

Development of a New Method to Predict Crop Yields with High Accuracy by Using a Photosynthetic Model and AI Technology and Start of Demonstration Experiments

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Osaka Gas Co., Ltd.
AEON AGRI CREATE Co., Ltd.

Starting today, Osaka Gas Co., Ltd. (President: Masataka Fujiwara, hereinafter "Osaka Gas") and AEON AGRI CREATE Co., Ltd. (President: Yasuaki Fukunaga, hereinafter "AEON AGRI CREATE") started demonstration experiments at strawberry farms in Chiba and Shimane prefectures by using a new method to predict crop yields with high accuracy developed by Osaka Gas. This method is a predicting method that combines a model that calculates the amount of photosynthesis that affects crop yields (hereinafter "photosynthetic model") and artificial intelligence (hereinafter "AI model"), which contributes to a stable distribution of agricultural products, reduced food loss, etc.

AEON AGRI CREATE sells agricultural products produced at 20 directly managed farms nationwide to Aeon Group companies. When selling strawberries, it is necessary to grasp the shipment volume up to about 10 days in advance in order to carry out planned sales. The person in charge of cultivation at each farm predicts the harvest volume of the entire farm, based on the maturity of strawberries and the weather forecast, and estimates the shipping volume. Yield prediction requires knowledge about growing crops, based on experience and know-how, since the yields are affected by weather, such as temperatures and the amount of sunlight. If there is a difference between the prediction results and the actual yields, additional procurement or stock-out might occur in the case of a shortage, and decreased product prices, waste loss, etc. in the case of a surplus.

Osaka Gas started weather forecasting using its own method in 2008 and since then has promoted the development and use of AI technology in addition to accumulation of weather-related knowledge.

In 2021, the two companies started research aimed at improving the accuracy of strawberry harvest volume predictions and improving the efficiency of harvesting, and this year they started demonstration experiments at strawberry farms in Chiba and Shimane prefectures.

The new method developed by Osaka Gas combines a "photosynthetic model" that calculates the amount of photosynthesis from the amount of sunlight, carbon dioxide (hereinafter "CO₂ ") concentration, humidity, etc. and an "AI model" that predicts the yields from the amount of photosynthesis, tree age, etc. Crop yield prediction using AI has been available for some time, but the new method achieves high predicting accuracy and generalizability by combining the theoretical "photosynthetic model" and the statistical "AI model" properly.

In the demonstration experiment starting from today to around June 2023, the strawberry harvest volume from the next day to 10 days ahead at Kashiwa Farm in Chiba Prefecture and Yasugi Farm in Shimane Prefecture will be predicted. The harvest and shipment based on the prediction results will be used to evaluate the usefulness of the method. The method is also scheduled for further improvement. After the demonstration experiment, the method will be also planned to adapt predicting the yields of other agricultural products such as tomatoes.

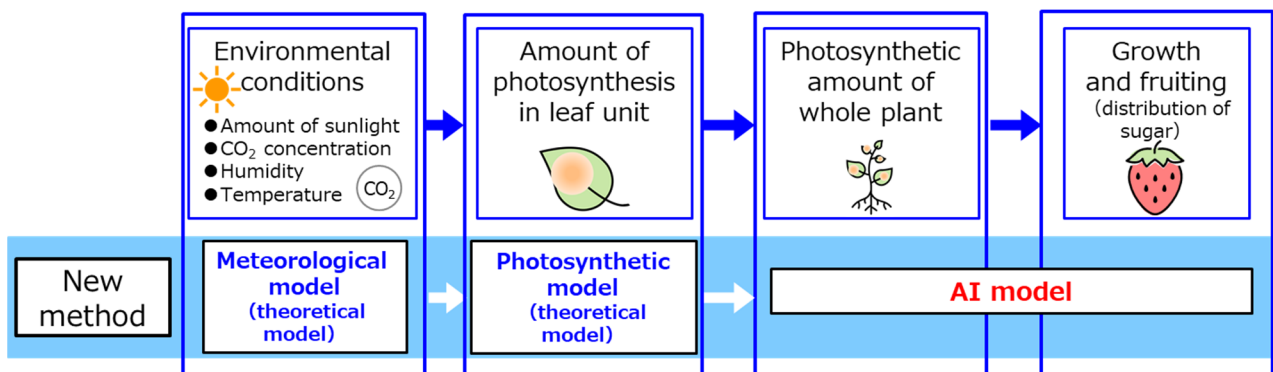
The practical use of the method will facilitate optimized shipment, stabilized distribution, reduced food loss and efficient allocation of workers. In addition, for greenhouse cultivation, the two companies believe that controlling the environment for crop growth, such as the amount of sunlight and CO₂ concentration, based on the growth prediction using the method can contribute to stabilized yields as well as quality.

Furthermore, in the "organic agriculture" promoted by the Ministry of Agriculture, Forestry and Fisheries, the companies believe that the method can contribute to a stabilized price, quality and production volume by predicting the growth situation and help farmers who have "newly entered farming" and have little experience.

Osaka Gas and AEON AGRI CREATE will strive for the sophistication of agriculture by predicting crop yields with high accuracy.

1. Outline of the method

A method combining a "photosynthetic model" that calculates the amount of photosynthesis from the amount of sunlight, CO₂ concentration, humidity, etc. and an "AI model" that predicts the yields from the amount of photosynthesis, tree age, etc.



2. Image of a demonstration experiment

3. Company profiles

[Osaka Gas]

Company name	Osaka Gas Co., Ltd.
Establishment	April 1897
Representative	Masataka Fujiwara, President and Representative Director
Location	4-1-2 Hiranomachi, Chuo-ku, Osaka, Japan
Main business	Production and sale of gas; generation and sale of electricity, etc.

[AEON AGRI CREATE]

Company name	AEON AGRI CREATE Co., Ltd.
Establishment	July 2009
Representative	Yasuaki Fukunaga, President and Representative Director
Location	1-5-1 Nakase, Mihama Ward, Chiba City, Chiba Prefecture
Main business	Production, processing, wholesale and retail of agricultural products