

## Closed Greenhouse Production Systems for Smart Plant Production in Urban Areas

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**Abstract :** The integration of agricultural production systems into urban areas is a challenge for the coming decades. Because of increasing greenhouse gas emission and rising resource consumption as well as costs in animal husbandry, the dietary habits of people in the 21st century have to focus on herbal foods. Intensive plant cultivation systems in large cities and megacities require a smart coupling of information, material and energy flow with the urban infrastructure in terms of Horticulture 4.0. In recent years, many puzzle pieces have been developed for these closed processes at the Humboldt University. To compile these for an urban plant production, it has to be optimized and networked with urban infrastructure systems. In the field of heat energy production, it was shown that with closed greenhouse technology and patented heat exchange and storage technology energy can be provided for heating and domestic hot water supply in the city. Closed water circuits can be drastically reducing the water requirements of plant production in urban areas. Ion sensitive sensors and new disinfection methods can help keep circulating nutrient solutions in the system for a longer time in urban plant production greenhouses.

**Keywords :** semi closed, greenhouses, urban farming, solar heat collector, closed water cycles, aquaponics

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