



European Tour of Learning
Report for growers and the wider industry
February 2025

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Introduction

Vegetables NZ and TomatoesNZ organised a combined trip for 5 board members or their representatives and the GM of TNZ to visit Fruit Logistica in Berlin February 2025. While in Europe, the opportunity was taken for the group to take part in a series of meetings across the Netherlands. The brief was:

The New Zealand Greenhouse industry is facing a critical time with aging infrastructure needing to be replaced (80% of GHs are 20+ years old) and a number of issues facing the industry. As such there were 2 key questions and several areas to investigate:

1. What technology, techniques and cultivars were available to ensure the economic life of the existing glasshouse stock could be fully utilized. Survival in other words.
2. What was the latest and best available technology that should be considered in a new greenfield development.

Specific technology and questions that were explored (top of mind) included:

- ToBRFV avoidance, hygiene, management and resistant varieties
- Automation, robotics and mechatronics
- Energy: saving, alternatives, management and practices.
- Labour management, efficiency and saving.
- Water quality technology and management
- New build technology
- Crop vaccines
- Beneficial and crop protection

Please note: the views expressed in this report are subjective. The aim is to provide learnings from the trip but it's always advisable to do your own research, especially before making financial commitments.

The team:



Simon Watson, Managing Director of NZ Hothouse, Auckland (19 hectares of tomatoes and cucumbers) and Vice Chair of TNZ



Chris Cowie, Head Grower at T&G Reparoa (24 hectares of tomatoes over 4 sites)



Liam Griffin, Glasshouse Manager at Southern Paprika, Auckland (26 hectares of capsicums and 6000m² of snack cucumbers)



Rob Lindsay, Managing Director of Island Horticulture, Christchurch (1.6 hectares of cucumbers) and VNZI board member



Mike Saklani, Managing Director of WingShing Farms, Auckland (1.2 hectares of tomatoes and cucumbers) and TNZ board member



Dinah Cohen, GM of TomatoesNZ, representing 140 commercial tomato growers throughout NZ

Seed companies / ToBRFV resistance:

Key points

- **Trial ToBRFV seeds now so you have a plan of what works**
- **Step up your hygiene measures across your operation**
- **In the next few years, non-resistant seeds are likely to go out of production**

Resistance to ToBRFV is something that all seed producers are talking about. Growers need to keep in mind that there is no standard for measuring resistance and seed companies don't generally pay for independent resistance testing as paying for a report immediately makes the independence questionable. All a grower can do is ask questions about what generation the resistance is up to (the higher the generation, the better) and ask if the pathogen is killed in the plant or is just subdued by the resistance (the first is preferable). Resistance normally takes around 7 years to breed fully and most seed companies are only 4-5 years into the process. Another point to keep in mind is that once it is present in a regio/country, this is the only insurance policy a grower has for ToBRFV, so it is a good idea to trial seed varieties now so you know what to use in the event of ToBRFV coming to NZ or because in the next few years, requests for non-resistant varieties might get so low that seed companies stop manufacturing them.

1 supplier suggested that officially 89 growers have been confirmed as having ToBRFV in the Netherlands but there is a feeling that many more growers didn't report cases when it became a quarantined pest.

De Ruiter Experience Centre – 100% of the seeds being produced are 'IR' (intermediate resistance), they are cautious about making claims around resistance but say there are hardly any symptoms and less than 10% loss of yield.

The rootstock has no impact on resistance of the plant, as the virus is mostly spread by people / mechanically. They can provide resistant rootstock though if a grower specifically asks for it.

Other resistance: They claim their varieties are resistant to TY which is an infection from whitefly and are mostly resistant to powdery mildew but botrytis is still an issue. Better hygiene measures help to decrease all disease and virus pressures.

They have fewer ToBRFV resistant cherry varieties as these were prone to cracking so are still being worked on.

Estimate that 85-90% of seeds currently sold are resistant and they see phasing out of non-resistant seed lines in the next 1-2 years.

Enza Zaden over 40 varieties of resistant seed and a belief that they've sorted out yield issues. They claim to have the highest 'high resistance' possible whereby the plant doesn't just block the virus but actually fights it over time.

4,000 hectares of resistant varieties being grown across the world and most customers are happy with what they're producing

When demand supports, non-resistant seeds will no longer be available.

Growers should take this time to trial resistant varieties as these will be an insurance policy when the virus arrives.

Enza claim the Tomagino Seram cherry tomato variety doesn't crack.

Saint Anna produces the same number of clusters as Tomagino Seram but with slightly higher weight so the kilos/hectare are improved from the non-resistant variety

They have heirloom resistant varieties available

They believe they are breeding stronger varieties in general that will require fewer pesticides.

Rijk Zwaan – A RZ salesperson was with the grower in Jordan when he spotted the signs of ToBRFV and sent in the samples for testing, meaning they've been working on breeding resistant strains from very early. Their resistant varieties are all from 2 resistant genes. The rootstock doesn't need to be resistant because any virus spreading through the plant is killed. Some of their varieties (e.g. 72Mi which they claim is also resistant to powdery mildew, large loose or truss) can be between 80-90kg in NL. They don't have a Campari sized cherry. Smaller cherries, Anizalla produces around 40kg/hectare in NL. They think around 65:35 currently sold as resistant:non resistant varieties. They don't have plans to stop producing the non-resistant varieties but they are realistic that there might not be a market for them in the future.

Axia have 40 varieties available that are all resistant and another 20 varieties are currently being trialed. They claim there is resistance in both parents and they are 'several generations' into the breeding programme. Their resistance is 'high' and symptoms of ToBRFV are less. Weaker plants show more symptoms. They claim there are 800 hectares of 'Macixie XR' being grown at the moment in the Netherlands with 70kg/m² yield. In 2024 75% of total seeds were resistant.

BASF – Their varieties have 'decent' resistance. There are around 180 hectares of Vitalon being grown globally (Europe, Japan, China, USA). It's been commercial since 2022. Local seed supplier is Paula at Lefroy Valley.

PepMV vaccine

Enza is a clean site so doesn't use a vaccine. While PepMV won't kill your crop, ToBRFV will. ToBRFV is 4 times more infectious than PepMV.

Valto is a company steeped in the horticulture industry having helped to set up Axia seed company. Their products are registered for use in over 34 countries and 70% of Dutch growers use the Valto vaccine. The products are not chemical based and help prevent crop damage with a cross protection mild strain 'vaccine'.

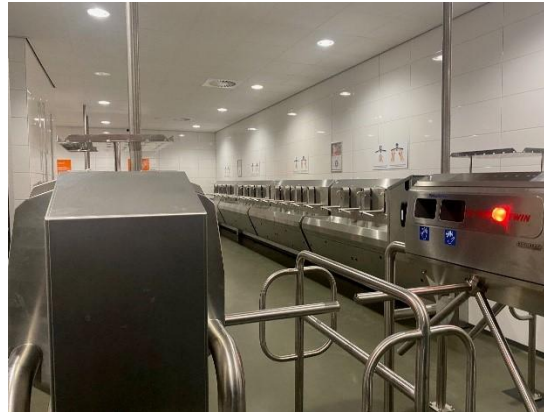
PepMV and PVX are part of the same family. PepMV works by going down to the roots first before spreading throughout the whole plant within 25 days.

The V5 product (which is for the CH2 strain) can be applied by hand (glove or sponge) or spraying but they believe that manual application allows the plants to be inoculated faster. 1 grower we met says that manual application takes experienced employees 10 hours per hectare to apply. Only 1 leaf per plant needs to have the application – choose a leaf that will remain on the plant for at least 3 weeks. If spraying, it can take 7 weeks for the plant to be

fully inoculated. Symptoms of PepMV start to show around 17 days after applying the vaccine but starts to grow through these symptoms quickly (exact timing depends on the time of year/GH conditions).

Axia have found that HR plants struggle more when vaccinated and it takes them longer to grow through the PepMV virus symptoms.

Hygiene



Timed washing, drying station



Virkon at the end of each row



Employee uniforms at the end of the working day
Cotton overalls, rubber shoes, hairnets, disposable gloves for all visitors



Along with ToBRFV resistant seeds, the other insurance policy for growers is stepping up hygiene protocols. Generally speaking growers in Europe don't allow anyone onto their properties that isn't directly involved with growing their crops. Truck drivers don't leave their vehicles.

Washing stations were in all seed company GHs and the packhouse we visited. These couldn't be easily bypassed and were mostly automated so that the washing was for a specific length of time. Phones were either not allowed or needed to be bagged, disposable gloves were common place as was cleaning fluid / sanitiser at the end of crop rows. One place put glasses through a UV sanitiser.

Rijk Zwan have Royal Brinkman installed timed wash stations. Cotton overalls and rubber shoes means no more disposable PPE. All reuseable covers are washed according to Royal Brinkman guidelines for detergent and temperatures.

Roam Technology – Huwan San received an emergency permit for use in Australia. This product and the newer Virba San (which doesn't contain silver) are ecological disinfections. Similar use to Virkon but not as corrosive. Huwan San is used for cleaning / disinfecting

irrigations systems and all surfaces (glass concrete plastic metal). It's made up of H2O2 and silver with the positive charge in silver reacting against the negative charge of bacteria. Used for an initial cleaning and then for maintaining that cleanliness. Silver works better with resistant or mutated viruses by paralysing the stress reaction of a virus.

Allegedly 5 growers known to the salesperson have eradicated ToBRFV using Huwan San. It also works with fungal diseases and other mosaic viruses.

Huwan San and Virba San are registered for use in NZ.

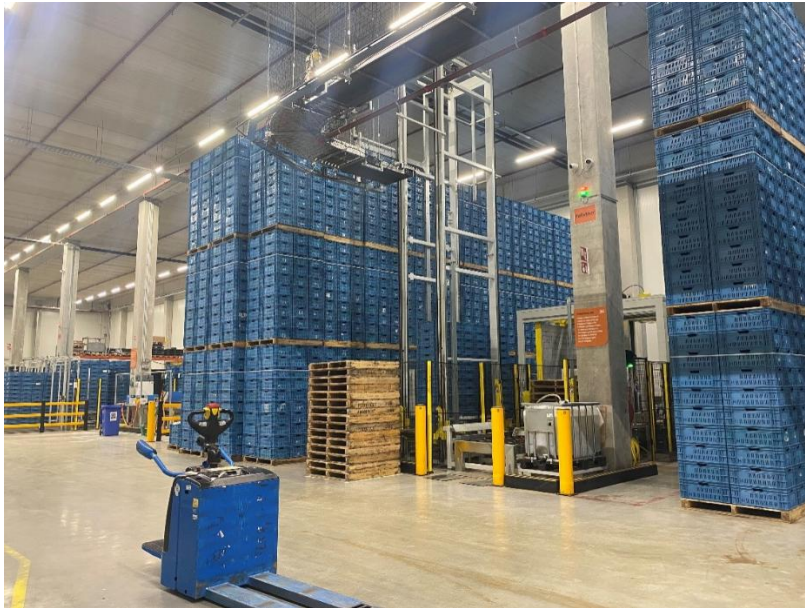
Enza Zaden have a subsidised café to restrict the food coming onsite

Infected plant material - This is either burned, bagged and sent to landfill or sent to deep burial. One grower said that when plant material is in contact with burnt lime, it neutralises the infection so they add bags of burnt lime to waste plant material.

Crates



Growers United Packhouse This packhouse handles around 265m kilos of tomatoes a year. They also handle capsicums and cucumbers (45m kg capsicums, 170m cucumbers in 2024). They aren't a wholesaler, as the produce remains the property of the grower even as it moves through the communal packhouse. Prior to this packhouse opening in 2020, most growers packed their own tomatoes but this was seen to be inefficient and the communal packhouse offered opportunities for speed and cost savings. It operates 22 hours per day with around 650 people at peak season.



Inhouse they use crates from EPS which are cleaned in chlorine and hydrogen peroxide but these are only for use packhouse to retailer and return, so no contact with the growers and their GHs.

Some growers have contracts with crate companies which mean they only receive brand new crates, other growers including all imported product, arrives in cardboard boxes which then go for recycling. 70% of growers in the NL send their crops directly to the retailers in cardboard boxes. What isn't handled as above goes from the grower to the packhouse in open loop blue crates

There is a full track and trace system in place for all crates from the grower to the retailer.

Growers' experiences

Wim Peters – they don't have ToBRFV and don't grow with any resistant varieties. They would rather take the risk with 32 hectares of tomatoes than compromise taste / quality and yield with resistant varieties. Instead they keep hygiene protocols at the highest level to continue to keep ToBRFV out of the property. This includes:

- no one going into the GHs that isn't there to work the crops
- dipping tools and gloved hands in milk after each row
- uniforms that stay onsite including shoes
- washing stations that can't be bypassed for employees going into the GHs
- Workers assigned to compartments and only mixing in 'common areas' like the lunchroom.
- Trucks are disinfected coming on site to collect tomatoes
- crates are closed loop and disinfected and kept out of the GH
- There is a one way packhouse system in operation and all transportation is disinfected and truck drivers wear PPE.

Words of advice: Don't trust crates going to other businesses.

Their GHs were rebuilt brand new in 2017 at a height of 7m to improve air circulation. Heated with gas although they know that isn't sustainable long term. Trialling an area of 800m² with no gas, reusing heat and capturing CO₂ from the air.

Hoogstod – They use mostly resistant varieties and maintain good hygiene practices. Plastic crates are for internal use only (closed loop) and they disinfect them themselves with a chlorine based product. Pallets – they try to minimise what comes into contact with them but they also decontaminate these and trucks with Vilocit (2%). This is a carcinogenic product so can't be used on anything that has direct contact with tomatoes. For packing products from other growers, crates are in a separate closed loop system and also disinfected.

Workers wear colour coded uniforms and are in separate zones each day. They use Virkon for tools and gloved hands which are dipped after every row. Workers also have disposable sleeves.

Hygiene at the start of each crop is crucial otherwise the crop could fail.

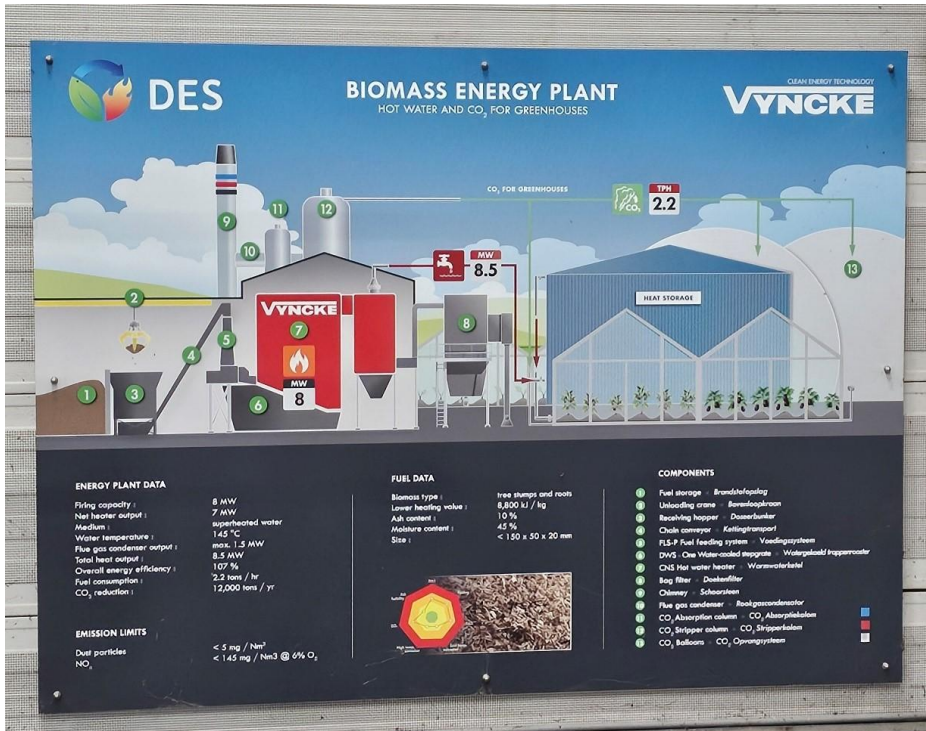
Air vents are netted to reduce pests which also helps reduce the spread of infection from one GH to another.

Belgium grower – 100% HR varieties grown. Have been involved in trials and then fully growing for 2 years. Yield and taste 'are still not there but when you've had ToBRFV you have to make the compromise'. Use crates in the open pool system. Deal directly with Lidl for 70% of their production which can go anywhere in Europe.

Energy – the hybrid approach

The Dutch government offers an insurance scheme, whereby if someone drills to access geothermal heat and doesn't find any, the Dutch government will pay out. This scheme now rarely pays out as there are so many geothermal bores that the area is well explored. At times, Dutch growers produce 8% of the total electricity for the whole country and energy management can be more profitable than selling tomatoes due to being able to sell energy back to the energy companies when there's a supply shortage and they get paid to turn lights or boilers on (and store heat) when there's an over-supply.

Co-location with sewage treatment plant – this was mentioned in the NL when the treatment of sewage uses water taken from rivers. The treatment process increases the temperature of the water which can be used for heating e.g. a greenhouse which allows the water to then be returned to the river at the temperature it was taken out.



Smaller growers like Marc Groenewegen and his 2 neighbours share a hybrid system for energy known as DES; Gas boiler, biomass boiler (8.8 MegaWatts) and heat pump. They also share buffer tanks for storing heat and balloons for storing CO₂, each balloon stores 8000kg (important in the summer months when less heat is required, see photo below of balloons). There is a growers' collective using software to advise which heat system to turn on/off to make best use of pricing and economic gains.

They also collectively store 20,000 cubic metres of water.

The biomass boiler takes tree and plant trimmings from 20 different companies, with wood blending to maximise the output. In winter they can burn 5 truck loads per day. The biomass boiler can burn fuel with a 45% moisture content.



Thanks to Dutch government subsidies, Green Gas has implemented a machine that takes 99% of CO₂ out of flue gas using a food safe and biodegradable solvent (Galoxocol). When cool, it absorbs CO₂ from the cleaned flue gas, and when heated CO₂ molecules detach from the solvent and are stored in large balloons ready to be used in the greenhouse (see photo below of storage balloons). The fire in the biomass boiler operates 24/7 apart from 2 weeks of shut down for maintenance which they schedule over the summer.

The biomass boiler was roughly €8m (Euros) but the environment filters which need changing every 5 years are almost as expensive.



Green V – generally, NL GHs run their pipes colder to those in NZ due to double screens being common, the age of the GHs etc. NZ GHs also use some of their heating to dehumidify or dry the air when a dehumidifier would work more effectively and economically than heating and opening the vents. NL growers often use underground storage for keeping hot water in layers of sand which is then used with a heat pump. Off the shelf heat pumps aren't always the best solution for GHs. Waste heat from industrial companies is an option although the capsicum grower (see below 'Agriport') that we saw (situated near data centres) said that they weren't using as much waste heat as they had imagined.

Agriport operate a 6 year old and a 3 year old greenhouse totalling 22 hectares of capsicums but with plans to double the size in the next 12 months. They have a hybrid energy system and belong to a grower cooperative.

Central to their system is a large hot water buffer tank, which can be heated from multiple sources; geothermal, electrode boiler, natural gas engines (CHP), and a gas boiler.

Hot water from 6 geothermal wells drilled 2.5-3km deep is pumped through heat exchangers with the excess heat going back into the ground.

They generate electricity via 3,500 solar panels and 2 x 3.6MW CHP units, large 16 cylinder engines that run on natural gas, with heat and CO₂ generated as a by-product. There is a back up diesel generator which is used for onsite demand only in the event of a grid failure.

When there is surplus electricity available on the grid, the 10MW electrode boiler is automatically activated. They also clean CO₂ from a 10MW wood burning boiler

Lastly, they have an old gas boiler which is used as a back up if the outside temperature falls below -10 degrees, which it does for 2-3 weeks per year.

Their rainwater reservoirs are connected to neighbouring data centres where the water is used for cooling their systems, this produces some warm water (30 degrees) but is not used in the GH heating system.

Also, of interest was the 16mm thick polycarbonate side walls on the glasshouses, giving 65% light transmission, and good energy savings.

The grower is a member of a cooperative with a shared ringline for electricity, and CO₂. This gives the members assured access to electricity and CO₂ in the event their own equipment needs servicing or breaks down.

Syn Group - Syn gas is used to heat water and has a high density of CO₂. It would be a good idea to visit a grower using this type of heating – Katunga Fresh in Victoria is one example (although they have ToBRFV so not a good idea), there is also a herb grower between Victoria and SA who are a smaller syn gas operation.

Syn gas – versus – biomass. Syn gas furnaces can take more varied inputs such as straw or plant material and is a cheaper technology to set up than biomass.

Rainbow Bee Eater developed the tech and Ultimal Group is the commercial business behind Syn Group.



Geothermal heating and storage

Geo Scientific Research Centre – Visit to BTB Energy and research

This is a project between GFZ Helmholtz centre for geosciences and BTB Gmbh energy company to investigate the potential for storing thermal energy in an aquifer and extracting it when demand is high. The project has drilled an exploratory well to ascertain the likely aquifers that may be used for heat storage. The next steps involve drilling two more active wells; one for cool water and the other for warm water, while building and then commissioning the plant.

The GFZ Helmholtz Centre for Geosciences is Germany's national centre for research into the solid Earth, performing a similar function to GNS in NZ.

BTB Gmbh is an energy company (producing both electricity and heat supplied via a district heating scheme).

BTB energy operates a district heating scheme and electricity network consisting of 130km of pipes, supplying both industry and domestic users. running on a mix of wood, coal, gas boiler, a gas engine (CHP), and an electrode boiler. There is a baseline demand for heat all year round, but a seasonal increase in demand during the cooler months.

The biomass plant runs year round but lacks the capacity to meet demand in the winter, so the plan is to store excess heat (from the biomass plant and electrode boiler) using water pumped 200-400m underground. Exact depth is yet to be confirmed. This heat is then extracted during winter months and passed through heat pumps to take it to 120degC when outside temps drop to -15degC.

In Germany for every 1km of depth, there's an extra 30 degrees of heat which can be used for heating, production of electricity and for cooling. Mid depth drilling is perfect for storage

with minimal infrastructure required. The PUSH IT project is a multinational research project to test the system.

For an aquifer thermal energy storage (ATES) system, 2 wells are needed 1 for cold water (30-50 degrees) and the other for warm water (50-90 degrees). They must be at least 100m apart and at a depth of 200-400m.

The hope is to replace the fossil fuels and store excess wood fired heating during the summer, for use in the winter.

The anticipation is for the district heating network requiring 650 GWh/a at temperatures of 90-120 degrees, returning 50-70 degrees. Aiming for 85% efficiency although this takes time to build up (2 to 3 years as the storage absorbs heat).

Key points for storage water:

Economic depth for storage is 500m

Can only use water that isn't drinking water (as drinking water for a big city is in short supply)

The natural ground water velocity needs to be low

The geology of the land is important with sand being the best for storage. Silt and clay are no good

The drill required to create the well is the same machinery used in oil and gas exploration

Greece – geothermal bores are drilled by the government to take away the risk to individual businesses and then the government auctions them off to the highest bidder for sole ownership.

Screens

Svensson – In NZ, 25-30% of energy per year can be saved by using a screen, up to 45% per year with a double screen although they do case by case modelling for individual sites as there are many factors determining the savings. It has become standard to have double screens in the NL, especially in new builds. The UV in NZ is high but nothing special is done to prolong the life of screens for NZ. An example of a potted plant business in Brisbane with screens that are 23 years old was given to show that their screens do last. However the suggested lifespan is 8-9 years. Sometimes other components as well as the material needs to be replaced – to note nylon wire, rubber strip on aluminium leading edge may also need to be replaced.

Fitting screens: 1 hectare can take 2 weeks to fit new and 4-5 days for a replacement (based on 4 people working per hectare). Times are increased if there's a crop present. Always better to aim to fit screens with no crop present.

We saw examples of many types of screen materials including the Luxous which is made with 30% recycled plastic. In time, it's felt all screens will be made with the recycled plastic product.

The H2no technology anecdotally creates a drier climate.

Screens are also for light deflection including black out for LED legislation and shading, insect prevention (different size holes for different size pests with the idea being to keep good bugs in and pests and birds out).

When comparing different screen companies, look for the NEN figure, especially the diffuse stat, as this is a standard, independently determined number that allows different screens to be easily compared and the figure will often vary to the company's own stats.

Screens versus coatings – coatings can't be removed on a daily / weekly basis and either need to be permanently washed off or are removed over time. Screens can be open and shut according to the season / weather.

Something to be aware of is the difference between the horizontal and the vertical climatic differences within a greenhouse which can have a 5-6 degree temperature variance and even higher humidity variance. This is caused by gaps in the screens. The temptation is to increase the pipe heat but this only increases the temperature difference. Equilateral ventilation above a closed screen is more appropriate –even at outside temperatures down to -10°C.

If algae becomes a problem with screens, it can usually be resolved with small changes to the climate controls. And during clean out, putting hydrogen peroxide through the fogging system will breakdown any algae that remains.

In the NL, screens are used in winter for 20 hours/day and only opened for bees to get some natural light for 4 hours/day

Humidity & Energy

Humidity issues input = evaporation or misting. Rotting leaves left on the ground will increase the moisture in the atmosphere but removing the leaves causes other problems so a balanced approach is required between the benefits of leaves remaining (less labour, lower waste disposal costs and more BCA present) and the problems caused. Output = condensation and ventilation for example Svensson's vertical fan – Climafan. A vertical fan will push warm air towards the crop as it rises. Horizontal fans will only move warm air around horizontally. 40-45 Climafans are required per hectare although it depends on the growing system and crop being grown. Also required are approximately 1 Climafan to 2 Climafans.

It's important to have data on both temperature and humidity from both above and below screens so that adjustments can be made e.g. opening some or all windows above a screen. Fungal issues can be helped by having screens so long as the operator understands relative humidity and when to open/close screens and vents.

Low energy trial at **Botany** – they wanted to be able to grow for 12 months of the year (rather than the more usual 8-9 months in the Netherlands) but to use 40% less energy as customers were demanding growers to be more sustainable. What they aimed to do was – use only LED lighting (rather than HPS), heat only dry air rather than humid air. Research shows that 60% of heating can be used to only dry the air and 40% is then used to increase the temperature. In a traditional greenhouse with no screens, 25 cubic metres of gas can be used over winter alone. The trial has shown that this can be reduced to 12 cubic metres per metre squared of greenhouse by using an air exchanger that sucks out the air in the GH,

dries it out, heats the dry air and blows it back into the greenhouse. This system isn't as efficient in particularly humid or freezing conditions. Keep up to date with this research project here: <https://www.grodan.com/global/knowledge/collaborations-and-trials/Low-energy-tomato-growing/>

Greenhouse construction & tech

Wageningen University Research. Much of the work in robotics research is for private clients through public, private partnerships with industry and the Dutch government contributing 50:50. As of 2024, NZ is now allowed to participate in EU projects and benefit from the Dutch government, private industry funding

Digital twin: A lot of their research focuses on producing data from multiple cameras analysing plant growth, strength etc and all inputs to allow deep learning and ultimately cost savings. Hortiskey sells the data driven tech 'Plantayzer' which maps tomato ripeness while the fruit is still on the plant.

Enza Zaden breeding programme is also working on spacing and ability to reach crops to improve mechanical picking accuracy e.g. Lettuce shape

De Ruiter Experience Trial Centre – the GH was new 2018, built by Havecon, 3200m² compartments using electric boiler and solar panels for heating. CO₂ comes from industrial waste piped into the area and stored by growers in buffer tanks. Use LED lighting to allow a winter planting of tomatoes (plants in November with lights or in January no lights) and is turned on midnight to 4pm which is equivalent to 1300 joules on a sunny spring day. Blackout screens required from midnight. Also 2 x compartments of cucumbers 1 x LED + highwire, 1 x no lights + umbrella. Twisting, de-leafing are performed manually. IPM followed with no chemical spraying.

Green V is a combination of businesses who aim to work together to provide everything that a grower might need to construct a GH. They work closely with Apex in NZ. Their focus is not just on supply of GH but also maintenance hence they look to use companies that have local presence. Each GH is designed as per individual requirements. E.g. UV and ultrafiltration are the most common hygiene set ups in the NL but as this is based on growing substrate, ozone, osmosis might also be considered. UV works well with Rockwool but not so well with cocopeat due to the discolouration of the water. Ultrafiltration works well with both Rockwool and Cocopeat.

A semi-closed GH might be a good set up for humid NZ conditions, using low grade heat and less CO₂ due to closed vents.

Atrium is a collaboration between companies who work together in a similar to Green V. They also use Apex locally in NZ. They focus on delivering turnkey projects from Dutch based factories with a local presence. PB Tech specialise in irrigation, filtration, UV, electrical and lighting systems.

As mentioned above, we heard from **VB** about the possibility to extract heat from sewage plants, water from a river is used to cool the temperature of the river water after the sewage treatment process, heat pumps are then used to extract this heat which can go into e.g. a greenhouse and the river water can return to the river at the regular temperature.

VB are also involved in geothermal projects but only in the Netherlands as they have enough work there, They class geothermal heat as heat that is extracted from a +500m depth. Anything extracted at less than 500m depth is thought of as soil heat. At a depth of 3.5km in the western parts of the Netherlands, the heat is likely to be around 80-90 degrees. Every 100m is likely to be 8-10 degrees warmer. The geology of the Netherlands means that often quantities of oil and gas are extracted as well as the geothermal. The gas can be used in CHP. The deeper the bore, the dirtier the water which means reinforced piping is required to avoid erosion.

Geothermal wells in the Netherlands have a lifespan of around 25 years and it isn't yet known how far a new well would need to be drilled to find a new source of geothermal.

With geothermal heat, as it can't be turned on and off, it makes sense to have a cluster of users. It requires 24/7 monitoring and a significant input for health and safety measures.

Ridder also supply climate screens (minimum order is 10 hectares), climate control systems, water treatment systems and energy management systems and data management systems. They have also developed a robotic picking machine. Belief in data driven control where the more sensors to measure all aspects of growing and plant development, the better the outcome, with less money wasted on fertiliser, water etc. Ridder's systems are 'open' meaning they can connect to any make of sensor or camera.



Ridder's **MetoMotion** robot aims to pick 80% of available truss tomatoes. The feeling is that labour is expensive, people are difficult to train and are better placed doing specialist jobs and leaving the intensive manual labour to robots. But 100% accuracy for a picking machine isn't realistic. The MetoMotion works best x5 machines working with one supervisor to guide the robots between the rows. The robots generally work 16 hour days (with 2 shifts of people), picking a new truss every 16 seconds. This is slower than a human who can generally pick a new truss every 5 seconds BUT people require HR, holidays, sick days, managers etc which all cost money so a different mindset is required to acknowledge that

robots don't have to be as quick or accurate as a human to save money. These robots have been working in commercial settings for over 2 years, working well with tweaks being made based on realistic feedback. Estimated to retail at Euro 200k/robot with capacity for 1 hectare per robot. The service contract, including software updates would be valid for 10 years. Ridder are open to leasing robots but are still working through if this is realistic. Expected ROI is 5 years based on workers in the NL earning Euro 22/hour.

Other Robots: Wageningen have a lot of money and will usually produce a prototype but that is no guarantee of a commercial robot at the end of the project. There seems to be a fine balance between achievable accuracy of machines and grower expectations along with the high cost of some of the components, despite many of the components being transferable from one machine to another for different crops e.g. standard robot arms but with different 'grab' attachments. There can also be issues around who owns the IP and who is willing to take on the risk of commercialisation of a robot. This is possibly the case with a machine built collaboratively between Certhon & Densel (Japanese software) with Wageningen now helping to perfect the machine following trials at De Ruyter for approx. 3 years.

At Fruit Logistica we saw videos of **ISO Horti Innovators**, a Truss picker going to a few growers this year with the aim of perfecting the robot before being fully commercial in 2026. It requires the trusses to be exposed at the front of the plants for the machine to work more effectively. Cost: one off price of Euro140k but also a 'to be determined' annual software fee.

Kuto Auto Clima low CO2 greenhouses build semi closed greenhouses which are pressurised, with screened vents that open to vent excess pressure. Their own test greenhouse is called Bluelab – this runs on ambient CO2 with matched light levels and temperatures. Bluelab uses 3% of the liquid CO2 of a commercial GH, saves 22% on energy and only has 2% less yield at the end of a 1 year trial period. The system can't be retrofitted so only applicable to new builds. Key highlights with semi closed: less insect pressure, high air circulation means ambient CO2 is used more effectively. Drawbacks include: A lot more expensive to build than a standard GH

Plant health

Climate, the plant and the root zone are all key to get the best vegetative , generative state of the plant. Vegetative = more transpiration. The more irrigation used, the more vegetative the plant and the more nitrate etc is wasted (as it comes out in the drainage water. The more generative the plant, the less nitrate required (can be 25% less). Botany is interested in trying to gauge how much fertiliser e.g. 1kg of crop actually requires. Usually no one compares the nutrient input with the output through the drainage water. Because growers generally over water their plants, they also overuse fertiliser. Excess watering increases humidity.

Chemicals & Pesticides

In the NL there will be a complete ban on chemical use by 2030 and in the meantime / other countries activates will continue to be reviewed and banned. So seed breeders are under a lot of pressure to develop pest resistant varieties. In most cases these are 4-5 years away.

Specifically mentioned was work on capsicum varieties which worked to make aphids and thrips a less attractive food item.

IPM use in seed and research GHs was commonplace.

Biologicals

Koppert – Natutec (blower for applying BCAs)

This doesn't work well for all BCAs for example it's no good with encarsia as if an encarsia egg falls on its back, it can't turn itself over and fly away when it's a wasp. It works well with mites though.

ICAS - They have various biological controls for pest and fungal diseases e.g. downy mildew, powdery mildew, rot. Due to the natural ingredients their products leave no residue so can be used right up to harvest.

Houweling Horticulture – They have a biological based shade spray for glass that is sprayed on ahead of the summer season to diffuse some of the heat and while it can be removed with a cleaning product, it also naturally washes off over a period of time and because it is biological, can still go into the irrigation water.

They have a biological spray for powdery mildew which is usually used as a prevention measure.

Another product Root Energise uses enzymes which breakdown the cellulose in old root stock in rockwool so that when the growing matter is used for a second season, the roots are naturally broken down while the new crop also has the benefit of an added fertiliser in the spray. Can't be used in coco peat only inert slabs.

New product called 'Insect Road Block' which is a glue sprayed onto e.g. the base of a tree or plant stem. It is water based with no chemicals, food grade. It becomes sticky 30 minutes after application and remains sticky for years. Insects living in the soil/growing matter can't access the rest of the plant.

They also have a disinfection product with stabilised peroxide which has a slow release for driplines.

Houweling is currently opening an office in Canada with aspirations to become an international business. Wants to have local NZ distributor contact details.

Biobest – possibly some interest in entering the NZ market but 320 hectares of GH isn't enough so we would need to show them the potential for the whole of NZ horticulture. There is a possibility that rather than being another competitor they could work with an existing NZ company. Production in Australia so some potential for Australian registered biological pesticides to piggyback off this?

No known 100% guaranteed products for russet mite although burning sulphur pots at night are the most common GH control. They can have a negative affect on BCAs but if there is a well established population the loss of BCAs should be able to handle the losses. Biobest are currently developing a beneficial mite that feeds on mildew and russet mites – Pronematus. Currently population being established so worth checking back in 1-2 years.

Andersoni is another russet mite 'hotspot' only possibility – would need too many of them for a whole GH problem.

Biobest also have a remote camera ID system 40 cameras per hectare required. Checks to positively ID up to 6 pests on sticky traps. Could potentially be trained to ID NZ common pests.

Action – help Biobest build a business case for NZ whole of horticulture. Interested in what the biggest challenges are for crop protection; the willingness of growers to adopt IPM and an overview of the life of chemicals currently and in the future in NZ

Humofert is a Greek company selling Trichoderma and bacillus subtilis amongst others packaged with nutrients so that they can be sold as fertiliser and therefore get round plant protection restrictions. Not currently represented in NZ.

Octiva have a UV-c treatment aimed at controlling powdery mildew while also making the plant more resistant to other diseases and pests. Treatment can be done at night if that is the most convenient time although there is no human health risk. Works autonomously. Costs Euro 6,000

Davik Industries have a product called 'Catchy' which can be applied to yellow sticky traps and can attract one particular pest e.g. whitefly. More info here: <https://daviktapes.com/product/catchy/>

General comments & learnings:

CO2 at Rijk Zwan is cold injected from above so it drops into the crop.

Water disposal: NL growers must recirculate all water even condensation. To be able to dump water, all nitrates etc must be removed. Dumped water is measured and invoiced at the end of each year as a discard charge.

From 2027, NL no more nitrates can be dumped. Reverse Osmosis is working towards zero discharge systems, as legislation changes



Green V - Irrigation, heating, disinfection systems are all built onsite in NL factory, to the size of a shipping container. The aim is to wheel in/out and plug in with minimal installation required.

If water is high in sodium, flushing is required before it can be successfully recirculated e.g. through reverse osmosis.

LED lights should give 20% increase in production to justify the spend

Blue slips are used initially when the seedlings are brought from the propagator as they help to drive down the roots. They are removed after approx. 1 week or 2 flowers and result in the roots driving into the rockwool better.

A full moon and clear sky can prompt a flush of fruit approximately 8 days later.

Protect the plant to make it grow stronger and more able to survive diseases.

Agrocare is Ridder's biggest customer with +300 hectares of tomatoes in the Netherlands (all truss) and +200 hectares in Morocco and Tunisia (loose) where labour is cheaper. This has grown from just 10 hectares in the early 2000s.

From PB Tec - When using coco, the drain becomes coloured with the tannins from the media. One option to deal with this is to add a 3 way valve and mix fresh water to achieve correct t10. Also use the flow valve to slow flow down and filter to 50 micron pre UV treatment in order to achieve disinfection.

Appendix 1 - Contact List

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Octiva – more info here: <https://octiva.tech/products/lumion-vine-crops/>

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Ridder – Joep van den Bosch j.vandenbosch@ridder.com MetoMotion picking robot <https://grow.ridder.com/>

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