



By Erik Runkle



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# Sustainable Production Technologies — a Dutch Perspective

I was fortunate to be one of 10 North Americans who participated in “The Sustainability Initiative” in the Netherlands. This pilot program was organized by the Agricultural Counselor’s Office of the Netherlands Embassy in Washington, D.C. We spent five very full days with the Dutch organizers visiting with more than 20 leading horticulture companies, many of which produce greenhouse crops or equipment. One of the goals of the project is to generate discussion on agricultural sustainability and innovation using social media as a communications tool. For more, visit [www.thesustainabilityinitiative.com](http://www.thesustainabilityinitiative.com).

I could probably write a book (well, at least a few chapters) about what I learned during my trip to the Netherlands. Even though I visit there about once a year, this trip was especially full of information and insight about how Dutch companies are addressing sustainability in the production of greenhouse crops (primarily fruit, cut flowers and potted plants). Like here, labor and energy are two large inputs and so it’s not surprising that companies are focused on developing and using technologies that reduce those costs. One should also remember that most Dutch growers produce one or a few crops, enabling them to build and operate greenhouses to optimize production of those crops (Figure 1).

Very briefly, here are some of the major technologies that Dutch companies use to produce greenhouse crops more sustainably:


**Semi-closed greenhouses, in which little air is exchanged with the outside.** During the summer, greenhouse heat is captured by heat pumps and stored in aquifers or giant water tanks above or below ground. That stored energy is then used during cold periods to heat greenhouse air. This enables minimal use of ventilation and thus, air can be enriched with CO<sub>2</sub> to increase plant growth. Semi-closed greenhouses allow for a wider range and more accurate control of climatic factors compared with traditional greenhouses. More importantly, energy costs for heating, and water and pesticide use, can be lower.

**Multiple retractable curtains.** Two or three retractable energy and/or light curtains are commonly used to minimize heat loss from a greenhouse and to provide desirable light intensities to crops below.

**Robotics and mechanization.** Labor costs are high in the Netherlands and so there is an emphasis on using automation in greenhouses. For example, potted plants are often transplanted, watered, spaced, graded and moved with little or no labor.

**Complete recirculation of water and nutrients.** There is a mandate that by 2027 Dutch growers will not be allowed to discharge any water or fertilizer. An increasing number of growers are already achieving this goal, recapturing all water, treating it, and then re-using it within the greenhouse. As water resources become more scarce, sustainable (more efficient) use of water will become more important.

**Combined heat and power (CHP) engines, also called cogeneration.** Many large Dutch greenhouses use engines powered by natural gas to simultaneously produce heat, electricity and CO<sub>2</sub>. Heat is either used immediately or is stored in water tanks; electricity powers lights or is sold to the electrical grid at a reasonable price; and CO<sub>2</sub> is used to increase the concentration of the greenhouse air to increase plant growth. Water is a waste product and even it can be filtered and used on crops.

As we look to the future of greenhouse crops, it’s clear that sustainable production will become increasingly important. Using technology is one way that greenhouse growers can produce crops in a more efficient manner. Some of these sustainable production strategies are already being used in the U.S., and I’m sure more growers will be embracing at least some of these technologies in the future. 

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**Figure 1.** The new growing facility at Ter Laak Orchids in Wateringen in the Netherlands utilizes numerous sustainable production technologies. Here, phalaenopsis orchids are grown above their sorting and shipping area.