Text: Lynn Radford
Images: Pura Hoja

Sebastián Pacheco: "We are very strict about hygiene. We have a dedicated team of ten people who work all year round to keep everything clean – not just the gutters and trays, but all plant-related surfaces."

Production Manager Sebastián Pacheco at Pura Hoja, Chile:

Growing hydroponic lettuces safely, sustainably and aided by technology

Producing 15 million hydroponic lettuces a year, Pura Hoja is the biggest market player in Chile and perhaps even in the whole of South America. These volumes are only possible with a high degree of automation, ranging from automatic seeding to closed-loop irrigation and a mobile gully system. Here, the company's Production Manager explains how precise control of factors including climate, pests and hygiene supports higher yields and better quality.

Chilean high-tech lettuce production company Pura Hoja was founded in response to local market demand. "In the existing open-field systems, lettuce could only be produced in certain months of the year, but the country's retailers were looking for a reliable year-round supply," says Sebastián Pacheco, Production Manager. "We explored various possibilities and technologies, and decided that the best option was to produce hydroponic lettuces on gutters. We started small, on just 0.7 ha, with a mobile gully system (MGS) from Hortiplan."

Since then, the company has expanded its production area roughly every two years and currently has a total of three poly greenhouses amounting to 4.7 ha of cultivation space. "They are all from Filclair because their design maximizes the amount of available light," says Pacheco. Each year, the company produces six different lettuce types: batavia and butterhead, which account for the majority of the annual total yield, as well as Lollo bionda, green oak leaf, Lollo rossa and Trio, depending on the season. This amounts to 15 million heads of lettuce per year based on an average annual yield of around 100 kg per sqm.

Unique topography

Chile has a unique topography, but the company provides a constant supply of lettuces to the extreme north, the extreme south and everywhere in between. "We benefit from working together with the other companies in the group - Punto Azul and Pro Verde - to supply to all supermarket chains in Chile daily," says the agronomist, who has over 18 years of experience in various high-tech greenhouse crops, includ-

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ing previously with tomatoes and peppers at Tomaval SA. “Around 70,000 lettuces per day are transported in own trucks to our distribution centre 1 hour away in Santiago, where they are packaged and consolidated for shipment to the retailers on the same day,” he explains.

This fast turnaround helps to ensure the lettuces are still fresh when they reach consumers. “We have a 10-day shelf life on average, helped by the fact that our lettuces are sold with the root ball attached. But we’re constantly looking for varieties with even better shelf life, so each year we trial around 300 commercial seed varieties from all the leading suppliers.”

Automated from the start

The cultivation starts when the lettuces are automatically seeded into 5x5x5cm Grodan stone wool blocks at a density of 300 plants per sqm. “We have been using this block from the start. Supported by research and advice from Grodan on things like EC, pH and timings, it’s the perfect solution for me in terms of the volume of the block and the size of the lettuce I can produce,” comments Pacheco. After 15 to 30 days in the 0.7 ha on-site nursery, the seedlings subsequently sprinkler-irrigated in trays at a density of 100 plants per sqm for 5 to 10 days. They are then transferred to the MGS, which automatically then moves the plants through the system.

To minimize problems with too high temperatures in the summer the nursery has a pad & fan system.

“The MGS is specially designed to provide the highest possible plant density at all stages of growth to achieve our target end weight, which is usually 300g. Hortiplan also calculated the optimum plant density for our newer greenhouses, which at 7 m in height are 2.5 m taller than our original greenhouse. This has enabled us to optimize our use of space in the new greenhouses by working with an average plant density of 28 plants per sqm instead of 21,” he states.

The seedlings are transferred to the mobile gully system, which automatically moves the plants through the system.

Precision irrigation

The irrigation unit, which includes a water recirculation system featuring sand and carbon filters, enables Pacheco to precisely manage how much water is delivered to the gutters 24/7. “The water shortage is a growing issue in Chile, so this closed-loop irrigation system is important because it saves 90% of water as well as fertilizers. It also includes natural cascades that generate nanobubbles to increase the oxygen level in the water to support root health.” He even controls the water temperature: “We heat the water to 17-18ºC in winter to kick-start the plants early in the morning, and chill it to 18-19ºC in summer to keep fungi dormant.”

At the end of the cycle, the plants are transported from the gutters to the processing area by an automated roller system. The company also has an air transport system that carries the boxes of lettuces over several hundred metres to a central collection area, improving the speed and labour efficiency.

Changes in the climate

The facility is located around 20 km inland from the Pacific Ocean, where the climate is

temperate and there is often a cooling breeze off the ocean. “However, climate change is making the weather less predictable. That’s why the use of greenhouse technologies has become so important to respond to sudden changes in temperature, humidity or radiation. All of our systems are controlled by our Ridder HortiMaX computer.”

In the summer months, the radiation level can reach 3,200 J on a sunny day. “Our Svensson screens provide 30-40% shade. In addition, in summer, we paint the greenhouse with a special Sombrasol coating to reduce the indoor temperature. This is easy to clean off again afterwards,” according to the Production Manager. Last year was the first time it was applied by drone, at nighttime, and he is very pleased with the results.

Tackling humidity

To minimize problems related to high temperatures in the summer and also to maintain humidity in the seedbed, the nursery has a pad & fan system. Meanwhile, the greenhouses are fitted with vertical fan circulation from Holland Heater, and in some cases lateral ventilation too. “Ideally, 100 percent of the air in the greenhouse should be renewed several times per hour. This results in thicker lettuce leaves and overall better quality,” explains Pacheco.

“We also recently installed a dehumidification system from DryGair in our newest greenhouse. It has enabled us to produce around 10% more lettuces in that greenhouse by reducing the relative humidity. That also increases the greenhouse temperature, thereby saving gas too,” he comments. This is particularly important because Chile does not have its own natural gas reserves, so the energy costs are affected by the gas price on the international market.

Sustainability goals

By reducing gas consumption, active dehumidification also contributes to Pura Hoja’s sustainability goals, according to Pacheco: “Alongside product quality, food safety and teamwork, sustainability is a very important pillar of our company. Retail customers and consumers are increasingly concerned about the environment. We have a strong positive message for them, because hydroponic lettuce cultivation avoids soil erosion, saves water and uses fewer environmental resources compared with open-field systems. Plus as a clean cultivation approach, hydroponics on stone wool results in a food-safe product.”

Strict on hygiene

The commitment to sustainability is also reflected in the company’s approach to crop protection. “Automatic doors with air curtains help to keep insects out of our greenhouses, and we use biologicals from Koppert rather than insecticides,” he says. “And we are very strict about hygiene. We have a dedicated team of ten people who work all year round to keep everything clean – not just the gutters and trays, but all plant-related surfaces. In the newest greenhouse, we’ve even installed an ultrasound system to keep the pipes clean.”

Supported by suppliers and consultants, Pacheco loves exploring how new technologies can help him to achieve higher production and/or higher quality. “For example, we’re currently running an LED trial to evaluate the potential benefit of artificial lighting for us in the winter. Light is an issue for me in the summer too, because I lose valuable radiation when I shade to prevent the temperature from rising too much. Therefore, to help us manage the radiation to temperature ratio, we’re considering investing in a fogging system in the next few years.”

The target is with the highest possible plant density final weight of 300 g.

The facility is located 20 km from the ocean, where the climate is temperate.

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The company supplies to all supermarket chains in Chile daily.

Trial of hydroponic lettuce on stone wool vs peat

Growers are under mounting pressure to move away from peat. Stone wool offers an alternative, but as a non-organic substrate it requires a different irrigation approach. Grodan has therefore recently conducted a trial comparing its stone wool growing media with peat when cultivating hydroponic lettuce.

The research trial, which was conducted at the research centre in Sint-Katelijne-Waver in Belgium, was specifically focused on determining the optimal electrical conductivity (EC) levels for hydroponic lettuce cultivation when using stone wool blocks.

A higher EC level

After testing various EC levels, the researchers have found that a higher EC level during propagation and the initial wetting gives the best results on stone wool. Under these conditions, stone wool produces lettuces with the same germination rate, good plant uniformity and better overall quality (fewer yellow leaves and significantly less rot), resulting in a longer shelf life. Moreover, the stone wool lettuces had reached the same size as the peat ones by harvest time, despite being smaller when they were transferred to the gutter system. This implies that stone wool lettuces grow faster in the gutter phase. The positive impact of EC on lettuce quality, efficiency and speed will be validated in another trial starting in early 2025. The researchers will also be testing the hypothesis they have developed for resolving the size issue of the stone wool lettuces at the end of the propagation phase.

AI as a decision-making tool

The Production Manager is also keeping a close eye on advancements in artificial intelligence (AI): “I don’t think that AI will ever replace us as growers, but it can be a tool to help us make better and faster decisions. For example, the use of drones fitted with multispectral imaging cameras is already becoming more common for greenhouse crop inspection. I believe that adding AI into this mix could help us to spot potential problems sooner and manage the climate even better. I’d be keen to test this to help us continue growing vegetables safely, sustainably and aided by technology,” Pacheco concludes.

Summary

Pura Hoja was founded in 2010 with 0.7 ha of poly greenhouse in Quillet in the Valparaíso region of Chile. Today, it has 4.7 ha of production space and cultivates 15 million hydroponic lettuces per year, accounting for 90% of the country’s domestic demand. It also grows Sala Novas and multileaf varieties such as mizuna and watercress in a 0.5 ha NFT system, and has its own propagation area. The company employs approximately 120 people.

Hobby Craft

Hobbies are the colourful threads that weave joy and creativity into our everyday lives. By definition: a hobby is an activity or interest pursued for pleasure or relaxation and not as a main occupation, done regularly in one’s leisure time for pleasure. Unsurprisingly, many growers I’ve met over the years have hobbies beautifully intertwined with their work in greenhouses and growing.

Speaking for myself, for example, my journey as a greenhouse grower introduced me to several fascinating hobbies, including beekeeping and woodworking. Observing pollinators darting about my plants sparked an interest in beekeeping, leading me to dive into the mesmerising world of apiaries, honey and candles. Similarly, the structural simplicity of beehives and extinct greenhouse frames inspired me to try my hand at woodworking. Both pursuits have been deeply fulfilling, offering insights into wider ecosystems and the raw beauty of natural materials.

Of course, my passion for gardening and all things green remains a cornerstone of who I am. Coupled with my love for walks in nature and a profound appreciation for outdoor spaces, there’s something truly magical about stepping outside and witnessing the intricacies of plant life intertwined with modernities.

Hobbies, however, are not just an extension of our work or interests, they are vital for balance. For growers, whose days are often consumed by the cycles of planting and harvesting, hobbies provide a necessary diversion. They allow us to step outside the greenhouse, metaphorically and literally, offering a fresh perspective and a chance to recharge.

Engaging in hobbies is not merely escapism; it’s a tonic for mental health. They foster creativity, relieve stress, and encourage mindfulness, which are essential in our often hectic lives. Whether it’s painting, hiking, cooking, or even learning a musical instrument, hobbies remind us of the importance of play, curiosity, and joy.

So, as you tend to your crop or dream of your next harvest, ask yourself: What’s your hobby craft? It just might be the perfect way to grow something new in yourself.

John Cappalonga
Greenhouse horticulture consultant