



PHILIPS

Horticulture
LED Solutions

Case study
Osaka Prefecture
University

Osaka, Japan



Philips GreenPower LED production module

Growing indoor crops **cost-efficiently**

“We don’t use any pesticides, so consumers can enjoy good, safe food that is produced locally in city farms”



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Philips GreenPower LED production modules **open up the possibility of lettuce cultivation under artificial lights** in closed-type plant growing facilities.”

Prof. Masakazu Anpo, Fellow (Advisor to President)
and Director R&D Center



Background

The Osaka Prefecture University (OPU) is one of the largest public universities in Japan. OPU actively develops collaborative research projects between academia and industry and contributes the results of its research to society. In 2014, the OPU began an innovative indoor farming project called the R&D Center for the Plant Factory, funded in part by the Japanese Ministry of Agriculture, Forestry, and Fisheries. Growing crops indoors offers many ecological and horticultural advantages. The purpose of the OPU R&D Center for the Plant Factory, according to Director and Professor Masakazu Anpo, is to carry out fundamental research to improve the profitability of the business case and thereby facilitate the widespread implementation of indoor farming. The Center hopes to make a social contribution to the agricultural field by offering a verification model for the collective efforts of corporations, universities, and the government.

The challenge

In a vertical farm, crops are grown in climate-controlled rooms under artificial light, giving growers a great deal of control over growing conditions. Their crops use significantly less water and are not affected by unpredictable weather. The challenge is making the business case – managing the costs so the crops can be sold for a profit. Another challenge for this relatively new industry is that the skills that are needed are not yet commonly available. When the Center began designing their new indoor farming facility they had several goals. They wanted to establish a cutting-edge R&D facility equipped with full artificial lighting. Experience gained through the university’s industry-academia-government collaborations would be used to develop basic technologies to build efficient vertical farms that could produce delicious and safe, fresh vegetables for consumers. The facility would also be used to train competent people to develop and run such facilities.

The solution

The GreenClocks New Generation (GCN) City Farm spans 1,300 m² and grows 5,000 plants at a time. It is equipped with a hybrid eco-energy system combining solar power and LED lighting sources to reduce energy costs. Philips GreenPower LED production modules were chosen because LEDs consume far less power and produce far less heat compared to conventional fluorescent lights. Philips plant specialists and application engineers helped the Center select the right light recipes for cultivating lettuce without daylight. The research labs include two clean room labs, several multi-environment labs, and other cultivation environment simulation rooms. In the simulation rooms, effects such as vent hole positioning, wind direction and velocity, airflow, temperature, humidity, CO₂ concentrations, and artificial lighting on plant growth are being studied. These combined factors create growth recipes for specific crops.

Benefits

Production yields have been increased by 30% through the use of localized air and temperature control.

By operating at night when energy is less expensive in Japan, the Center has reduced its energy costs by over 30%. Professor Anpo says, "Since the farm is like a cleanroom, once the lettuces have been harvested they can be eaten without having to be washed first which is an added benefit for consumers."

"Thanks to the Philips GreenPower LED production module, we have been able to cultivate lettuce favorably. The photosynthesis of lettuce has been sped up by exposing the lettuce to the optimal wavelength of light," says Junichi Yamaguchi, Engineer, General Manager & Sales General Manger, GCN. White lights are included to visualize the crop clearly. "The color of the lettuces under our previous LED lights was deep purple, making it hard to tell what their actual color was. Now the color looks almost the same as it does under natural daylight."

Tipburn issues resulting from hastened growth were also resolved by increasing the calcium content of the growth liquid.



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The LED lamps produce a lot less heat, **which means it costs less to run the air conditioning in the farm”**

Junichi Yamaguchi, General Manager & Sales General Manager, GCN



Facts

Horticulturalist / grower

GreenClocks New-generation (GCN) Corporation at Osaka Prefecture University

Sector

City Farming & Research

Crop

Lettuce

Location

Osaka, Japan

Solution

Philips GreenPower LED production module

Philips LED Horti Partner

CCS

Results

Improve profitability of indoor farming to open the way for efficient large-scale production



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