

# ClearVue Case Study

## Horticultural Industry - 2015



Food security is one of the 21st Century's major challenges, with the United Nations (UN) introducing food security as one of the 11 Global Thematic Consultations gathering input to shape the post 2015 UN development agenda. To put food security into perspective, TechNavio's report "The Global Greenhouse Horticulture Market 2012-2016" forecasts that the demand for food will increase by 100% by 2025. The primary driver for this change is the rapid growth in middle class incomes in Asia, LATAM and Africa resulting in a significant increase in food consumption.

As countries seek food security solutions, Research & Development (R&D) into the horticultural market has resulted in a massive uplift in crop yields from greenhouses. Forecast compound annual growth rate (CAGR) for the Global Greenhouse Horticulture market is over 10.0% for the period 2012-2016.

ClearVue advanced glazing technology ability to **"turn clear glass into a clean, sustainable energy resource"** has the potential for a major transformation on how we observe glass across many sectors within an economy. The purpose of this case study is to explore the use of ClearVue technology specifically within in the Horticulture market.



Example of a commercial glass greenhouse

### Challenge

- Glass green houses are prone to get very hot and they are difficult to cool.
- The success of a greenhouse is dependent on consistency of temperature.
- Finding an insulation and cooling solution will dramatically improve the economics of a glass greenhouse. In addition, energy can be a very expensive component of the total cost of running a greenhouse.

### Solution

**Incorporating the ClearVue technology into the glass covering of a greenhouse**, because:

- The ClearVue Advanced Glazing Technology provides superior insulation properties to any other glass and many of its existing non-glass peers. This will result in lower amplitude swings in the temperature of a greenhouse due to poor insulation, while allowing the visible natural light in.
- ClearVue Advanced Glazing Technology also produces electricity. The energy requirements of the greenhouse can be powered (or at least in part) from electricity generated from the greenhouse glass.
- By adopting the ClearVue Advanced Glazing Technology, a greenhouse will benefit from a significant cost reduction through better insulation and lower energy costs.

### Technology

- ClearVue Advanced Glazing Technology employs a patented nano technology solution that harvests most of the solar UV and IR energy whilst blocking the thermal heat and letting and the natural visible light through.

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***26% of all food imports into the United States are a horticultural product***

Source: United States Department of Agriculture

# ClearVue to revolutionise the Greenhouse Industry

## Why Greenhouses

Greenhouse food production has become an important source of sustainable food for millions of people around the world. This has been driven by the unique qualities greenhouses present to the production or “life cycle” of a farmers produce. In simple terms:

- The producer – benefits from consistent production (optimization) of produce throughout a year. Control of the environment reduces risk of crop failure and provides assurance to the supply of food to the buyers’ market.
- The environment – benefits from much less land required to produce food, a significant reduction in the amount of pesticides required to cultivate crops and the much less water needed in comparison to traditional farming methods. This is an important consideration given that water security is also a major global concern.
- The consumer – benefits from the healthier and cost-effective food produced.

Perhaps the best illustration of the effective use of greenhouse farming methods is in the Netherlands. Relatively small in geographic terms, the Dutch Horticulture Industry covers some 60 square kilometres of glass and enables the Netherlands to be one of the largest exporters (by value – 4.2 billion euro’s) of fresh vegetables and seeds.

The Netherlands example highlights just what can be achieved from such a small land area. Not surprisingly, Asian countries such as Japan, China and India, where land is at a premium, are exploring greenhouse technologies. This includes relatively new concepts such as vertical farming, where greenhouse gardens are built into large scale vertical (or high rise) buildings, thereby conserving even more valuable lands.

Going forward, greenhouses present a unique opportunity to deliver long-term food security, including healthier food options and long term sustainable farming.

## Business Value Proposition

ClearVue provides a solution to **Heat Insulation**, which is one of the vital elements of a glass greenhouse.

The success of a greenhouse is dependent on the following key attributes: the control over 1) temperature fluctuations; 2) light; 3) humidity; 4) soil aeration; 5) soil moisture and drainage; and 6) fertility levels. Temperature control, the most important element of a greenhouse is dependent on the crop grown and can range greatly from 60°F to 85°F (15°C to 29°C).

Glass is extensively used in Northern hemisphere countries due to its long lifetime, ability to withstand harsh winters and the fact that it is unlikely to be damaged from strong winds, e.g. tearing like a plastic sheet. However, **conventional glass has limited heat insulation** properties, making it unable to maintain a constant temperature within the greenhouse. Maintaining this constant temperature within a greenhouse requires constant monitoring and expensive climate control systems that regulate temperature fluctuations. This requires energy and is an additional cost to the producer.

ClearVue addresses this insulation problem in two ways.

Firstly, ClearVue patented nano technology film provides superior insulation compared to any other glass product on the market. This insulation property protects the internal environment from the external environment i.e. heat or cold weather.

Secondly, as the ClearVue panel generates its own electricity, a portion of the electrical power required for the climate control system can be supplied by the glass of the greenhouse.

From a business perspective, this significantly reduces the installation costs related to climate control due to better insulation and electricity generation.

### Architects Drawing of a ClearVue greenhouse



ClearVue vision is for commercially viable greenhouses within 12-24 months

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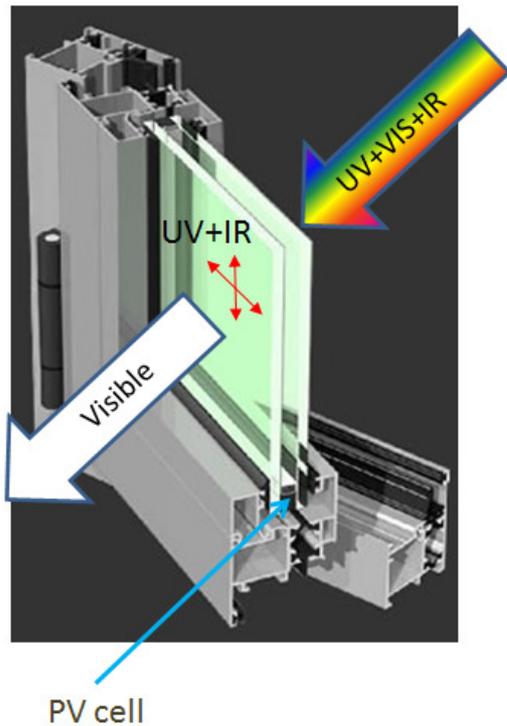
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## ClearVue Technology

Through a patented nano-technology solution, ClearVue advanced glass glazing deflects the ultra-violet and infrared radiations from the sun's energy to the edge of a glass surface where it can be harvested and converted to electricity via solar cells. This is achieved whilst maintaining superior transparency and blocking the heat from transmitting through.

ClearVue has defendable patents worldwide and our research partners are Edith Cowan University in Perth, Western Australian, Gwangju Institute of Science and Technology in South Korea.

Illustration of the ClearVue Technology



ClearVue Advanced Glazing Technology:

- Sitting within the glass sheet of the greenhouse, the ClearVue solution harvest the sun's energy and directs the Ultra Violet (UV) light to a solar cell.
- Micro & Nano particles interact with visible light
- UV radiation is converted to longer wavelengths and scatters Infrared (IR) light to the edges of the windscreen.
- IR is collected by Photovoltaic cells and produces electricity.

# \$218 billion

***The value of the Global Horticulture Industry in 2010. This represents almost 21 percent of global food and animal product trade.***

Source: United States Department of Agriculture



Example of a commercial Green house

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## Market Dynamics – Size of the Horticulture Market is large and growing

The size of the global horticulture market is large.

Over the past decade, growth in global horticultural trade has been substantial. According to the United Nations' ComTrade database, fruit and vegetable trade rose from over \$90 billion (2000) to nearly \$218 billion (2010) (derived from import data) and accounts for almost 21 percent of global food and animal product trade. From a U.S. perspective, fruit and vegetable imports and exports more than doubled in value, reaching \$22.9 billion and \$15.7 billion, respectively, or about 26 percent of U.S. food and agricultural imports and 13 percent of exports.

The opportunity...

Given the size of this market and the issues that this case study has attempted to identify, there is an opportunity to position ClearVue as a significant player in the value chain of horticulture market around the world.

ClearVue delivers:

- Better glass insulation properties
- Ability to generate energy
- Potential for improved environmental outcomes and
- Significant cost savings for commercial and personal use of a greenhouse.

ClearVue will continue the research and development program and seek to go to market in the foreseeable future.



Picture is of a ClearVue window in a standard commercial frame compliant to European and US markets. April 2015

## ClearVue “A new paradigm”

ClearVue Technologies presents a new paradigm on how we will look at and use glass in Agriculture.

The ability to create a new energy resource from a core horticultural material will have a significant impact on the energy efficiency of Agriculture.

The purpose of this case study is to illustrate just one application of the ClearVue technology. As we ramp up our research and development, we see potential in area of agriculture, in addition to other potential industries.

Should you wish to find out more on ClearVue, we would encourage you to contact ClearVue.

## Our Vision

**“We see a world where consumers are part of the energy solution”**

For further information please contact:

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