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Are plant factories the future of agriculture?

Plant factories are attracting widespread attention as innovative technologies are being developed for light-emitting diode (LED) bulbs. Can plant factories compete and coexist with traditional agriculture? In this roundtable discussion, a leading researcher on plant factories and a representative of a manufacturer striving to develop the plant factory business discuss the advantages and disadvantages of the facilities. Jun Chanoki, a senior consultant at 5 Plus 2 Corporation Ltd., served as the facilitator.

Chanoki: Dr. Toyoki Kozai, Professor Emeritus of Chiba University and President of the Plant Factory Association of Japan, and Masatoshi Miyaki, who works in the Solutions Business Promotion Department of Panasonic Corporation Eco Solutions Company, are here to talk about the potential of artificial-light plant factories, which are being promoted as a form of eco-friendly agriculture. First, could you please explain what a plant factory involves?

Dr. Kozai: Basically, it is a closed space in an airtight building or other structure where plants are grown on tiered shelves under artificial light. In the factory, the concentration of CO₂, temperature, humidity, light intensity, light-versus-dark hours, and other conditions are controlled to help the plants grow faster. Plant factories vary in scale from large ones for commercial use to smaller ones for households. Some factories extend over 1,000 to 2,000 m² with 10 to 20 tiers of shelving, while others can fit on a tabletop.

Chanoki: What is the artificial light source?

Dr. Kozai: Until recently, the major light source was fluorescent tubes, partly because they are economical. Now, LED bulbs are commonly used.

Chanoki: Mr. Miyaki, what is Panasonic's interest in the field of plant factories?

Miyaki: The Panasonic Group is developing technologies for plant factories, determining the feasibility of related businesses, and conducting research. We have not yet launched any commercial products in this field, but have been involved in a nearly 30-year project to grow plants using optical technology. LED bulbs are becoming more economical and their wavelength stimulates plant growth more efficiently than fluorescent lights.

Saving resources

Chanoki: Are plant factories really environmentally friendly and sustainable?

Dr. Kozai: The technology for such factories is still being developed, but they are eco-friendly in that no waste is generated in the crop-growing process. Although the definitions of "chemical-free agriculture" differ, plants can be grown without chemicals in these factories. They also do not waste fertilizer. Unfortunately, a lot of resources and energy are required to set up a plant factory, and we need to increase their productivity to offset that.

Chanoki: Do plant factories save water?

Dr. Kozai: When cultivating leafy vegetables, plant factories consume only 1% or less of the water required to grow them in the field, and 2% or less of that required in a greenhouse. Plant factories are therefore receiving a lot of attention in the Middle East and PR China, where water



(L–R) 5 plus 2 Corporation Ltd. Senior Consultant Jun Chanoki, Chiba University Professor Emeritus Dr. Toyoki Kozai, and Panasonic Corporation Eco Solutions Company Adviser Masatoshi Miyaki. Photos courtesy of Yuji Ozeki.

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