

EXCITING WORLD-FIRST FOR GREENHOUSES

Hot Lime Lab's container-based
CO₂ producer.

The future of covered growing aided by artificial CO₂ - carbon dioxide - production can be described in one word: "exciting".

That's the description offered by Hot Lime Labs chief operating officer Tijs Robinson.

The simple thing is that CO₂ is food for plants. Many operations will burn natural gas to heat their greenhouses and the by-product is CO₂.

The story of Hot Lime Labs began with research undertaken by industrial chemist Dr Vlatko Materic, at Callaghan Innovation. Dr Materic developed a process that uses waste and renewable biomass to create low-cost CO₂.

As Tijs explained, a modern greenhouse operation using hydroponics, humidity, temperature control and supplementary LED lighting can produce 20-times the product per hectare than can be achieved outdoors. Indoor cropping uses only 10 percent to 20 percent of the water outdoor cropping does. Outdoor farming is also affected by the weather and other factors, including urban sprawl.

"In glasshouse growing operations, where everything is optimised, the last 'ingredient' growers can't get enough of is CO₂. I go to

greenhouses, they'll have all the vents shut and there is 200 to 300ppm CO₂ inside because the plants are using so much - well below the ambient outdoors level of 400ppm.

"They all want more CO₂ up to as high as 1000ppm. They'll burn natural gas for heat and the by-product is CO₂. But they can't commercially justify getting the optimal CO₂ levels they'd like."

Large parts of New Zealand do not have access to reticulated natural gas, including the whole of the South Island.

In a world-first, Hot Lime Labs has developed a process in which the gases produced by burning biomass are passed through a modified calcium carbonate material, in a patented process.

"The calcium carbonate - limestone - acts as a sponge and grabs the CO₂ from the gasifier biomass. We then blow air through the sponge which releases the CO₂ into the glasshouse. This is not being done anywhere else in the world at this scale, and the reaction we've had from growers is 'hurry the hell up'. We are learning locally and have started talking to people around the world."

New Zealand has about 600ha of usable greenhouse space and Hot Lime Labs is currently working with NZ Gourmet's 12ha operation at Mokai, 30kms north-west of Taupo, which uses geothermal energy for heat.

A one-quarter scale pilot CO₂ producing plant has been built using a 20-foot shipping container, and the next step is to build a system that has 10 times the pilot capacity but still fits in shipping containers.

"We plan to make a mobile standardised plant. It will depend on how much we can cram into a container. Simplified logistics are a big part of meeting demand and we like the containerised approach."

THE PEST WHISPERER

Novel and creative ways of controlling and eliminating insect pests are the way of the future, according to entomologist for Plant & Food, Dr Lloyd Stringer.

Dr Stringer works with an extensive network of researchers to understand scent, sound and sight-based communications among existing and potential insect pests - and how these can be used in their eradication and control in New Zealand.

Foreign insect pests could be devastating to whole sectors of Kiwi horticulture, and in the era of easy international movement barely a year goes by without one alarm or more requiring the immediate deployment of comprehensive remedies.

For many decades New Zealand growers and researchers have been responding to consumer and regulatory resistance, in our domestic and overseas, markets to extensive chemical pesticide use for insect control.

"Generally we have good integrated pest management with a low chemical-control input. But increasingly there are new types of insects moving around the globe that tolerate the more common chemical tools available in New Zealand.

"Overseas, these pests have been driving a return to old-fashion long-lasting pesticides. If these pests established in New Zealand and we reverted to broad-spectrum long-lasting pesticides we could have flair-ups of old pests. That would reduce market access and demand for

Commercialisation could include different selling approaches to suit different grower requirements, including selling fully built gas-producing plants or selling CO₂ by the tonne in a service contract.

"We have a team working on finishing the pilot. We will get it to the customer, run it for six months to satisfy ourselves that it works before we start selling commercially. It's super-exciting."



Dr Lloyd Stringer, centre, with Gerardo Rosell, left, and Claire Levy, foreground, check a Nazgul trap - also known as ghost net - in a hedge in an organic apple orchard in the Trentino region, Italy. The net is treated with insecticide and an aggregation lure is used to attract brown marmorated stink bug. Bugs walk on the net, get a toxic dose of insecticide, and die.

our products because of chemical residue levels. We are working to have new tools ready to use that will allow New Zealand continued access to premium markets."

Working from Plant & Food's Lincoln campus, Dr Stringer and his team are investigating a variety of new tools that can be used to destroy or inhibit insect pests including sound, pheromones and sterile insects.

Among the developing insect-busting arsenal is biotremology, the science of recording and then playing back mating calls specific to certain insects.

"There are quite a few insects that don't rely on smells, such as sex pheromones, as attractants which would allow us to use behaviour traps.

"But insects will call each other during mating and we can play back the mating calls. If we play back the sounds, we can either attract the insects to traps or disrupt their mating calls and their ability to find each other."