establishing automatic water-quality monitoring system, supporting replacement of old diesel machines, subsidizing livestock manure treatment facilities, etc.

# Data-based Digital Agriculture

- **Digital Agriculture is NOT new!**

- Precision Agriculture (PA)

- Right timing
- Right place
- Right amount

**\* Right = Sustainable**



**PRECISION AGRICULTURE**

- Optimized resource use / Minimum environmental pollution / Cost saving
- GPS, Drone, Sensor VAR
- Farming field



**SMART AGRICULTURE**

- Productivity & Income increase / Improving production efficiency
- IoT, AI, Clouds, Big Data
- Production, processing & distribution, consumption, front & back industries

**DIGITAL AGRICULTURE**

- Productivity & income increase / Automation & sustainability increase
- IoT, AI, Clouds, Big Data, Platform, Solution
- Production, processing and distribution, consumption, front & back industries

Source: Seo et al. 2020.

# How Digital Agriculture Works as PA

Category	Main Technology	Machine & Devices
OBSERVATION	<ul style="list-style-type: none"> <li>▪ Crop field/Crop/Machinery sensing (water content, water stress, temperature, conductivity, wind direction, wind speed, etc.)</li> <li>▪ Wireless data interchange</li> <li>▪ Telematics, IoT</li> </ul>	<ul style="list-style-type: none"> <li>▪ Weather sensors (humidity, temperature, water content, sunshine duration)</li> <li>▪ Soil sensors (water content, temperature, pH)</li> <li>▪ Camera (RGB, thermo-graphic)</li> <li>▪ NIR, GPS, drone, communication modules, power supply</li> </ul>
<b>PRESCRIPTION</b>	<ul style="list-style-type: none"> <li>▪ Field mapping</li> <li>▪ Prescribed map generation</li> <li>▪ Database</li> <li>▪ Big data analysis</li> <li>▪ AI, machine learning</li> </ul>	<ul style="list-style-type: none"> <li>▪ Field mapping S/W</li> <li>▪ Big data server (GPU, CPU, HDD)</li> <li>▪ Big data analysis S/W</li> </ul>
ACTIVITIES	<ul style="list-style-type: none"> <li>▪ Wireless data interchange</li> <li>▪ Autonomous driving &amp; activities</li> <li>▪ Remote controller</li> <li>▪ Planting &amp; fertilization variable controller</li> <li>▪ Irrigation controller</li> </ul>	<ul style="list-style-type: none"> <li>▪ GPS, GNSS</li> <li>▪ Agricultural machine</li> <li>▪ Drone, camera</li> <li>▪ Spray nozzle</li> <li>▪ Sensor of line recognition</li> <li>▪ Actuator, motor, load cell</li> <li>▪ Flow &amp; sound sensors</li> </ul>
RESULT ANALYSIS	<ul style="list-style-type: none"> <li>▪ Field management (water, fertility, yield)</li> <li>▪ Database</li> <li>▪ Big data analysis</li> <li>▪ AI, machine learning</li> </ul>	<ul style="list-style-type: none"> <li>▪ Big data server (GPU, CPU, HDD)</li> <li>▪ Big data analysis S/W</li> </ul>



# Korean Policies about Digital Agriculture

## ICT Facility



- Greenhouse Modernization
- U-Farm advancement
- U-IT project
- Integrated measures to spread agricultural ICT convergence
- Smart farm support project
- ICT-based high-tech ag-happy rural development

## Base Development



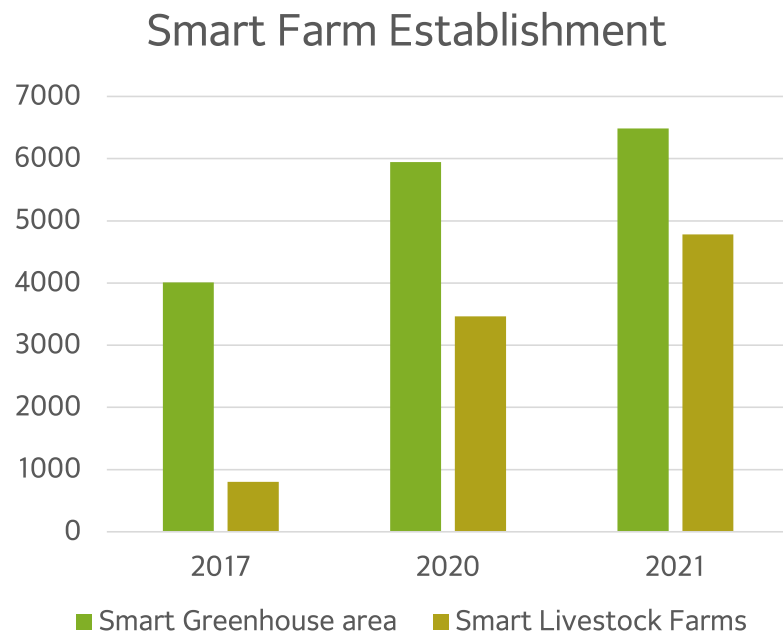
- Smart Farm Innovation Valley
- Smart Livestock Complex

## Data Utilization



- Multi-ministry Smart farm innovation technology development project
- Agricultural Big Data Platform
- Smart Agriculture Big Data Platform
- Digital Agriculture Promotion Organization
- (MAFRA) Bit Data Strategy Officer
- (RDA) Team of Agricultural Big Data Jobs

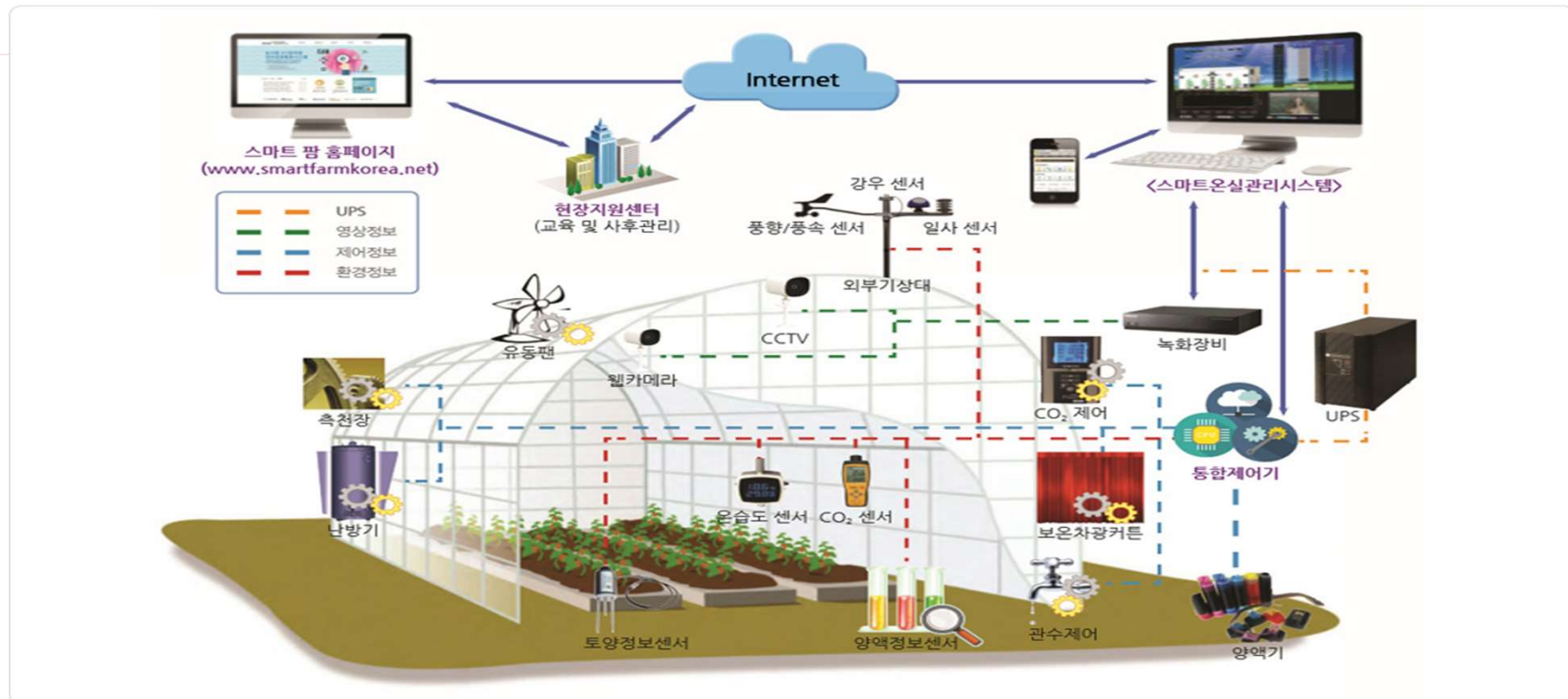
# Current Status of Digital Agriculture in Korea



Source: MAFRA 2021, KREI 2020 survey

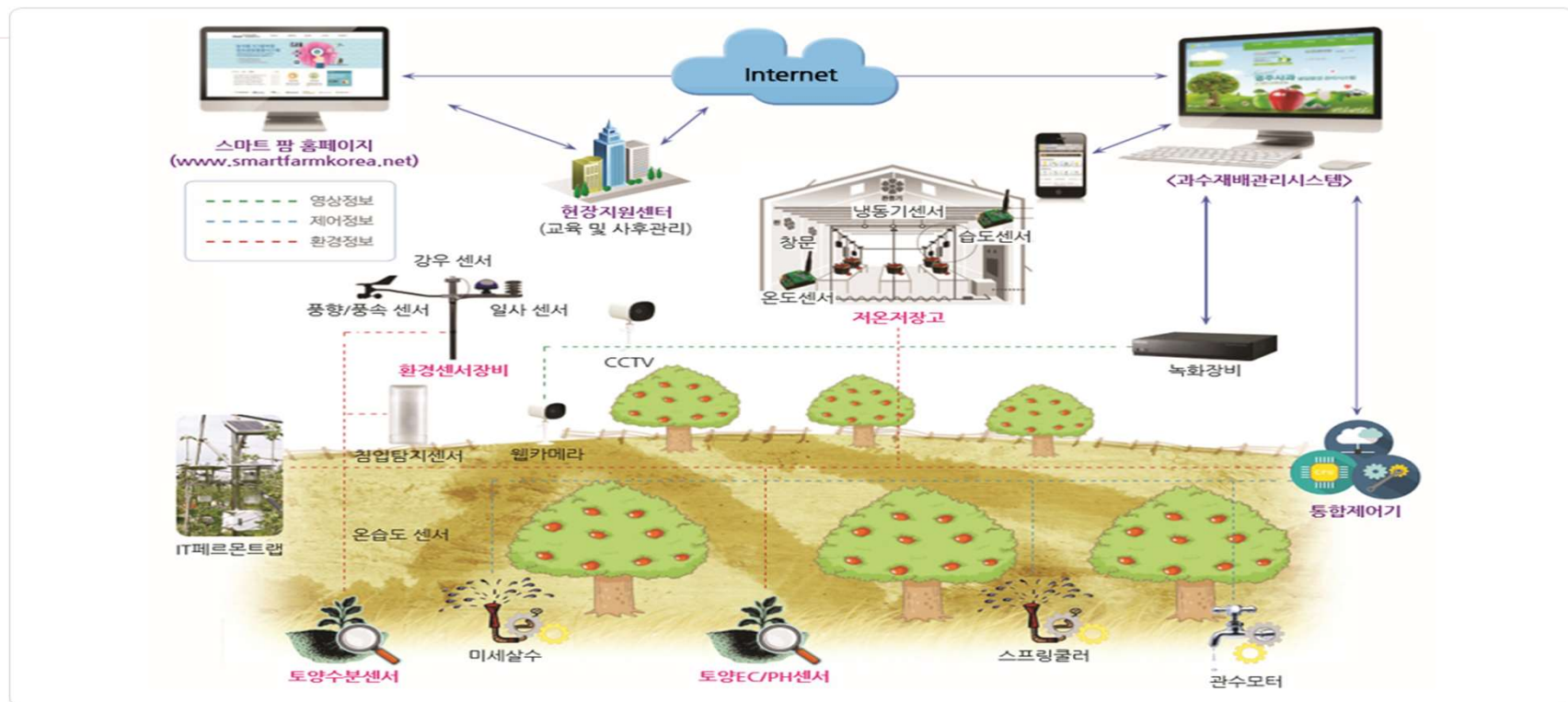
- After using smart farms
  - Production quantity 32.1% ↑
  - Labor hours 13.8% ↓
  - Pest disease 6.2% ↓
- 59.5% of farmers would like to establish smart farms
- So far, productivity and saving cost are main concerns

# Smart Greenhouse in Korea



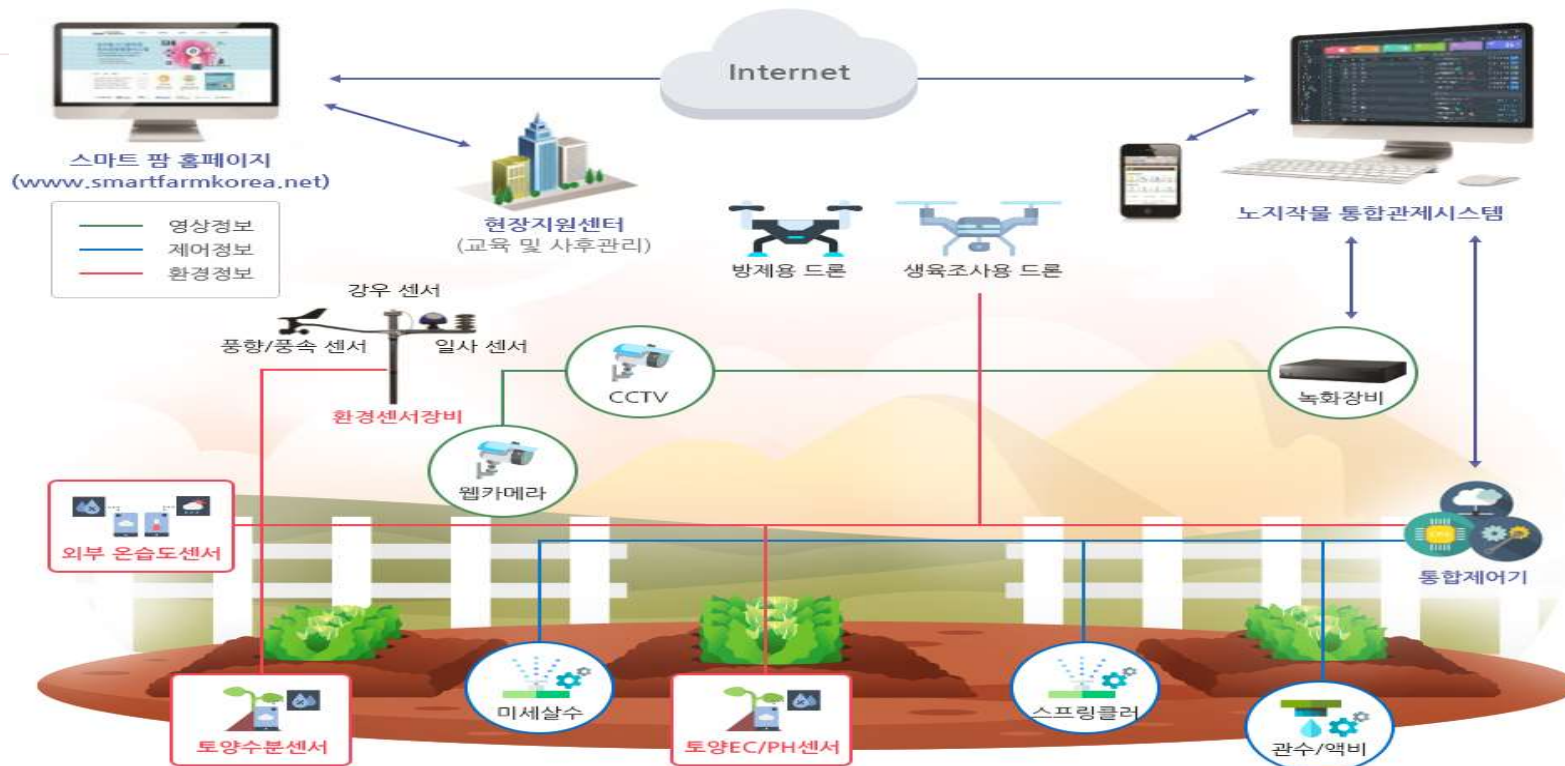
Source: smartkorea.net (Accessed on May 20, 2022)

# Smart Orchard in Korea



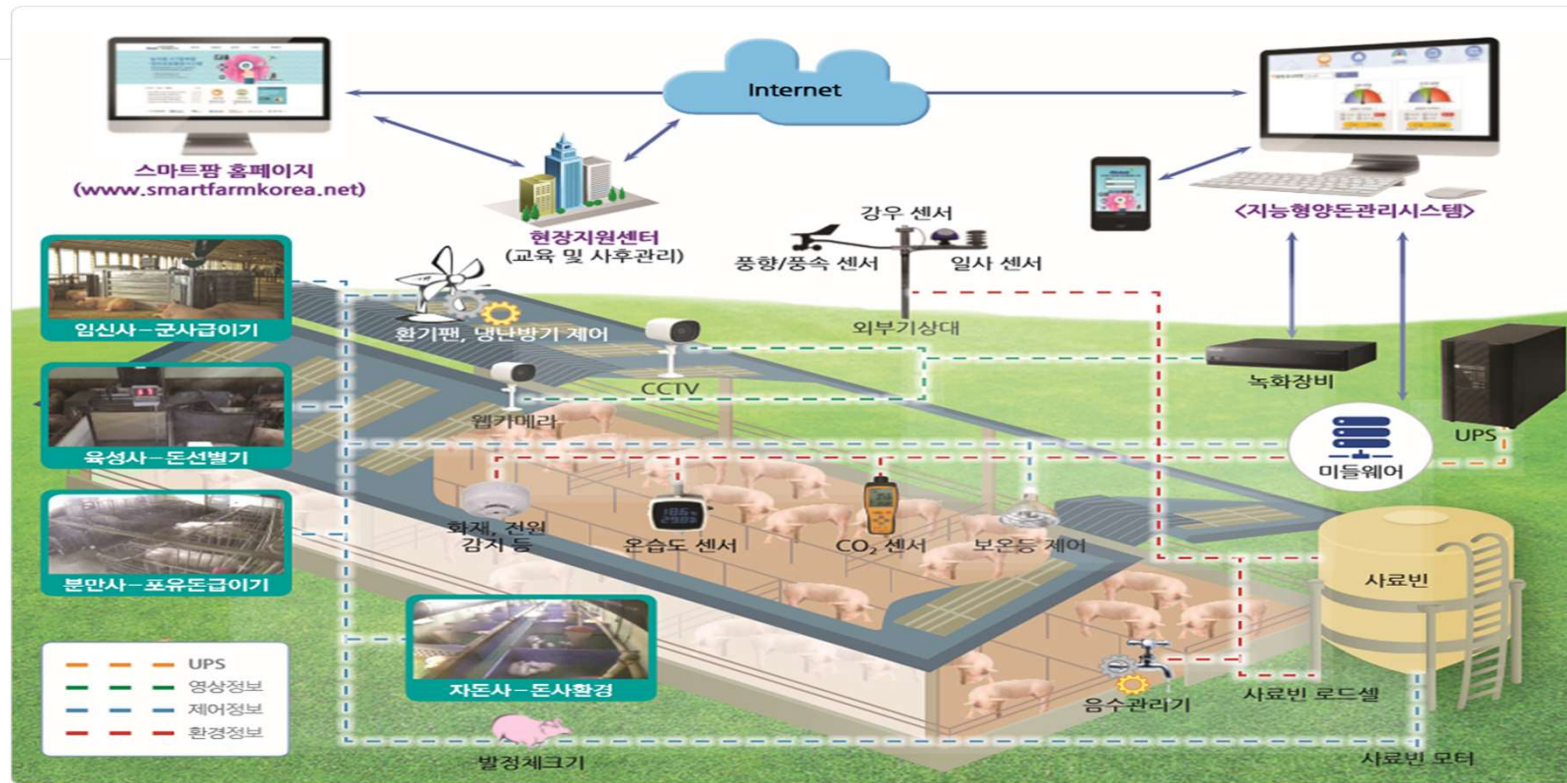
Source: smartkorea.net (Accessed on May 20, 2022)

# Smart Field Crop in Korea



Source: smartkorea.net (Accessed on May 20, 2022)

# Smart Livestock Farm in Korea



Source: smartkorea.net (Accessed on May 20, 2022)

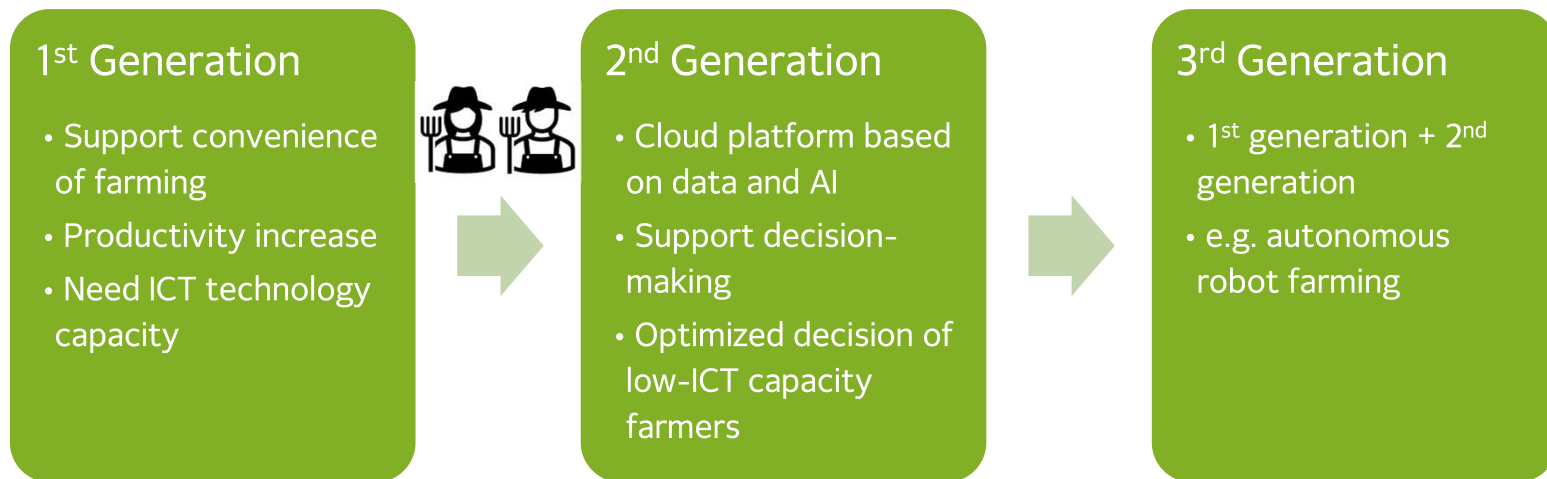


# Smart Livestock to Carbon Neutrality

- 2050 Carbon Neutral Strategy in Korea
  - Productivity of Milk cows and chickens is already high
  - But we can expect to double up the productivities of cattle cows and pigs until 2050 through Smart Livestock Farms
  - (In the national scenario) Productivity increase of smart farms will help to reduce the number of animals and its related GHG emissions

# Suggestion for the Future

- 1<sup>st</sup> generation Smart Farm → 2<sup>nd</sup> generation Smart Farm





# Suggestion for the Future

- **Digital New Deal + Green New Deal (+ Human New Deal)**
  - Digital technology can be tools to support environmental sustainability
  - When developing technologies, need to take environmental factors into accounts
  - User-friendly platform ⇔ Farmers do not need to understand all pathways of environmental consequences

# Suggestion for the Future

- **Hardware oriented → Software + Data oriented**

- Limit to have an expensive initial investment, and a few farms can be beneficial
- Need the algorithm to support the farmers' decision-making
- People can have access to S/W at the same time
- Help to necessarily analyze the economic and environmental risks



Thank you very much!

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