Smart Agriculture in the world and its application to Asian smallholders

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Current State of Agriculture in Japan

1. Aging and lack of labor force
2. Sum is large but scattered farmland
3. Loss of experience due to retirement of elderly farmers

Number of primary farmers = 1.75 million
Average age = 67.0

Under 50: 177,000 (10.1%)
65 and above: 1.132 million (64.6%)
Overview of Smart Domestic Agriculture: in the case of land-based farming

Improvement in efficiency of multi-field farm management

Mechanization of paddy and land farming, adaptation for larger-scale operations

Water management system (irrigation, drainage, etc.)

Satellites

Robotized agricultural machinery

Combining harvester with measuring function of protein content yield

VRA fertilizer

Multi-field management system

※Color-coded data (fertilizer application, yield, etc.), work history and material management per field

Open cloud platform (Linked with other softwares)

Mobile devices (on-site operators)

Data output

Instructions

Data Sync

Automated recording

Crop growth measuring devices

UAV

Boom sprayer

Satellites

Robotized agricultural machinery

Tractor

Smart transplanter

Combine harvester with measuring function of protein content yield

VRA fertilizer

Water management system (irrigation, drainage, etc.)
Current State of Smart Agriculture in Europe

Motivation for Smart Agriculture
- Environmental issues
- Cost reduction

Robot tractor

Robot weeder

Spray system using Camera and AI
Target for Smart Agriculture in Japan

Robot agricultural machinery initial cost

- $80,000 ~
- $34,000 ~
- $140,000 ~

Running cost

Target for Smart Agriculture in Japan
Farmers cultivating more than 10ha

National Agriculture and Food Research Organization
Annual income of Rice (paddy)  
500(USD/tonne) × 50,000(hg/ha) = $2,500

Introducing Smart Agriculture to Asia  
At what cost?
Cost effectiveness

Agricultural mechanization for Sustainable Agricultural production by Smallholders

- Affordable initial cost
- Affordable running cost
- Maintenance support network

Is Smart Agriculture cost effective for Smallholders in Asia?
Utilization of AI in Agriculture

Establishment of AI and Diagnostic Server for the Diseases and Pests Determination

Development of Disease Diagnostic AI

Development of Pest Diagnostic AI

Established and made available to the public a server that enables cross-sectional use of the Disease and Pest Diagnostic AI

Downy Mildew: http://gaityuu.com/index.htm
Utilization of AI in Agriculture

Diagnostic AI

Free application for smartphones
- Free of charge to anyone
- Only identification of pests

Paid Smart Glass and Apps.
- Providing Smart Glass and Applications for a fee
- In addition identification of diseases and pests, methods of disinfection pesticides, etc. are provided.
- Collaboration with the authorities and companies about the detailed countermeasures

Provision of automated support system for agricultural work
- Early detection of diseases and pests by Drone patrol
- Pinpoint pesticide application at the detected spots of diseases and pests

Development of Disease and Pest Diagnostic Technology Utilizing AI
Supporting mechanization systems and postharvest

Business models for contract service provision
Most machines are too expensive for individual farmers in particular if they only farm a few hectares. IRRI is developing pilot business models for contract service provision to enable small farmers to benefit from machinery or postharvest equipment through service provision. We are also developing ICT tools like EasyHarvest to facilitate machinery usage scheduling.