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Asian Monsoon PFS Consortium

## Japanese Industry-academia-government Consortium Announces Development of Plant Factory System for Asian Monsoon Area

- This project promotes informatization and production system innovation of agriculture, forestry, fisheries and food industries

The Asian Monsoon PFS Consortium\* today announced it has achieved the initial goal of its project aiming to develop technologies to produce safe, secure and delicious Japanese fresh vegetables stably and at low prices even in hot and humid regions in the same way as in the temperate areas in Japan, including the main island, by blending core Japanese technologies in agriculture and industry. Since December 2016, the consortium has worked on a project named “Development of plant factory system (PFS) of Asian monsoon model to promote informatization and production system innovation of agriculture, forestry, fisheries and food industries.” The project was adopted as an “R&D model project of the Field for Knowledge Integration and Innovation” promoted by the Bio-oriented Technology Research Advancement Institution. The project, which involves plant factories with solar light, will be completed at the end of March 2021.

Major achievements of the project for plant factory type intelligent greenhouse that can be used in hot and humid environments are as follows:

- 1) Development and verification of plant factory for hot and humid areas and temperature and humidity control technology program
  - Developed and verified a temperature and humidity control technology that can achieve the cultivation of Japanese fresh fruits and vegetables in hot and humid areas all year round by using a cloud-based integrated environmental control system
  - Aiming at the improvement of producers' profitability, verified the technology to formulate a low-cost cultivation system that allows a cultivation facility to be established at a cost of less than 200 million yen per hectare
- 2) Development and verification of materials that reduce the running costs of plant factory type intelligent greenhouse in hot and humid areas
  - Developed a heat shielding film for greenhouses and verified it can maintain the temperature inside the greenhouse 2-3 °C lower than the traditional greenhouse film
- 3) Development and evaluation of cultivation technologies for plant factory type intelligent greenhouse that can be used in hot and humid environments
  - Verified a yield and quality equivalent to temperate areas in Japan (Honshu, Kyushu, etc.)

in cultivating Japanese fruits and vegetables: tomatoes (40 tons/10a, Brix 6); strawberries (4.1 tons/10a, Brix 10); and paprika (10 tons/10a, Brix content 8)

- 4) Development of certification indicators to support the branding of Japan Premium Vegetables and seeding growth chamber to supply high-quality young plants
  - Established a technique to distinguish tomato cultivation method (hydroponic/soil) and a marker display method by scarce elements
  - Developed a seedling growth chamber utilizing the suitable LED lighting that provides high-quality young plants that can stably produce fresh tomatoes even in hot and humid conditions all year round
  
- 5) Development of plant factory management system and agricultural management training system using ICT
  - Achieved growth and harvest prediction based on weather forecasting and established a navigation system for cultivation work (automatic display of to-do lists for cultivation work, etc.)

The Asian monsoon model plant factory system is expected to improve agricultural producers' profitability and help achieve sustainable development goals (SDGs) when it is widely implemented in hot and humid areas not only in Japan where global warming is progressing but also in Southeast Asia and other countries.

Going forward, a new consortium that continues to use the research facility at the Tropical Agriculture Research Front of the Japan International Research Center for Agricultural Sciences will be created. On the assumption of cultivation in tropical and subtropical regions, the new consortium will work on the optimization of environmental control for tomatoes (quality stabilization for increasing marketable fruits) and the optimization of cultivation technologies for strawberries (yield improvement through supplemental lighting with LED) aiming at further developing the Asian monsoon model plant factory system.

In addition, in order to encourage the wide use of the Asian monsoon model plant factory system, the new consortium will promote the broad implementation of the system including a remote cultivation training service in Japan and abroad in cooperation with the Ministry of Agriculture, Forestry and Fisheries of Japan and the relevant embassies. Thereby it will strive to contribute to improving the profitability of producers both in Japan and abroad and achieving the SDGs.

[\*Asian Monsoon PFS Consortium]

The Consortium, whose representative institution is Mitsubishi Chemical Corporation, was established to promote the Asian monsoon model plant factory project. Its members are three public research institutions (National Agriculture and Food Research Organization, Japan International Research Center for Agricultural Sciences, National Institute of Advanced Industrial Science and Technology); four universities (Nagoya University, Osaka University, the University of Tokyo, Hokkaido University); and six private companies (Mitsubishi Chemical Corporation, Panasonic Corporation, FUJIFILM Corporation, Citizen Electronics Co., Ltd., TAKII & Co., Ltd., HORIBA Ltd.).



IT Greenhouse at Ishigaki demonstration site  
(single-span models for the first-stage experiments)



Mist-spray system to control temperature/humidity inside the IT greenhouse

