



生資院分子生物科技學系推動校級特色實驗室 「植物工廠(LED 節能燈源農業應用)」

LED光源植物工廠

近年來受到全球化的影響，使台灣的農業逐漸走向精緻化的趨勢，植物工廠在未來即為使農業走向精緻化的重要指標，植物工廠兼具了無農藥的殘留、作物的生長不受天候影響與循環式水資源利用等多項好處。全球節能減碳的環保意識逐年被重視，具節能效益的LED照明產業，前景頗被看好，同時也是本校研究重點項目。LED除作為一般照明用途外，也可用為植物栽培光源。考量當前全球人口暴增、全球氣候變遷作物減產、人們願意付出高價格只求食品安全的高需求下，世界各國均積極投入發展植物工廠。本實驗室即是利用人工的方式去建構一個適合植物生長的室內培育環境，以達到植物工廠的幾項基本要求(1)作業標準化；(2)產量最大化；(3)培育品質最大化。植物栽植是利用水耕循環系統，搭配LED燈的方式來種植葉菜類。水耕是以人為方式來調控養液成分並配合循環系統，提供植物生長所需的養分及氧氣。

對於本校發展之重要性

本校位於農業大縣之彰化縣，彰化生產之花卉與蔬果供應全國各地甚至外銷。為了發揚本校關懷在地(彰化)特色及達成「企業夥伴型大學」願景，遂提出「LED節能燈源農業應用實驗

室」之建構計畫。本計劃所規劃之「LED節能燈源農業應用實驗室」，可兼具教學與產學研究功能。預期本校級重點實驗室於教學面，可供本校生資院、工學院及設計學院培育跨領域人才之用；於產學研究面，藉由本「LED節能燈源農業應用實驗室」作為研究發展平台，將可獲取各作物栽培最適化的各項參數、研發養液配方、建立環境控制系統等跨領域的成果。預期相關教學暨研究能量之累積，對於本校整體形象也將有正面提昇的效益。

未來兩大願景

理論結合實務，提升就業競爭力：

藉由本「LED節能燈源農業應用實驗室」模擬植物工廠之運作，提供學生實際參與操作之機會。學生也可學以致用，學習如何將理論用於產業，以提升未來就業的競爭力。

無農藥無污染，生產健康高品質蔬菜：

台灣蔬菜的問題在於「冬季菜土、夏季菜金」及農藥使用過多等問題。植物工廠可解決夏季在台灣產量不足與農藥殘留的問題，這也是植物工廠的潛力所在。

LED Plant Factory in Da-Yeh University

Increasing global population and more intense and extreme weather events pose major difficulties for the future of the human. One potential solution to these increasing challenges is the development of plant factories. A plant factory is a high-tech growth system in which plants are cultivated under artificially controlled conditions. Using modern technology, plant factories can grow high quality vegetables and crops in high density constantly and independently of seasonal variation. Unaffected by the weather, vegetables can grow two to four times faster than in open-air field conditions, and yields can be ten to even twenty times higher. In pursuit of academic and intellectual excellence, Da-Yeh university sponsored the construction of an LED (light-emitting diode)-based plant factory, and currently development of techniques for artificial growth is under way. To optimize plant growth systems, we analyzed the needed artificial environment by controlling the composition of culture solutions; the spectrum and intensity of LED lighting; and the needed temperature, humidity, and carbon dioxide (CO₂) concentration levels. In addition to serving research and education purposes, the LED-based plant factory at Da-Yeh university also provides a homegrown model for future industrial implementation and key techniques for commercial operation.