Fujitsu Group’s Agricultural IoT Challenges

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Fujitsu Kyushu Systems Ltd.

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Who we are

- Overview of Fujitsu
- Fujitsu Group in Thailand and Kyushu
Overview of Fujitsu

- Global scale in technology and service capability yet with a local face
- We integrate solutions in response to our customers’ business needs

Fujitsu is a global Japanese ICT vendor, with the goal of social affluence together with our customers by leveraging our experience and ICT technologies.
Fujitsu groups in Thailand & Kyushu

Fujitsu (Thailand) Co., Ltd. (FTH)

- **Founded:** September 1990
- **Capital:** 50 million Baht
- **Employees:** 475
- **HQ:** Bangkok
- **Offices:** Eastern Branch (Sriracha-Chonburi)

Fujitsu Kyushu Systems Ltd. (FJQS)

- **Founded:** July 20, 1981
- **Capital:** 300 million Yen
- **Employees:** 1,483 (as of July, 2016)
- **Revenue:** 42.6 billion Yen

**Wholly owned subsidiaries of FJQS:**

- Fujitsu Kyushu System Service Ltd. (FQSS)
- FQS Poland Sp. z.o.o
Environmental Change Occurring in the World

- Everything is connected the Internet
- Utilization of IoT in Agriculture
Everything is connected the Internet

This is the arrival of the "Hyper-Connected World"; networking together people, things, and information.
Utilization of IoT in Agriculture

Know the state

✓ Environment (Temp, Humidity, CO₂, Sunlight, Wind Speed & Direction, Rain, etc.)
✓ Position (Open/Close, On/Off, Locked, Movement, Steps...)
✓ Condition (Photosynthesis, transpiration, stress, sugar, Diseases...)
✓ Predict growth conditions and crop yields

Change the state

✓ Open or close windows and curtains
✓ Switch heating/cooling, lighting, irrigation and pumps on or off
✓ Supply fuel (kerosene, heavy oil, chips, pellets, etc.)
✓ Human interaction (labour, planning and execution of plans)

Execution of agriculture based on science, and not relying on experience or intuition.
Agricultural IoT designed for Greenhouse Horticulture Farms
~Greenhouse Horticulture SaaS/Environment Control Box~

- Challenges agricultural companies face
- Overview of the Greenhouse Horticulture SaaS
- Greenhouse Horticulture SaaS Hardware
- Implementation Status by Country
Challenges agricultural companies face

Challenges
- Limited ability to manage due to a lack of experience and intuition in individual employees.
- Uneven growth due to location.
- Difficulty managing and sharing information with a large number of employees.

Solution
Use “Greenhouse Horticulture SaaS” to stabilize production and manage better

Environmental Control

Visualization of environment and growth

Use of mobile devices
Greenhouse Horticulture SaaS

- A cloud service utilizing data stored in the cloud.
- Visualization of the production process, remote monitoring of the greenhouse, and remote control of equipment. Help stabilize the supply of high-quality crops with a low opportunity cost.

**Home/Office**
- Environment Monitoring of Greenhouse (Temperature/Humidity/CO2)
- Remote Control of Machines
- Customize of Cultivation Template

**Outside of Office/Home**
- Environment Monitoring of Greenhouse (Temperature/Humidity/CO2)
- Remote Control of Machines
- Modify control information

**Inside Greenhouse**
- Environment Monitoring of Greenhouse (Temperature/Humidity/CO2)
- Force control of machines when the greenhouse environment is changed

* UECS: Ubiquitous Environment Control System
Hardware used for Greenhouse Horticulture SaaS

- **Sunlight Sensor**
- **Data Converter**
- **Environment Control Box**
- **Outdoor Weather Sensor (Sunlight, Wind Direction & Speed, Rain, Temp, Humidity)**
- **PoE-HUB**
- **Cloud Communication Box**
- **Temp, Humidity & CO₂ Sensor**
- **Soil Sensor**
Implementation Status by Countries

- **Japan**: 40 farms, 140 Houses
- **Taiwan**: Jade Beauty Bio-Tec Co., Ltd (PoC)
  : Arranging other PoC
- **Vietnam**: Akisai Showroom in Hanoi
- **Turkey**: Ankara University (PoC)

As of end of July, 2016
Agricultural IoT designed for Livestock Farms

~GYUHO SaaS (Connected Cow)~

- Challenges livestock farmers face
- Overview of the GYUHO SaaS “Connected Cow”
- Connected Cow Hardware
- Standard Configuration
- Characteristics of Connected Cow
- Implementation Status by Country
Challenges livestock farmers face

**Challenges**
- Difficultly detecting estrus.
- Cost of missed insemination timing.
- Difficult to efficiently manage cow information, including estrus periods and number of births.

**Solution**

Use “Connected Cow” to detect estrus and reduce the missed opportunities.

- Estrus Detection
- Visualization
- Use of mobile devices
GYUHO SaaS “Connected Cow”

- Could based solution.
- Detection and push notification of estrus signs in real time.
- Protect missing opportunities for AI and make high productivity and reduce the cost.

Cattle Farmer

- Receiver
- Step Count Data

Pedometer

- Estrus Cycle Notification

Remote Monitoring

- Real Time Data Collection and Analysis

Cloud Center

- Estrus Cycle Detection Service

Government, Agriculture Corporation

- Integrated Management
- Production Planning
Hardware used for Connected Cow

Pedometer

Receiver

Dipole Antenna
Standard Configuration

Cloud Center → Base Station → Internet → House/office

- Receiver
- Dipole antenna
- 3G Card
- Router
- Pedometer

※This is a sample environment. The network composition will be different based on the customer environment.
Characteristics of Gyuho SaaS

① Determine estrus based on activity (step count) in cattle wearing a pedometer.

You won't miss estrus, even in the middle of the night.

② Activity by hour is displayed graphically in real-time.

You can also detect faint signs and abnormal behaviour.

③ Detection notifications are sent to mobile devices or PCs.

Even when you're not home, you won't miss the chance.
Implementation Status by Countries

- **Japan**: 61 farms, 5,363 cows implemented. 14 farms, 1,000 cows on plan in 2016.

- **Korea**: 4 farms, 85 cows implemented.

- **Poland**: National Research Institution of Animal Production (IZ) (PoC). 4 farms, 670 cows will be implemented.

- **Romania**: National Research Development Institute for Animal Biology and Nutrition (IBNA) (PoC).

- **Turkey**: CATTLE BREEDERS' ASSOCIATION OF TURKEY (CBAT) (PoC).

- **UK/US**: PoC in development.

As of end of July, 2016.
Smart Rice Paddy Agriculture (New Initiatives)

- Introduction to our Approach
- Our Challenges
Background

Smart Agriculture Challenges
• Strengthening the international competitiveness of domestic rice
• Expanding exports (based on TPP and Agricultural Free Trade situation)
⇒ Labor-saving, low-cost and high-value-added rice production

Expectations and participation in research projects with a certain university
• Environment, Growth and Soil data measured from 1000 farms (2014)
⇒ Be aware of Productivity, Quality and Yield improvements using data mining and machine learning
→ Utilizing Fujitsu's Agricultural ICT in order to disseminate project results
Research Project Overview (under consideration)

◇ Investigation of the “things” that are required for “watching over” seedlings during cultivation in rice paddies.

[Premise] Rather than expensive Smart Agriculture ICT robots and various sensors, but provide a simple and low cost "Agricultural Assist" support solution.

◇ Themes

① Water Management : Manage water depth of rice paddies
② Temperature Management : Camera digitization of analog thermometer
③ Growth Management : Recognize seedlings in an image and verify the growth rate
④ Pest Management : Determine damage in the early stages by image analysis
⑤ Disease Management : Verify the possibility of disease detection. Determine whether monitoring temperature, humidity (by discomfort index) and condensation on rice plants can lead to detection of onset or prevention.

Sensor (Camera) → Sensor HUB (Raspberry Pi) → Service Bridge Platform
Image Processing (OpenCV) → Image Processing (MATLAB)
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