

# Plant environment control for production of plant-derived pharmaceuticals in a plant factory

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## Abstract

Plant factories where leafy vegetables are cultivated until harvest in closed systems with artificial lighting were proposed, developed, and implemented in Japan during the 1980s. During the 1990s, the products from these factories received high evaluations by the food service industry, to which they primarily catered. During the 2000s, commercial production of nursery plants of fruits and vegetables was initiated in plant factories. Since the late 2000s, plant factory technology has been introduced worldwide, particularly to Asian countries. Plant factories also provide good cultivation systems for the production of medicinal plants and genetically modified crops for pharmaceutical use. In late 2000s, light-emitting diodes (LEDs) were introduced to plant factories as a more efficient light source. LEDs are expected to reduce the electricity costs of lighting and cooling because they have a higher efficiency of converting electric power to light power and exert lower cooling loads than conventional light sources. To achieve plant production in plant factories, more achievement of plant research is required taking engineering and plant physiological approaches, in areas such as the creation of optimal LED lighting systems, promotion of photosynthesis, control of gene expression, photomorphogenesis, and synthesis of secondary metabolites. This study reviews recent research status and achievements regarding plant production in plant factories with artificial lighting and introduces plant research topics related to plant environment control for production of plant-derived pharmaceuticals.

## Keywords

Functional protein, GM plant, light quality, medicinal plant, secondary metabolites

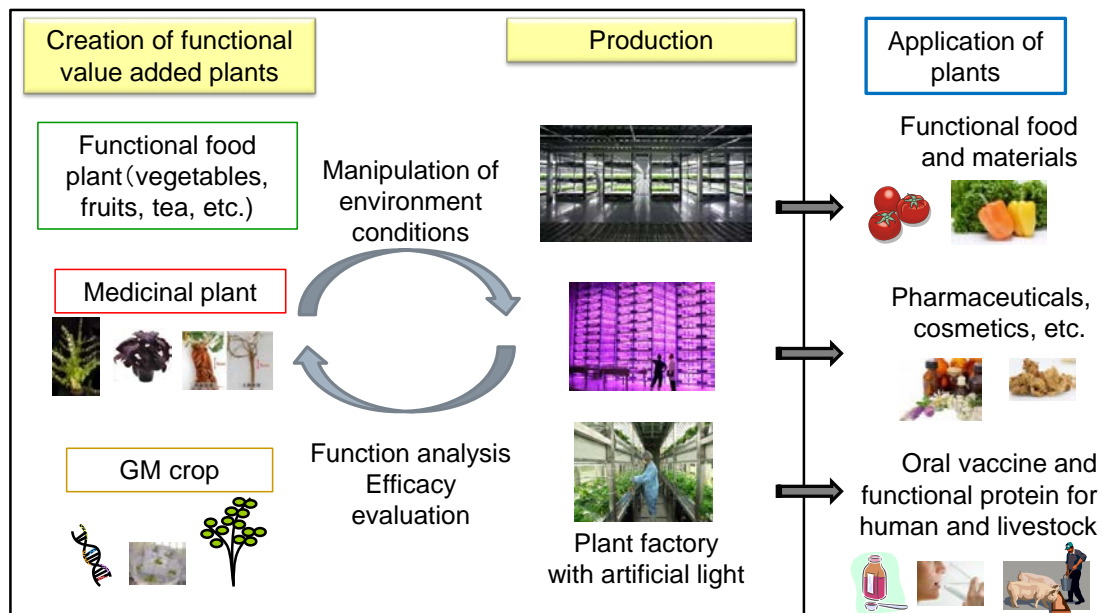


Fig. Creation of high-value added plants and development of production systems.  
Cited from Science Council of Japan, Academic research plan 2017, proposed  
by Chiba University.