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PS Solutions Corp.

Town of Yosano

Okada Laboratory, Graduate School of Agricultural and Life Sciences, The University of Tokyo
Honda Laboratory, International Digital Earth Applied Science Research Center, Chubu University
Federación Nacional de Arroceros (FEDEARROZ)
Fondo Latinoamericano para Arroz de Riego (FLAR)

International Cooperation via Japan's Innovative Agricultural IoT Technology
Site Visit by Research Management Team from Colombia
To Observe Implementation of "e-kakashi"



On May 24, 2016, Soft Bank Group's PS Solutions Co., Ltd. (Headquarters: Minato-ku, Tokyo; Chairman and CEO: Amane Kito; hereinafter, PS Solutions), Yosano Town Mayor Toma Yamazoe, Professor Kensuke Okada of the University of Tokyo's Graduate School of Agricultural and Life Sciences, Visiting Researcher Satoshi Ogawa of the International Center for Tropical Agriculture (CIAT), and Professor Kiyoshi Honda of Chubu University's International Digital Earth Applied Science Research Center hosted a research management team from Colombia visiting Yosano Town's rice and cultivation facility that utilizes *e-kakashi*, an innovative agricultural support solution based on the technology of the Internet of Things (IoT) as part of an international joint research project (hereinafter, the Project) being conducted by Japanese and Colombian research institutes.*

Colombia is the third largest country in South America. The 2012 Free Trade Agreement (FTA) with the U.S. is gradually eliminating tariffs on 920 of Colombia's agricultural products. Rice is a relatively new crop for Colombia. However, the current consumption per capita exceeds 40 kg, and rice has become such an important crop that it now occupies the largest cultivated area in Colombia in terms of annual production. Due to the FTA, 80% of tariffs have been eliminated and trade will be completely free in 2030. The demand for rice is increasing; however, yields have declined due to climate change. Moreover, irrigation efficiency and fertilizer quality have been low, which means that production costs are 20–30% higher than those in the U.S., and it is forecast that Colombia will have to import rice in the future. The reason for this site visit to rice fields that utilize Japan's innovative agricultural IoT technology (hereinafter, the Visit) was to gain knowledge that can help Colombia resolve these problems in rice production and become internationally competitive.

Negotiations for the Trans-Pacific Partnership Agreement (TPP), which comprises a total of 31 fields, were concluded for the most part last year, with Japan as a participant. As free trade is an international trend, agriculture as well needs to evolve into a global industry. In light of the situation, we believe that methods leading to higher efficiency and quality of crop cultivation using scientific evidence based on detailed data aggregation and analysis, such as agricultural IoT, are vital to the future of this industry. The groups participating in this Visit will continue their research and development efforts and will endeavor to contribute to the growth of agricultural IoT.

■ Visit Details and Each Organization's Initiatives

<Colombian Inspection Team>

The inspection team comprised four members affiliated with the Project from Colombia's Ministry of Agriculture and Rural Development (MARD), Federación Nacional de Arroceros (FEDEARROZ), and Fondo Latinoamericano para Arroz de Riego (FLAR). MARD and FLAR participated in the Project as Colombia's official and international institutions, respectively, with the end goal of implementing the acquired technologies both in Colombia and throughout Latin America. FEDEARROZ served as a liaison with local farmers.

Fedearroz: <http://www.fedearroz.com.co/new/index.php>

FLAR: <http://flar.org/>

<Town of Yosano>

During the Visit, Mayor Toma Yamazoe of Town of Yosano, Yosa-Gun, Kyoto Prefecture, and other town representatives explained how the New Agricultural Model Establishment Council employs the *e-kakashi* mechanism. This Council, chaired by Professor Takaharu Kameoka of Mie University's Graduate School of Biological Resource Studies, consists of the following members and institutions: Town of Yosano; Town of Yosano Agricultural Renewal Council; Mie University; Ritsumeikan University; Shinshu University; PS Solutions; Hachidaime Gihei Co., Ltd.; Yosano Town Agriculture Committee; Tango Agricultural Promotion Center of the Agriculture, Forestry and Commerce and Industry Department of Kyoto Prefecture's Greater Tango Promotion Bureau; Tango Agricultural Research Institute of Kyoto Prefecture's Agriculture, Forestry and Technology Center; and the Refrekayanosato Village Management Committee. The Council oversees the following activities:

1. Review of product R&D for organic fertilizers using new local resources
2. Scientific testing of new farming methods that promote more effective use of organic fertilizer using IT (environmental monitoring)
3. Investigation of potential new agricultural businesses focusing on high-quality products as well as environmental sustainability.

Town of Yosano: <http://www.town-yosano.jp/wwwg/index.jsp>

<The University of Tokyo>

The research center of the University of Tokyo's Department of Global Agricultural Sciences is handling the entire project as the key research institute in the "development and establishment of Latin American resource-saving rice cultivation using genetic improvements and innovative field management technology."

Project members, including Professor Kensuke Okada of the agriculture and life sciences laboratory, make proactive visits to Colombia to supervise the research, announce results, and exchange views with farmers and other local counterparts. Their goal is to create a new rice cultivation system that has high productivity and low production costs by applying innovative agricultural IoT technology to local conditions and popularizing this technology throughout Colombia.

Department of Global Agricultural Sciences, International Program in Agricultural Development Studies: <http://www.ga.a.u-tokyo.ac.jp/index.html>

<International Center for Tropical Agriculture (CIAT)>

CIAT's role in this Project is mainly one of rice breeding, but the center is primarily involved in promoting eco-efficient agriculture. Through the Project, CIAT aims to reduce water use by using new breeds and to realize less resource-intensive cultivation methods. Their most urgent objective is

to introduce *e-kakashi* overseas for the first time and to gather reliable data from the various agricultural ecosystems in Colombia (Cali, Ibagué, Saldaña, etc.). By developing these applications, they also aim to promote investment and disseminate agricultural IoT technology via Colombian government channels, FEDEARROZ, and individual farmers. These efforts contribute to the Project's mission of "development and establishment of resource-saving rice cultivation."

International Center for Tropical Agriculture: <https://ciat.cgiar.org/>

< Chubu University >

During the Visit, Professor Kiyoshi Honda demonstrated the interoperability of agricultural information and a crop growth simulation using environmental data. His presentation addressed the visitors' technological challenges and stimulated lively discussion and exchanges of views.

The crop growth simulator researched and developed by the Honda Laboratory can create 100 different climate scenarios integrated with mid- to long-term weather forecasts and climate change. By forecasting weather in the near future, the simulator can estimate the impact of planting time and other factors on crop yields and quality. Interoperability is a very important technology that enables interaction with the agricultural IoT service handling many kinds of information. By using interoperative technology, environmental history can be recorded up until the present, and forecasts of future environmental conditions are possible as well, which can support agricultural decision-making.

Professor Kiyoshi Honda, Chubu University International Digital Earth Applied Science Research Center and Graduate School of Engineering postgraduate program (Research Gate): https://www.researchgate.net/profile/Honda_Kiyoshi

< PS Solutions >

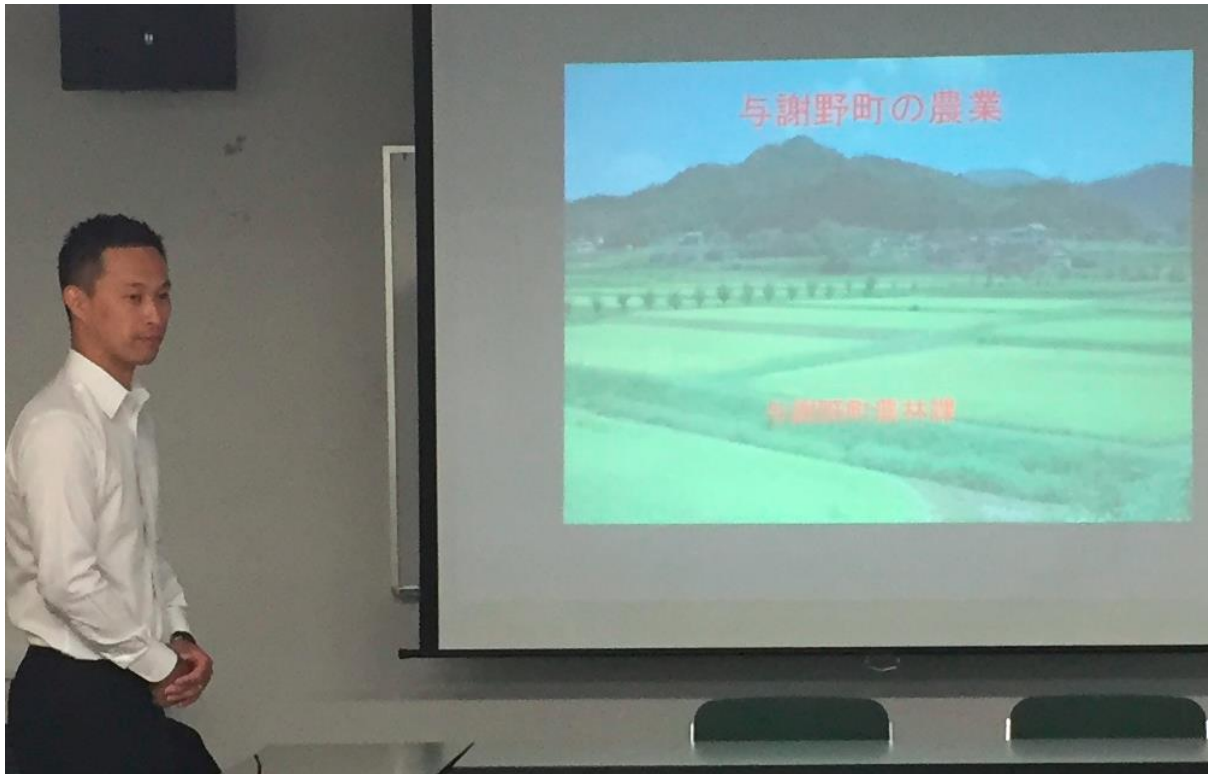
After introducing its *e-kakashi* service during the Visit, PS Solutions led the team to the field station to observe a functioning installation and have the opportunity to talk with farmers experienced in managing its operation.

E-kakashi is a solution that gathers crop growth and environmental information from the fields; cloud analyzes the information, and provides feedback in a user-friendly fashion. Sensors that share weather data, among other things, in real time have already been installed in Colombia, but they do not currently have systems that comprehensively manage analytic applications or diary functions as *e-kakashi* does. We thus expect *e-kakashi* to start attracting attention owing to its ability to manage large volumes of agricultural data.

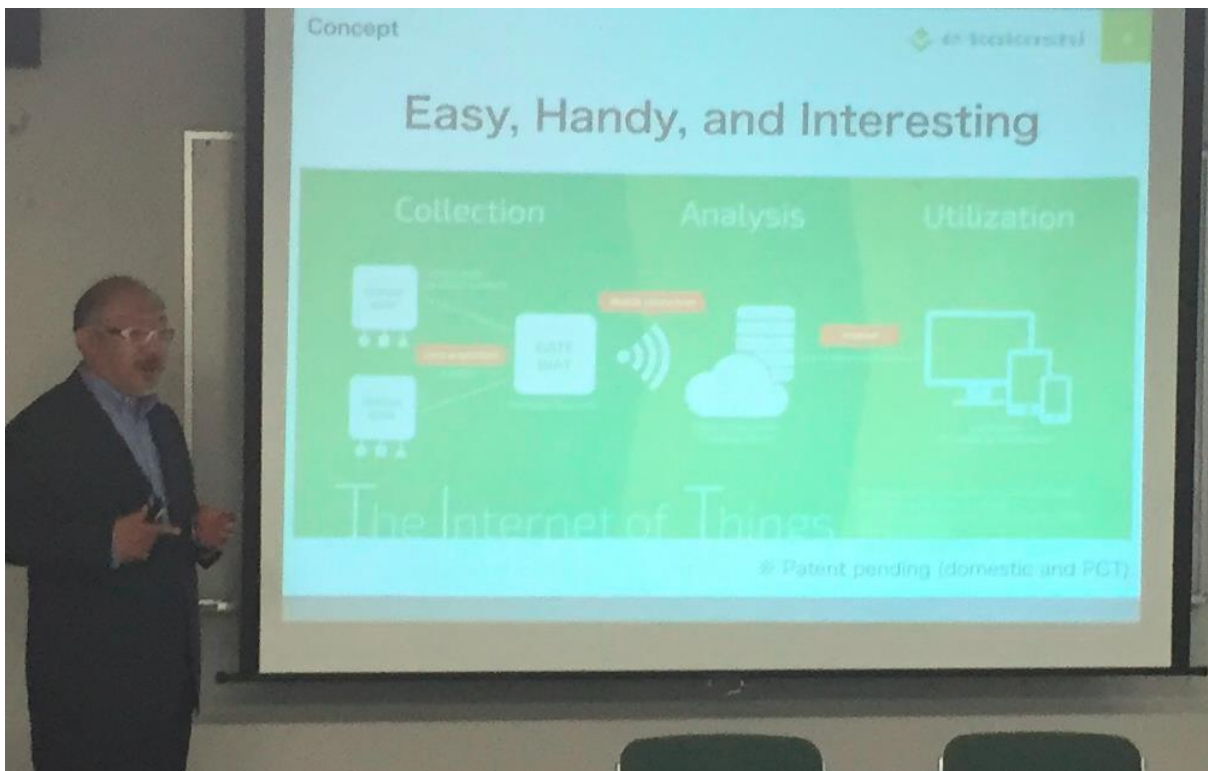
PS Solutions Co., Ltd.: <https://www.pssol.co.jp/>



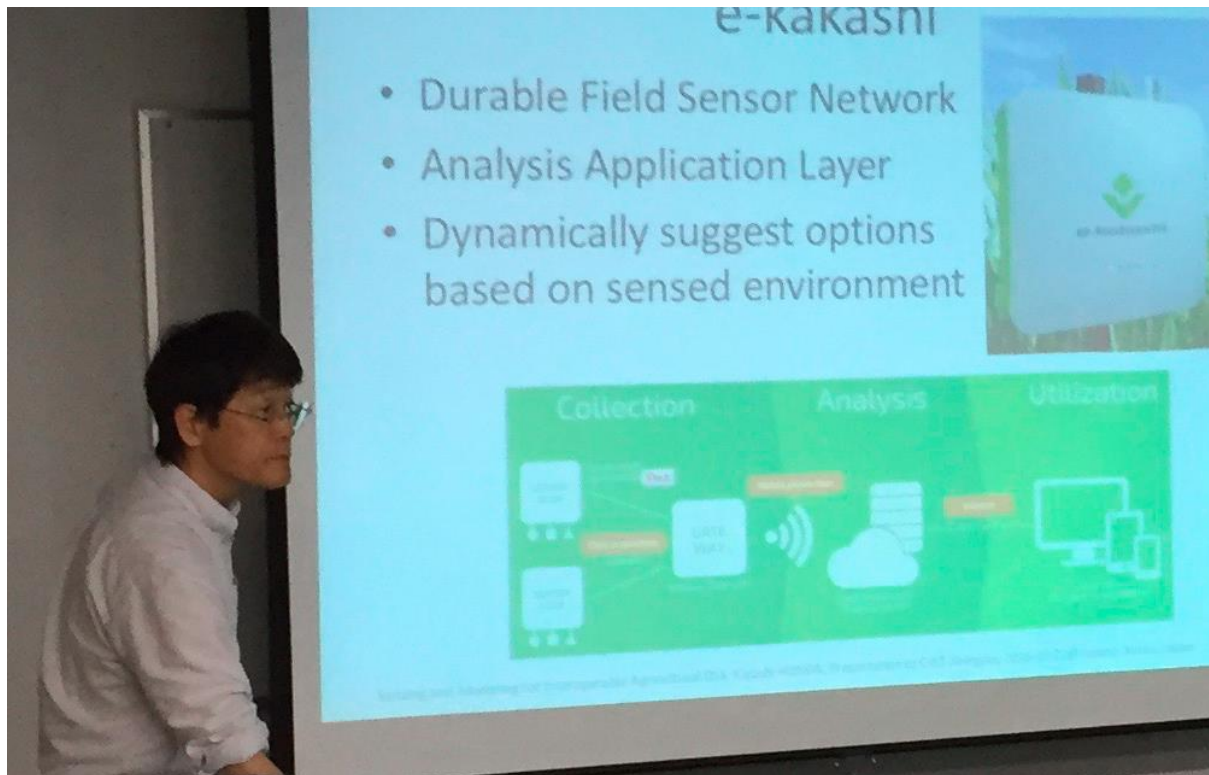
■ Synopsis of the Visit



Toma Yamazoe, mayor of Yosano Town, explaining the set-up used in his town



Norio Yamaguchi, general manager of CPS Division Headquarters at PS Solutions, presenting an outline of *e-kakashi*

Chubu University Professor Kiyoshi Honda describing *e-kakashi* and crop growth simulation

The team inspects *e-kakashi* installed on the town hall



Inspecting *e-kakashi* installed in a greenhouse



Inspecting *e-kakashi* installed in paddy fields



Exchanging information with Yosano's experienced farmers

From right: Ministry of Agriculture and Rural Development's Environmental Management and Climate Change Group Coordinator Nelson Enrique Lozano Castro, FLAR Executive Director Eduardo Graterol Matute, FEDEARROZ Technology Department Deputy Director Myriam Patricia Guzman Garcia, local farmer, FEDEARROZ Ibaguë Branch Office Cultivation Expert Luis Armando Castilla Lozano

* Regarding this international joint research project between the Japanese and Colombian research institutions:

Rice cultivation in Columbia suffers from an inadequate paddy irrigation infrastructure and low utilization of water and fertilizer. Also, inconsistent water depths make it difficult to suppress the growth of weeds, so productivity is declining due to environmental problems caused by the excessive use of herbicides. Furthermore, agriculture has recently been beset by change due to the impact of climate change and trade liberalization, which is increasing the demand for food security and sustainable food production that is internationally competitive.

To resolve these issues, an international joint research project comprising Japanese and Colombian research institutions was launched in 2014 under the auspices of Science and Technology Research Partnership for Sustainable Development (SATREPS; <http://www.jst.go.jp/global/index.html>), which is funded by the Japan Science and Technology Agency (JST) and Japan International Cooperation Agency (JICA). The Project's mission is to create a new rice cultivation system that has higher productivity and lower production costs by applying innovative field management technology to the local environment and disseminating such technology throughout Colombia. The Project also aims to use genetic modification technology to develop new rice varieties with improved root systems that require less water and fertilizer.

■ Visit Summary

Date: May 22, 2016 (Sunday)

Location: Yosano Town, Yosa-Gun, Kyoto

Featured Solution: *e-kakashi* (<https://www.e-kakashi.com/>)

• Each organization's name, logo, and solution names are registered trademarks or brand names of their respective owners.

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