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Crisis to Opportunity: Shaping a New Paradigm for Korean Agriculture with AI and Data

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Three Structural Crises Converging Simultaneously

Climate Volatility

- Record monsoons & extreme drought
- Unpredictable water supply
- Rising risk of year-by-year crop failure

Labor Shortage

4.03M → 2.09M
(2000) (2023)

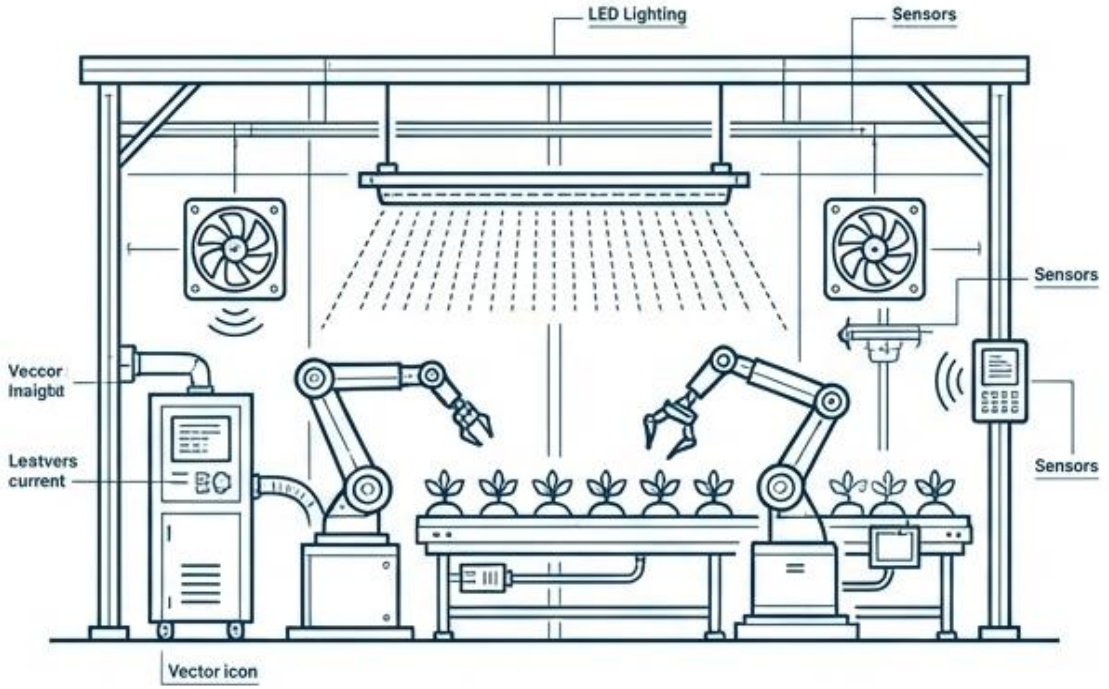
48% decline in two decades

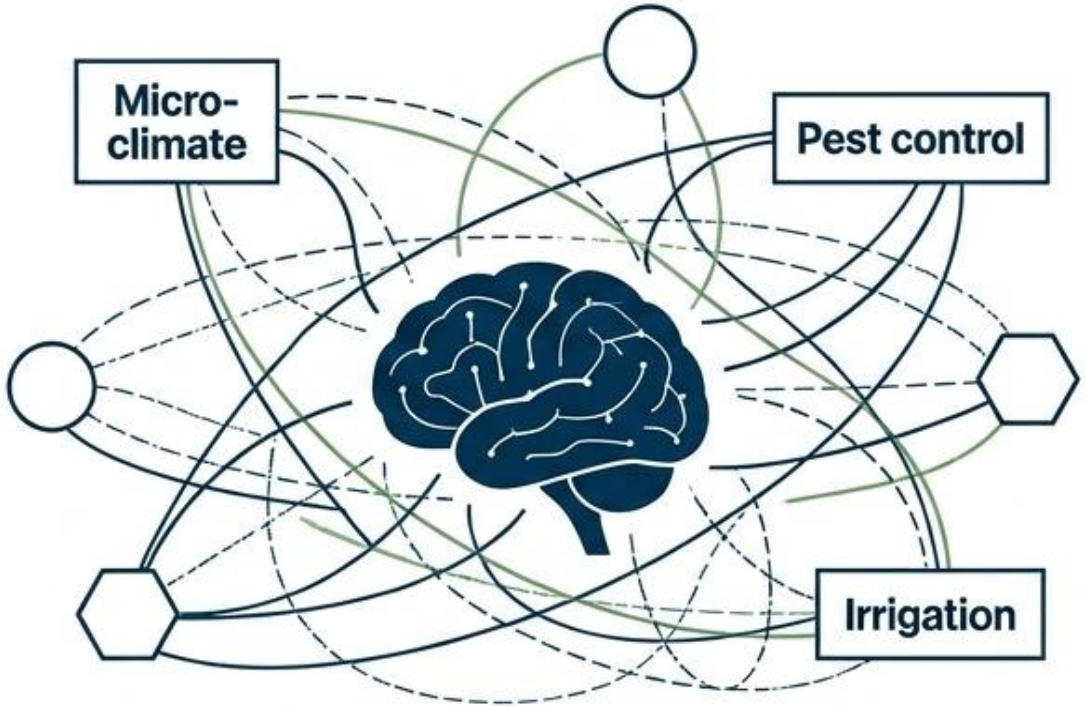
Declining Farmland

1.89M ha → 1.50M ha
(2000) (2024)

21% loss of productive land

Key Takeaway: These are structural trends requiring a non-linear intervention — an AI-driven solution, not just incremental policy.





The Infrastructure is Modernized.

The Intelligence is Trapped.

- **High Entry Barrier:** Environmental control requires decades of tacit expertise, even with automated machinery.
- **Skill Reliance:** Farm output still scales linearly with human real-time decision-making capacity.
- **Systematic Exclusion:** Complex automated systems inadvertently exclude aging farmers and deter newcomers.

Korea has heavily invested in hardware, but without **cognitive automation**, the system remains **fragile.**

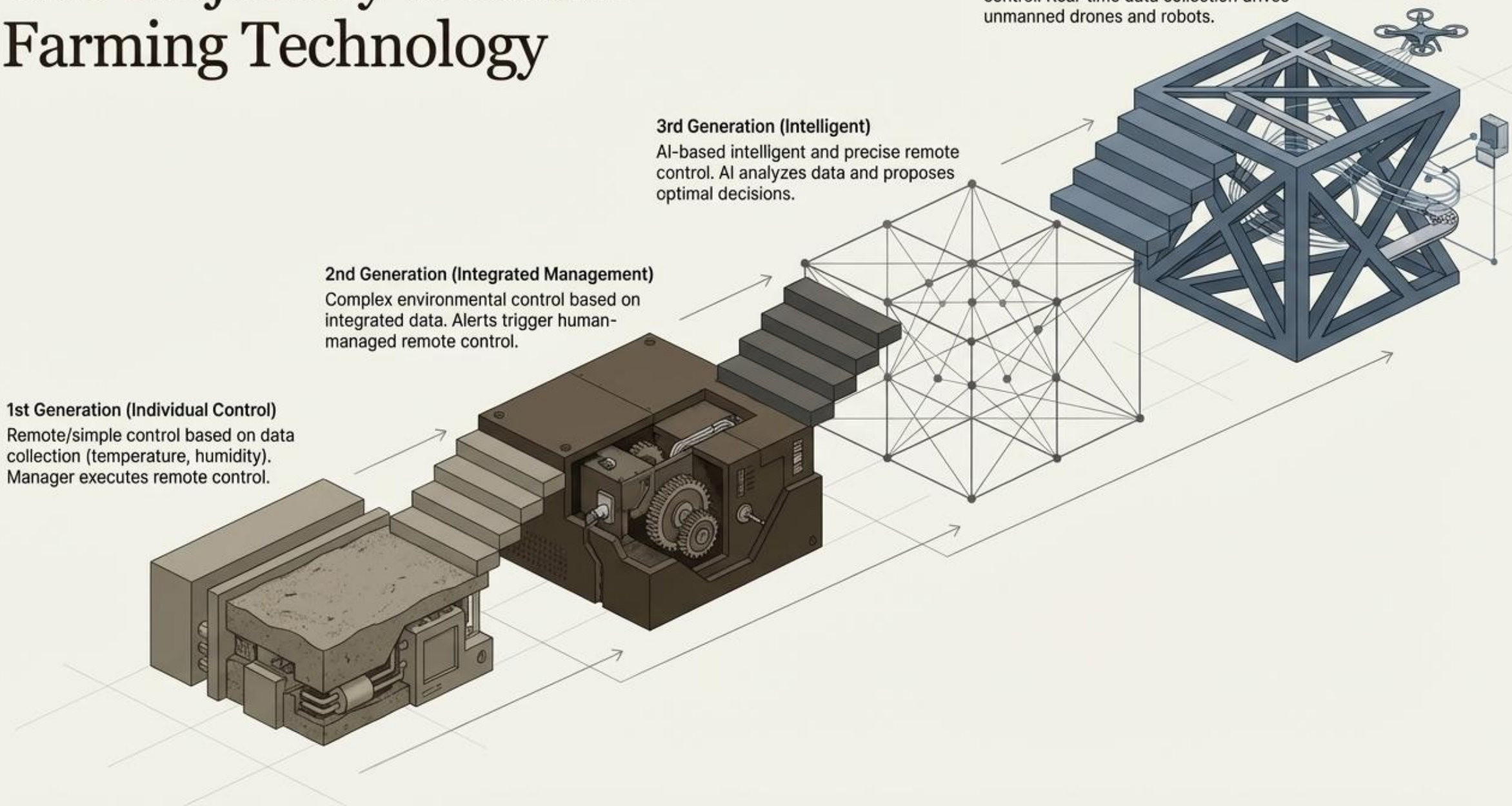
The Trajectory of Smart Farming Technology

1st Generation (Individual Control)
Remote/simple control based on data collection (temperature, humidity). Manager executes remote control.

2nd Generation (Integrated Management)
Complex environmental control based on integrated data. Alerts trigger human-managed remote control.

3rd Generation (Intelligent)
AI-based intelligent and precise remote control. AI analyzes data and proposes optimal decisions.

4th Generation (Unmanned Autonomous)
AI and Robot-based autonomous control. Real-time data collection drives unmanned drones and robots.



Defining the Agricultural AX Equation

Human Experience

- Decades of soil behavior patterns
- Crop response to micro-climates
- Pest and disease timing data

Action: Structured as AI training data

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Advanced Technology

- Machine learning prescription models
- Autonomous drone and robot systems
- Real-time IoT sensor integration

Action: Applied to every farm at scale

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Autonomous Outcome

Result: AI automatically provides optimal farming prescriptions, enabling anyone to manage agriculture easily and professionally regardless of age or experience.

Korea’s 1.5 Million Hectare Challenge

By law (Agricultural Land Act Art.31-3), all land use and illegal structures must be surveyed annually.

BEFORE: Manual Survey

55

plots / person / day

Inspectors physically visit plots. Remote, mountain, and island terrains are geographically inaccessible.

AFTER: AI Survey

111

plots / person / day (2x Improvement)

- AI-powered satellite and aerial imagery processing drastically accelerates coverage.

The Five-Step Geospatial Data Pipeline

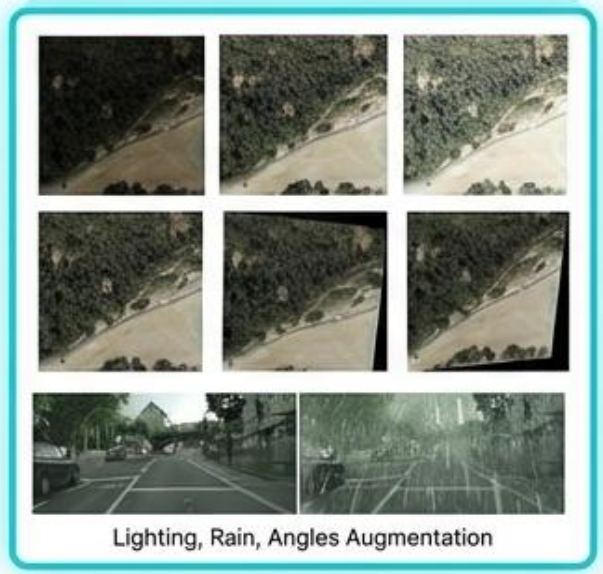
1. Training Data Acquisition
Satellite and aerial imagery collection.

2. Polygon Labeling
Object-level annotation of farmland features.

3. Synthetic Data Generation
Augmentation for terrain, rain, and lighting.

4. Transformer Model Training
High-resolution image analysis.

5. Cadastre Validation
Cross-checking against official land registers.

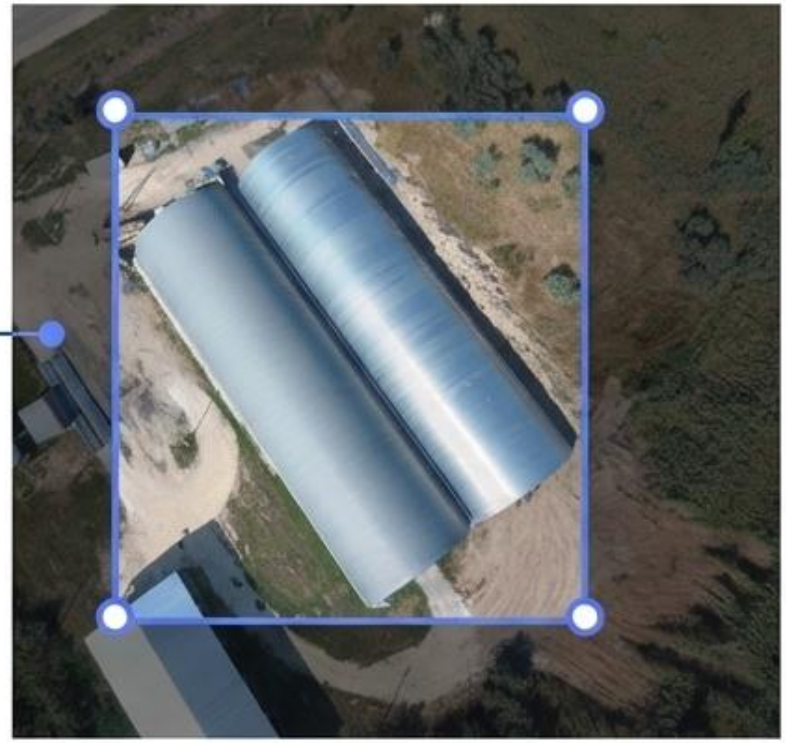

Lighting, Rain, Angles Augmentation

Human-in-the-Loop Protocol:
AI flags anomalies; human inspectors only validate the exceptions.

2024 Nationwide Rollout & Platform Integration

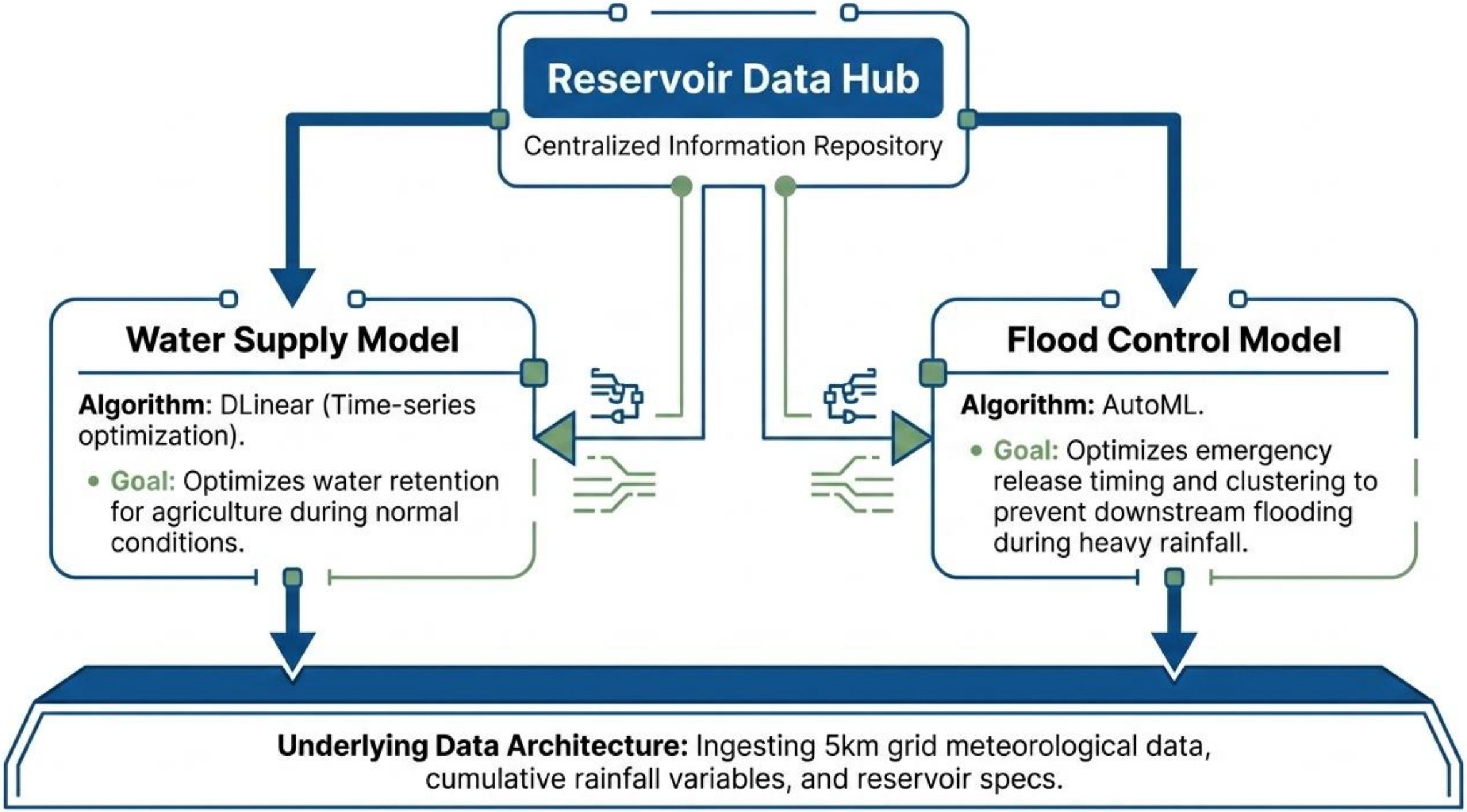
Widespread detection mapping across mixed terrain types (greenhouses, sheds, huts).

Precise object-level polygon segmentation.

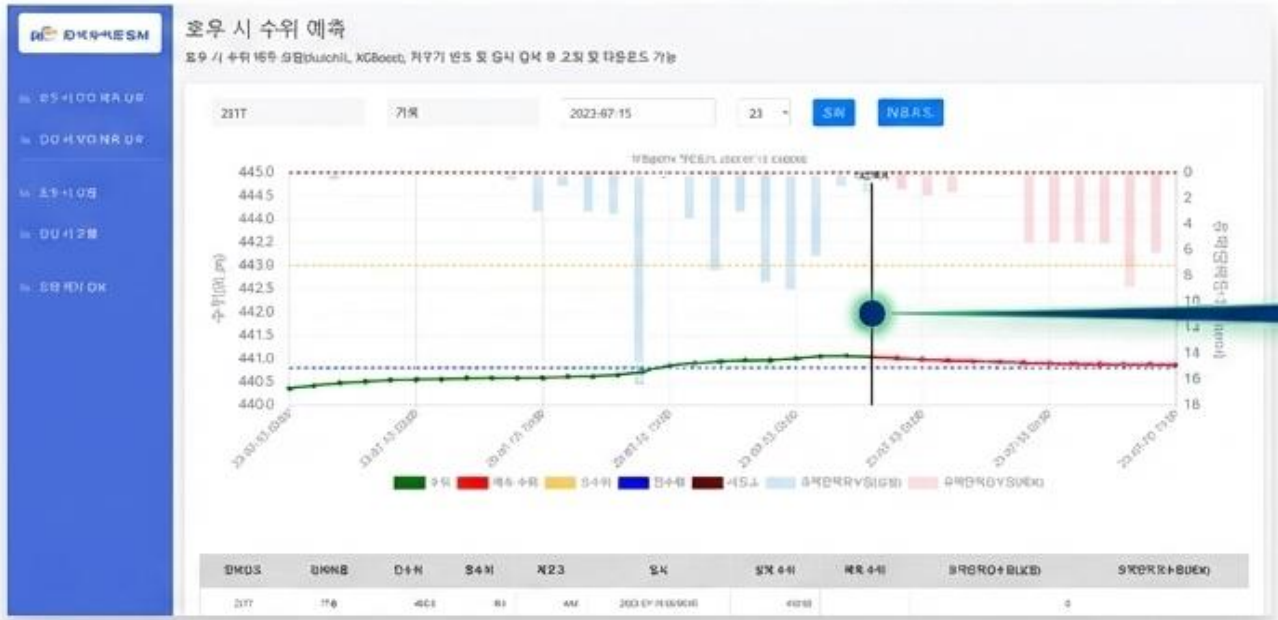


These verified spatial data feeds do not just sit in a silo; they flow directly into the national AX Platform's AI prescription engine to inform policy and agricultural support.

Human intuition alone fails against unpredictable monsoon climates. Managing aging irrigation networks requires hyper-precise, data-driven foresight rather than reactive, delayed responses.


Reservoir Data Hub
Centralized Information Repository
Water Supply Model
Algorithm: DLinear (Time-series optimization).
Goal: Optimizes water retention for agriculture during normal conditions.
Flood Control Model
Algorithm: AutoML.
Goal: Optimizes emergency release timing and clustering to prevent downstream flooding during heavy rainfall.
Underlying Data Architecture: Ingesting 5km grid meteorological data, cumulative rainfall variables, and reservoir specs.

Proactive Disaster Prevention in Action



Prediction Frequency

10-minute intervals, continuously updated.

Forecast Horizon

12 hours ahead.

Development Speed

16 months from concept to national deployment (Mar 2023 - Jul 2024).

Detect Threshold Breach → Trigger Automated Mobile Push Alert → Escalate: Caution → Alert → Critical

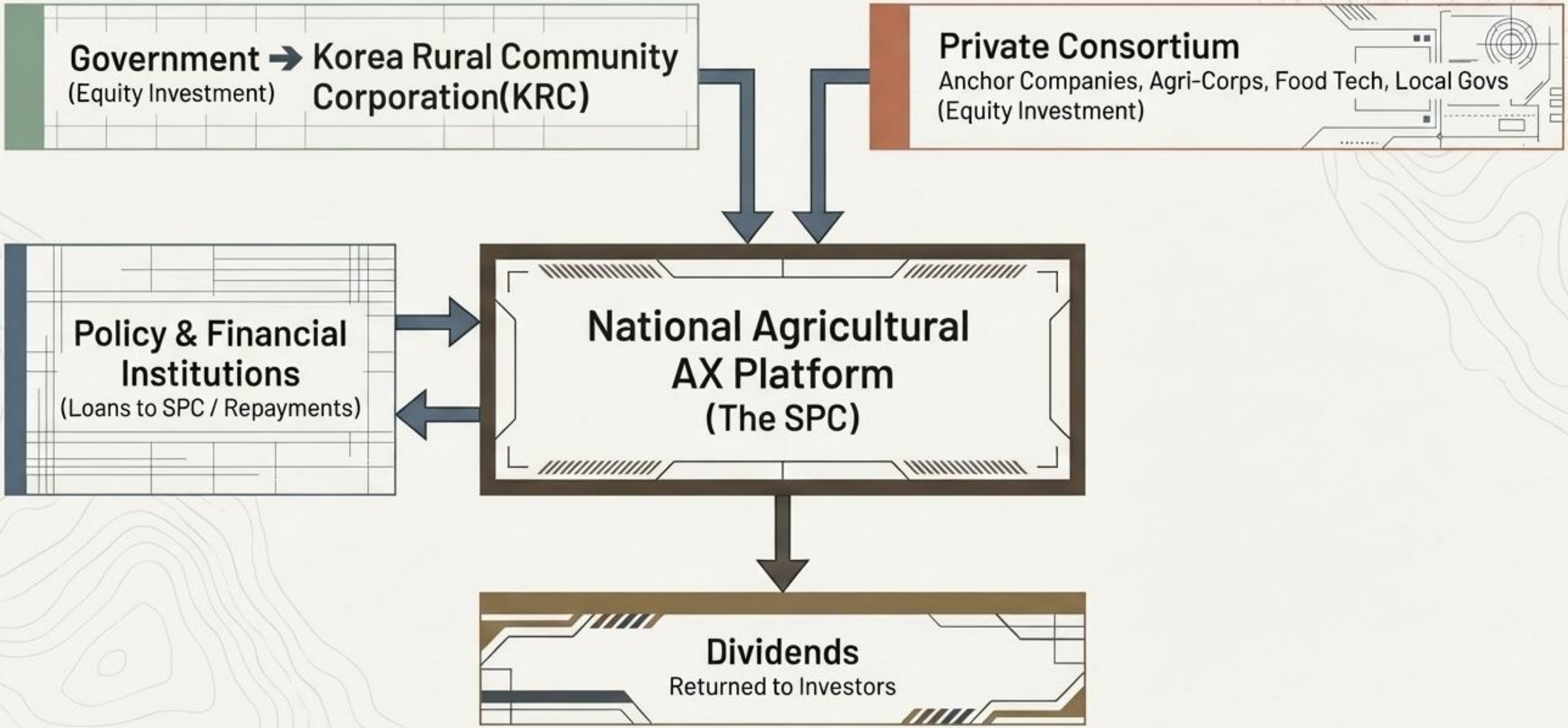
Engineering the National Agricultural AX Platform

- Pump-priming investment
- Regulatory framework
- Farmland data assets

- Technology & Agri-food companies
- Agricultural corporations
- Market-driven innovation

- AI-leading farm models
- Nationwide AX rollout

Architecture of the Public-Private Joint Venture



Financial Scale and Capital Structure

Total Project Budget: $193 Million+ USD
(Flexible based on private scale)

Public Sector Cap:
Maximum 49%

Private Sector Mandate:
Minimum 51%

Government investment is capped at $93.3 Million USD total.
(2026 maximum: $46.7 Million USD).

Government allocation is distributed relative to private scale.

Majority private control ensures market-driven innovation and operational efficiency.

International Cooperation Framework (via KGGTF)

Principle 1 — Institutional Readiness First

Technology without the right institutional host fails. We must identify and build the partner organization before deploying tech.

Principle 2 — Spatial Data Infrastructure First

Data readiness is the starting point, not an afterthought. Reliable spatial data must precede AI applications.

Principle 3 — Local Retraining is Mandatory

AI models trained on Korean data cannot be blindly transplanted; joint data governance and local model retraining are required.

KRC is ready to partner, transfer knowledge, and share institutional frameworks for a boundless, autonomous agricultural future.

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