

## AFFORDABLE ENERGY SAVINGS WITH NEXT GENERATION SEMI-CLOSED GREENHOUSE

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**A group of greenhouse builders and installers is introducing the Next Generation Semi-Closed Greenhouse, a concept built on technologies developed for the Closed Greenhouse several years ago. This new concept is expected to offer an energy-saving alternative to non illuminated vegetable production in moderate climates.**

The Closed Greenhouse was introduced some ten years ago as an energy-saving alternative to traditional greenhouses. Its results were below expectations, though, and the concept acquired a poor reputation. Nonetheless, a group of greenhouse builders and installers believed that the design still contained useable and affordable elements, and decided to develop the Next Generation Semi-Closed Greenhouse.

A prototype of the greenhouse is realised on a plot of 4,000 m<sup>2</sup> at tomato grower Lans in Rilland (NL). The starting point was to enable that the windows can be kept closed as much as possible in winter by using a dehumidification system, while in summer the same system collects sustainable energy. The first overall results are expected in the spring of 2013.

On behalf of AVAG, the trade association for the Dutch greenhouse construction and installation sector, Bram van der Kooy discussed the concept in more detail, while Wilko Wisse of Lans Tomatoes placed the development into the framework of sustainable horticulture and Feije de Zwart of Wageningen UR Greenhouse Horticulture shared the theoretical backgrounds, based on the preliminary experiences.

### Semi-closed instead of closed

The original Closed Greenhouse offered the possibility of saving 30 percent of energy by heating the greenhouse with a heat pump in winter. The heat pump uses heat from an aquifer, which cools down as a result and therefore needs to be rewarmed in summer. In the original Closed Greenhouse, a small part with a large cooling capacity was dedicated to this job while the larger fraction of the greenhouse remained standard.

In the Next Generation Semi-Closed Greenhouse, one single air conditioning system is used in the greenhouse. This system has a low cooling capacity (around 40 W/m<sup>2</sup>) and a small air circulation capacity of 10 m<sup>3</sup>/(m<sup>2</sup> hours). Nevertheless, this system can collect sufficient heat to regenerate the aquifer in summer. The same system can also be used to dehumidify the greenhouse in winter, preventing the need to open the windows while heating. The smaller cooling capacity in summer and heat demand in winter reduce the required aquifer capacity compared to the old generation of (semi-)closed greenhouses.

### Positive results

Wageningen UR Greenhouse Horticulture and its partners have already performed measurements at tomato grower Lans which indicate that the expected performance is indeed being achieved. The Next Generation Semi-Closed Greenhouse is therefore expected to be a realistic and affordable alternative for greenhouses without artificial lighting, allowing vegetable growers to reduce the primary energy consumption to 20 m<sup>3</sup> of natural gas per m<sup>2</sup> per year.

Partner in this HortiSeminar: AVAG