Andrew Hutchinson - Young Horticulturist of the year 2016

Trip report

Dubai, France, Belgium, Netherlands, Iceland

July – Oct 2018
I would like to thank the sponsors and organisers who helped make the competition possible. The prizes have allowed me to learn a huge amount in a relatively short amount of time. The course at Wageningen has meant I now have contacts around the world – from specialists at WUR to tomato growers in Mexico. The trip was a fantastic opportunity for me to see how horticulture fits into the global picture.

Dubai – July

First stop for the trip was a stopover in Dubai to visit the new Al Dahra BayWa LLC greenhouse which was recently built near the border with Oman. I was accompanied by Mark Stannard who is the Sales director at the Tropical Fruit Company (TFC), the company responsible for selling the tomatoes produced in the new greenhouse.

July is the low season for tourism in Dubai due to the extreme heat. On the way inland towards the greenhouse the temperature outside the car hit 50°C which wasn’t ideal conditions for transplanting new tomato seedlings.

The greenhouse is made up of two 5ha blocks with a separate nursery space to produce its own rootstock and scion material for crop rotation. The greenhouse design is the first of its kind using a 3 layered cooling system. The inner and outer layer are cooled using water evaporation and fans (pad and fan). The middle layer uses a Glycol system which gives another layer of evaporative cooling. The glycol can also be burnt to increase concentrations of CO2 in the greenhouse. The combination of the 3 layers was able to take the outside temperature of 46°C down to 30°C in the greenhouse.

Water is supplied through one of the main pipelines which supplies Dubai city with drinking water. Water is pumped into a reservoir which holds 2 days’ worth or irrigation water for 10ha of fully mature crop. As a backup the site can also be supplied by a desalination system which pumps salt water from the sea. This is not the preferred supply due to the high costs of running the desalination plant. The down side of the pipeline supply is the high Ec due to sodium in the water which comes from aquifers in the desert.

Due to the large amounts of sand being blown onto the roof and venting systems, roof washers are running 365 days a year to keep light transmissi as high as possible. The Labour force for crop work were all sourced from Nepal and housed in on site accommodation.

Following the visit to the greenhouse I visited the TFC packing facility where they were installing packing lines for the new crop. TFC import produce from around the world and sell to local retailers throughout the UAE. The new greenhouse is part of local efforts to become less dependent on imported produce.

After looking at the new biodegradable/recyclable packaging we visited a new supermarket to have a look at the tomato retail space. 90 percent of the produce was imported, with most tomatoes coming from the Netherlands. One of the products that stood out was the 500gm bucket of Candiezz snack tomatoes from the Netherlands. This is a product which could have a big impact on the snacking tomato category in NZ. Currently snacking tomatoes are sold as a premium product in NZ, but products like “value buckets” could change the consumer perception. The Carrefour Hypermarket we visited offered a valet trolley service which let customers do their own shopping instore but was delivered at a time of their choosing.
1. Temperature on the way to greenhouse

2. Newly transplanted crop - separate irrigation system and small slab size for interplanting
3. Recent sand storms effecting shading screens below air vents
4. Outside view of evaporative cooling system
5. TFC imported produce from Peru
6. Packed product from the new greenhouse - October
**Perpignan, France - July**

Valery Goy – Head Grower at Cooperative Sud Roussillon, a 10ha greenhouse in Saint Cyprian. Valery has been growing tomatoes in cocopeat for 20 years in Saint Cyprian, near the border with Spain. His site grows a combination of snacking tomatoes and large loose/truss tomatoes for the French market. As French consumers and supermarkets prefer high taste tomatoes, varieties like Merlice aren’t grown. Their main variety was Siranzo from Rijk Zwaan.

70% of their crop was able to be sold under the zero-pesticide residue label. This is product that has been sent away for MRL testing and has come back free from any residue. The sticker added a 25% premium to the product. They still spray ag-chem when their biological sprays and beneficial insects fail. Following a spray of pesticides, samples are sent until the MRL comes back at zero and they continue to put the sticker on the packaging.

Their returns were being challenged this year with cheap snacking tomatoes from Morocco keeping the retail price at 1 Euro for 250 grams. He estimated there was about 500ha of snacking tomatoes being produced in Morocco. He also was concerned about further snacking tomato expansion on the border of Morocco and Algeria which had the perfect climate and sunlight hours for tomato production. His spray free label allowed him to differentiate his snacking tomatoes against he imported produce from Morocco.

The greenhouse itself was 22 years old and they had no plans in place to replace the structure. Crop cycle ends in late July (mid-summer) and new plants go in mid-August. 5ha are pulled out at a time with 2 weeks in between strip picks. It takes 3 weeks to empty, clean, and replant 5ha so the site is in crop rotation for 5 weeks in total. Virkon is the only steriliser used during the crop rotation.

This summer was the hottest they had seen with highs of 37oC. The misting system allowed them to reduce their temperature by 2oC when temps went above 27oC. For heat in the winter the site ran a cogeneration plant which burnt natural gas to heat the greenhouse, create CO2, and produce electricity. The electricity was sold to local power companies under a 12-year contract. Without cogeneration he estimated it would add an extra 10 Euro per square meter per year to their costs. All greenhouses in France are running with cogeneration - they wouldn’t be able to compete with imported produce without it.

Labour was mainly permanent French locals with back packers from Portugal and Spain during the busier periods. Staff were on a salary which had them working 39 hours in summer and 28 hours in winter. Labour was relatively easy to find due to the high level of unemployment in France and Spain. New staff were started on ground crew (picking, deleafing) and earned 1200 euro per month. High crew had their own areas and had to do flower pruning, clipping, and lowering - earning 1700 euro per month. It took 96 man hours to do all three high crew jobs in 2.5ha.

As a side project Valery was trialling organic onion production under a 3.5ha greenhouse nearby. The onions were planted into the soil which had old cocopeat slabs incorporated into it. On top of the greenhouse the south facing peak had solar panels on top and were supplying electricity to the grid.
7. Moroccan snacking tomato Carrefour- France

8. Zero residue label
9. 4 cherry tomatoes - 1 Euro (~17 Euro/kg)
10. Floor plastic laid prior to first deleafing
11. One way to minimise staff downtime
**Proefcentrum Hoogstraten, Belgium - August**

Proefcentrum is an independent horticulture research station located in the North of Belgium near the Dutch border. I toured the site with Julie Moelants who is the researcher in charge of the tomato variety trials. The site offers a lot of services to growers, breeders, and consultants for tomatoes and strawberries.

The Hoogstraten area is well known for its strawberry production so a lot of the research station is focused on strawberry production both under glass and outdoor production (hydroponic and soil). Clients include grower cooperatives which fund the station to investigate growing techniques, fertiliser management, and variety comparisons. Results for the years trials are published in the annual journal Proeftuinnieuws. The station has several consultants which provide growers with advice based on soil/leaf/NFT results and crop registration/climate data.

The site runs with GEP accreditation or Good Experimental Practice. This is an accreditation in the EU which aims to ensure that high-quality trials are conducted. GEP is concerned with the management of efficacy evaluation trials and with the conditions under which trials should be planned, conducted, assessed, recorded and interpreted so that their results should be comparable and reliable. GEP relates to various aspects: staff qualifications, use of suitable equipment and facilities, protocols, modes of operation, recording of results.

The main reason for my visit was the independent variety trials conducted each growing season (Nov-Oct). Seed companies put their best varieties forward to be trialled against industry standards.
for segments like beefsteak, plum, large truss etc. Varieties which have been trialled and proven to be profitable at Proefcentrum are able to use the Flandria label. Flandria is the quality label for vegetables and fruit that is used by the 5 top auction houses in Belgium. The testing involves measuring several variety characteristics like disease tolerance, yield, fruit size, leaf length, fruit setting, fruit brix, and taste. The Flandria label helps differentiate the Belgian grown tomatoes from cheaper Dutch tomatoes.

The station was trialling different solutions for crazy roots which were affecting some of the greenhouses for the second year. The main treatment that was effective in lab trials was dosing Hydrogen Peroxide, this did not seem to be working in greenhouse trials. Russet mites were a big problem this year due to the warm summer conditions. They were using sulphur pots to reduce the pressure, but some varieties had huge populations established and were going to be pulled out early.

The greenhouses which were coming out early had ethylene tanks which were dosing at 5ppm from 9pm to 9am using a Macview - EMS controller. 5ppm is the max which can applied and can only start 6 weeks before a crop is set to be removed.

The site had between 20-30 staff depending on the time of the year – mainly from Portugal and Romania. The site has recently started evaluating varieties under different LED light recipes to determine which varieties/light wave lengths have the highest yield potential.

The site was having issues with high populations of Macrolophus – a beneficial insect used to control whitefly. Problems occur when the whitefly numbers drop and the Macrolophus have to find an alternative food source. In this case the Macrolophus where feeding on the soft head section of the tomato stems and the young fruit. The fruit continues to grow but is scarred where the Macrolophus has fed. If the numbers feeding on the head are high enough they can de-head the plant which terminates its growth.
13. LED lighting trials
14 Ethylene dosing unit and tank
15. Exposing crazy roots to light
16. Macrolophus damage
17. Digital penetrometer for fruit firmness
Mardenkro, Netherlands – September

Mardenkro produce roof shading products for greenhouses around the world. I visited the manufacturing site in Baarle-Nassau, a town in the south of the Netherlands with Roger de Jagher the Australasian sales representative. He took me through the manufacturing process, research and development lab, and the small trial station they had outside. Light diffuse coatings are their main focus in the lab as the glass industry are starting to compete with their products.

Their latest product is an anti-reflect coating which reduces the amount of light reflected by the glass and allows more to be transmitted through to the crop. The product can only be applied by certified roof coating contractors which have been trained and certified by Madenkro. The trials have shown a 3% increase in light transmission which roughly equates to an increase in 3% production.

18. Blending tanks
20. New product development
Wageningen University and Research, Netherlands – September

Every year Wageningen UR holds a Greenhouse Horticulture summer school at the University campus in Wageningen. The university is one of the highest regarded Greenhouse horticulture universities in the world. I was fortunate enough to attend the 2018 course with my fees funded by the Fruitfed leadership award and the Primary ITO scholarship.

The course is designed for leaders in the greenhouse horticulture industry to take their technical understandings further. My main purpose for attending the course was to develop my technical skills in greenhouse horticulture as a relative new comer to the industry. The course was a great way to network with growers, and industry suppliers from around the world.

The course is run by professors at the university who are arguably the top specialists in their fields. Lecturers included:

- Leo Marcelis – Covered topics including global greenhouse trends, LED lighting, and greenhouse propagation.
- Ep Heuvelink – Covered topics on crop physiology, plant growth analysis, and light and CO2 calculations.
- Cecilia Stanghellini – Radiation, thermal storage, and ventilation.
- Ing Wim Voogt – Nutrition and irrigation.

As well as lectures on campus, the course included site visits around the Westland area which is famous for its greenhouse horticulture.
Looye Kwekers, Tomato producer – Westlands

Looye are best known for producing their Honing Tomaten (Honey Tomato) which are sold as a premium snacking tomato. Their variety ‘Piccolo’ was the best tomato I tasted on the trip which is breed by Gautier in France. The product is a cherry tomato with an average size of 15-gram sold on truss in a 200-gram pack. The marketing behind the product means it is sold at a set price to distributors for the whole year and not effected by price changes in commodity tomatoes. This means that the tomatoes have strict quality guidelines and only high brix fruit (10+) are packed. The tomatoes that don’t make it are sold as commodity cherry tomatoes or processed into their Honey tomato ketchup.

The operation was struggling to control a relatively new pest called Nesidiocoris tenuis – a recent arrival from the Mediterranean. They were trialling a system which used fans on a trolley blowing through the plants as it went down the row and a yellow sticky tape sail moving down the row next to it. Having Nesidiocoris has meant challenges to maintaining their biological control program and a shift towards chemicals which they haven’t had to use in several years.
22. Yellow sticky tape sail
23. Overcast day - Lights on
24. Piccolo Honey Tomatoes on the vine
Koppert Biological Systems – Experience centre

Koppert’s are one of the pioneers for biological controls in the horticulture industry. In the 1960’s, a cucumber grower Jan Koppert set out to find alternatives to chemical controls for spider mite, leading to the discovery of the predatory mite. Once growers started to see the results he started to sell the predatory mites to other growers which was the start of Koppert Biological’s. Koppert’s has since developed biological controls for pests and diseases as well as the mass production of bumblebees for pollination.

They have recently opened their experience centre which takes you through the process of breeding and distributing their biologicals and bumblebees. Their main advice for getting new organisms’ approval by government agencies was to not have any unknowns when presenting your case. Unknown’s were seen as potential risk and government agencies were unlikely to approve. One of the trials was looking at pollination efficiency especially under artificial lighting. As bees use UV light to navigate, once the sun goes down and artificial lights are in use, hives need to be shut to stop them from getting disorientated and not able to make it back to their hive.
25. Experience centre - behind the scenes look at areas usually restricted to staff.
Beekenkamp – Plant propagators in the Westland

Beekenkamp are plant propagators which have been operating since 1951. They produce 2 billion plants per year from 90ha of greenhouse located in 25 countries around the world. The site we visited in the Westland was their newest development which mainly provided plants to greenhouse growers in the surrounding area.

The water treatment systems were new products which used a combination of hydrogen peroxide oxidation and microfilters to sterilise their return drain water (https://www.wateriq.nl/opticlear-diamond/). Due to high risk of disease they had installed a cleaning station for staff and visitors which they must pass through before entering the site. The site was part of the Rainlevelr group in the Westlands. The group is made up of greenhouse growers that help reduce flooding by draining their irrigation ponds prior to large rain fall events. There are enough growers involved that they can store large enough volumes of water during high rainfall events which minimises the flooding of the surrounding canals.
27. Cleaning stations for staff and visitor entry – Virkon foot bath and brush – alcohol spray for hands
Wageningen Research Station

Wageningen UR do several commercial trials for companies which want independent verification. This is carried out at their research station strategically located amongst the commercial growers in the Westlands. The site is funded by some of the large commercial growers and horticultural product suppliers. Trials included:

- Hands free greenhouse. Teams from around the world were given their own greenhouse compartment to produce a crop of Cucumbers. They were only able to enter the greenhouse in the first week of planting to install sensors of their choosing. From then on, the crop had to be produced remotely using only their sensors to guide them. The teams are being marked not only on their production but also how efficiently they turn resources into produce. Microsoft was one of the teams involved, and they stated that they see growing sensors and AI as a part of their future business strategy.

- LED lighting recipes. Lighting companies are now funding large projects to determine the highest yielding light recipes from their LED lights. This is because unlike High pressure lamps, LED are able to emit different wave lengths of light which have different effects on crop growth. They were mapping out recipes which changed throughout the crop lifecycle giving different light wave lengths during different physiological stages.

- Plant phenotyping. Due to the large number of crosses the breeding houses have to do to develop new varieties, Wageningen was using Artificial intelligence and cameras to screen thousands of plants for certain traits in a very short amount of time. This is all in an effort to reduce the large investment costs associated with developing new varieties.

28. Orchids under different LED light recipes.
29. Trial to extend cucumber crop cycle - encouraging roots to form mid stem.
Tomato breeding demo houses – De Ruiter, Syngenta, and Rijk Zwaan

A part of my role at T&G covered crops is looking after new tomato variety trials in the greenhouse. A large number of tomato breeding companies have demo houses for growers to visit in the Westlands area. The demo houses are designed to look at new varieties and compare them against established varieties grown under the same conditions.

Syngenta sales rep, Frank van Antwerpen ran discussion groups with Syngenta variety growers in the Westlands area. The majority of his growers did not see each other as competition, but instead used each other as sounding boards for discussing a number of growing topics. Every two weeks Frank organised the group to meet at one of the grower’s properties. There they would take a crop walk and discuss a summary of each other’s crop registration data. This reminded me of the work Dairy NZ does with farmers in New Zealand. Obviously, this is not as simple for NZ tomato growers with the strict anti-competitive regulations here.

Following the visit to the Rijk Zwaan demo house I was able to visit one of their commercial growers in De Lier. His crop had been inundated with Nesidiocoris tenuis which he had to spray agchem for. This reduced his biological control populations allowing Tuta absoluta to establish and severely impact his yields. He had been a grower for 30 years and this was the first year he had considered selling the business as he was no longer thinking about growing and more concerned with how to kill bugs.
31. Medley pack
PRIVA

Priva started out in De Lier, Netherlands where they developed climate control and process management systems for the greenhouse horticulture industry. They are now a global company which provides solutions for commercial building automation, water sterilisation, and full greenhouse management systems. During my visit to their headquarters in De Lier I was shown their latest water sterilisation systems and crop management software by André de Raadt and Jan Vos.

FS Performance is their latest management information system which covers most aspects of producing a greenhouse crop. The system is designed to offer a total package which covers everything from labour tracking, crop registration, production forecasting and quality inspections.

The Vialux M-line UV water sterilisation system was on demonstration in their workshop. The M-line system applies UV-C light to crop drain water which sterilises it by breaking down substances and damaging the DNA of any organisms in the water. The new setup allows an add on system (E-Line) which strips the water of any residual plant protection products which may create MRL issues or damage susceptible crops if the water is recycled to other greenhouses.

World Horti Centre

The World Horti Centre located in the Westlands is an ‘innovation centre’ designed as a place for education, research, and product presentation services to people interested in the greenhouse industry. The centre is split into three sections:

A permanent trade show of product and service providers to the greenhouse industry. Companies like Cultilene, Hoogendoorn, Svensson, and HortiLux all have stands here demonstrating their products and services. This is due to huge number of visitors from around the world who come to the Netherlands to do business and see the latest developments in the greenhouse industry.

Research facilities which study the fields of climate control, watering and sterilisation, lighting/shading, crop protection, crop systems, fertilizers and new varieties. The facilities are designed to provide a service to companies that want to investigate new technology in an
independent setting. Companies were using the research centre to verify new products and services before releasing to the market.

The education centre is designed to attract international students to come and study the latest greenhouse production systems and techniques. The program is run in collaboration with the research centre and several of the companies running stalls in the trade show. The site is also used by three local universities offering post-secondary education, as well as degrees and practical postgraduate research scholarships.
33. Trade show stalls
Iceland

My final stop before returning to NZ was the Fridheimar greenhouse in Reykholt, Iceland. Fridheimar is a family run business which offers greenhouse tours, Icelandic horse-riding demonstrations, and a restaurant. I was taken around the site by the head grower Ewa and owner Helena. The business started as purely a greenhouse operation. Now the greenhouse tomatoes only account for 30% of their income – the other 70% is generated from greenhouse and horse tours and their restaurant situated inside one of the greenhouses. This was mainly due to the booming tourism industry which has been steadily increasing every year.

The tomatoes they produce are only sold on the domestic market. 70% of Iceland’s tomatoes come from local producers of which they supply 20%. As they are competing with Dutch and Spanish imports, they have to offer a point of difference from the cheaper imported produce. This higher cost is due to the shortened day length in winter and extreme climate associated with being so close to the artik circle. Varieties are selected to taste better than imports and picked at a much redder colour than the green-picked imports. They also use ‘locally produced’ stickers to help consumers differentiate from imports.

The total area of the greenhouse is .5ha which is all under artificial lighting. This was setup with the help of tomato growers in Finland – the worlds greenhouse lighting specialists. The soil substrate was a blend of turf and moss sourced from a forest in Finland. The heating was supplied from geothermically heated hot water. This hot water was shared with the surrounding village which meant in the middle of winter they often ran much cooler temperatures than they would like. CO2 from geothermal vents was collected and supplied to the greenhouse in compressed tanks.
The greenhouse had a lighting technician working for them who was developing a neon interlighting system which was the first of its kind. The first prototype had shown an increase in yield of 20%. The crop was interplanted after 40 weeks of production with a full crop removal done every 3 years. Ewa was always happy to have whitefly in their greenhouse as it meant the Macrolophus had something to eat other than their plants.

In 2017 the greenhouse had 160,000 visitors to their restaurant. This has meant areas of their greenhouse had to be converted into a larger dining area and kitchen. The greenhouse imports bumble bees for pollination from Holland - except in the middle of the winter. This is due to the low levels of UV light for the bumblebees to navigate due to short day length.
35. Picking race cart
36. Interplanted crop
Neon interlighting trial
38. Table in the vines