



Marja and Leo Verdonck: "We opted for a high plant density because we plant relatively early and you can do that with LED interlighting."

Belgian tomato growers: stronger lighting and LED interlighting

## LED interlighting sheds new light on growing top quality

**Belgian tomato growers are working hard to intensify their crops. Last year two nurseries installed the latest-generation LED interlighting modules. They are going about it in stages to spread the investment, but also because they want to be able to compare the effect with crops grown entirely under top light. Interestingly, their aim is to achieve an even better product in the winter months, whilst reaping the benefits of higher yields at the same time.**

A worker unplugs the wiring from the assimilation lights one by one. And for the very last time, because Marja and Leo Verdonck-van Dessel of the Den Boschkant tomato nursery in Vremde, Belgium, will be replacing the light fittings with a new system. "Every spring we remove all the fittings and store them away

for the summer because we want to let as much natural light in as possible," Marja says.

Belgian tomato growers are very focused on light utilisation, as we discover on the rounds of Flemish customers we are doing today with Piet Hein van Baar, plant specialist at Signify (formerly Philips Lighting). Both Den Boschkant and Kevin Pittoors's Primato nursery in Putte have invested heavily in lighting systems recently. The two companies are quite similar in size. They both aim for top quality and they sell their tomatoes at the BelOrta auction.

### Tomatoes and asparagus

The Verdonck family grows on 9 hectares. The first part was built in 2005, followed by the second part in 2010. At the old site, where they started out in 1986, they now grow greenhouse asparagus on 1.7 hectares. Leo has always grown

tomatoes, but Marja originally qualified as a psychiatric nurse. They have brought their two careers together by running activities for vulnerable and disadvantaged people at the nursery. "We offer a range of meaningful activities here," Marja explains. "It's so satisfying when we can make that little bit of difference by helping people on their way."

Within the nursery's product range they regularly trial slightly more special tomato varieties, such as the small truss plum tomato Lilly. Their main range consists of the middle segment Briosso and the larger plum tomatoes Prunus and Intense. The September Prunus planting is replaced half way through the season by an interplanting with four stems.

### Lots of light, high planting density

In 2010 the Verdoncks fitted 4.3 hectares with 180  $\mu\text{mol}/\text{m}^2/\text{s}$  SON-T lights. Last season they

Continued  
on page 32 >



**Piet Hein van Baar:** “Dutch growers switch over more quickly to intensive lighting, while their southern neighbours prefer a more gradual approach.”

added third-generation GreenPower interlighting modules with  $75 \mu\text{mol}/\text{m}^2/\text{s}$  in 4.3 hectares, bringing the total lighting capacity in this part of the greenhouse to a formidable  $255 \mu\text{mol}/\text{m}^2/\text{s}$ . Soon they will decide which new system to install above the crop when the old lights are replaced.

The planting density is high right from the start of the cycle. Verdonck actually started off straight away with the final spacing of 30 cm ( $4.2$  plants per  $\text{m}^2$ ). “We opted for this system because we plant relatively early. There is still plenty of natural light in September. Allowing extra heads to develop would then coincide precisely with the time when light levels start to drop. That doesn’t feel quite right to me. Also, I always think that retaining a side shoot produces a more uneven plant,” he explains.

### Better truss elongation

In the section with interlighting, the modules are hung so that the LEDs are always at the same height as the developing truss. The plant not only benefits from the extra light but also from a little warmth. The temperature of the modules rises to  $38^\circ\text{C}$ .

Since the start of the lighting season, the grower has noticed that the trusses have been developing better. He is particularly struck by the elongation and uniformity of Briosio. The quality of the end product is more stable, although the grower realises that he is at the limit in terms of plant density.

“We were hoping that LED would also improve the flavour,” Marja adds. “Back when we installed the SON-T lights, both the quality and the flavour improved massively in the darker months. Interlighting doesn’t help with that, we find. We haven’t seen as much of a difference.”

### Consistent quality

The nursery has not yet decided which route to go down in the future in terms of lighting. They don’t want 100% LEDs because they see the heat emitted by the SON-T lamps as essential for the climate in the greenhouse. But LEDs at the top of the greenhouse are also tempting because they emit less heat and can therefore be used for longer.

Their vision is to continue combining conventional and lit crops in order to be able to deliver a consistent, uniform, sustainable and locally grown product. That’s also attractive from the point of view of labour. “We have a permanent team of workers here. Our work used to peak in the summer. Now we have the same amount of work all year round, give or take a few fluctuations,” says Marja.

Biological pest and disease control has been a challenge since they started using lighting, however. “It’s difficult to clear out all the pests if your nursery is never really empty,” Leo points out.

### Fast growth

The Pittoors family nursery underwent rapid development in a short space of time. A few years ago the nursery was just 3 hectares in size, but since son Kevin came on board they have expanded to 16 hectares. Construction began on 6.2 hectares at the end of 2015, followed by another 6.2 in 2017, both with AR-coated diffuse glass. The brand new nursery building looks all spick and span.

Kevin Pittoors started out growing in natural light three years ago. Now they have half the greenhouse under  $180 \mu\text{mol}/\text{m}^2/\text{s}$  SON-T lights, which can be switched off in four stages. Last year they installed  $75 \mu\text{mol}/\text{m}^2/\text{s}$  interlighting modules in 2.6 hectares of the lit section.

The total output is therefore the same as at Den Boschkant. “In reality it’s a trial that got out of hand,” the grower says. “It makes no sense to install LEDs in just a few rows. You also have to be able to adapt your irrigation, because plants under supplementary lighting transpire more and therefore need more water.”

Pittoors supplies his medium-sized cluster tomatoes in the BelOrta Elite segment. He grows Foundation in the unlit section and Xandor in the lit section, opting for the latter variety mainly because of its endurance. He also grows lit and unlit Juanita cherry tomatoes, without the LEDs.

### Lighting built up gradually

The first lit crop was planted in mid-October 2017 (week 42), at a density of 2.8 plants per square metre. He retained a succession of extra stems in the LED lit crop in weeks 44, 47, 49 and 10, bringing the stem density to 3.2, 3.7, 4.2 and ultimately 4.4 plants per square metre. He worked up to the same final density in the rest of the lit section, but following a more gradual regime. The trusses in the SON-T section were pruned to five and a proportion of those in the LED section to six.

The grower is building up his lighting regime very gradually. He only starts using his SON-T lights 14 days after planting, and only on the darkest days to begin with. By week 50 he has reached the maximum lighting duration of 18 hours per day. Van Baar: “There is a significant difference in lighting regimes between Dutch and Belgian growers. The Dutch switch over more quickly to intensive lighting, while their southern neighbours prefer a more gradual approach.”

They also wind down gradually in spring. Pittoors switches his LEDs off as soon as the greenhouse temperature rises above  $25^\circ\text{C}$ , or as soon as the radiation exceeds  $700 \text{W}/\text{m}^2$ . His SON-T lights were last used in week 15. Pittoors: “We start reversing our lighting strategy at the end of March or early April



**Kevin Pittoors:** “Everything in the greenhouse is new: this isn’t the time to push the boundaries.”



*The latest generation of interlighting modules has an output of 75  $\mu\text{mol}/\text{m}^2/\text{s}$ .*

so that the crop also produces good quality tomatoes in the summer.”

### Leaves stay greener

The grower has been switching on his LEDs as soon as they are 30 cm away from the heads. That way they end up hanging alongside the developing trusses. “We saw big differences quite quickly,” he says. “We noticed that the leaves at the bottom were staying green. With interlighting all the leaves stay active, whereas leaves on plants with only SON-T top light tend to age.”

In the spring, when the SON-T lights are no longer on, he still keeps the LEDs going as long as the greenhouse temperature doesn't rise too far. In practice that's mainly in the morning hours when the greenhouse and the crop are still cool.

Pittoors has already seen many differences between crops grown with and without interlighting in the most recent lighting season. “We noticed that the crop in the section with LEDs was quickly getting stronger. So we adjusted the 24-hour temperature half a degree upwards and varied the number of extra stems we left.”

Looking ahead to the next growing season, he tells us he will be switching his LEDs on earlier. He is also considering starting with 3.75 stems per square metre. “We didn't want to do that yet this year. The greenhouse, the system, everything is new. This isn't the time to push the boundaries. You don't want to risk the crop ending up too weak.”

### Longer lifespan

Both nurseries have achieved higher yields in the sections with LEDs. The extra yields obviously help when it comes to deciding whether an expensive lighting system will be cost-effective, and that objective has largely been met. Whether or not to use LED

interlighting depends on yields, quality and operational reliability. For example, on 1 May 2018 Pittoors had 25 percent higher yields in the section with LEDs.

“After all, every mol of top light produces 10 grams of tomatoes and every mol of interlighting has an efficiency that's one-and-a-half times higher than that,” says Van Baar. The LEDs deliver 3  $\mu\text{mol}/\text{m}^2/\text{s}$  of grow light per watt, compared with 1.8  $\mu\text{mol}/\text{m}^2/\text{s}$  from SON-T lights. “And then there is what we call an X factor, as we are making full use of the light spectrum and because of the position of the light in the crop.”

This improvement in yield needs to compensate for the difference between the investment in SON-T lights and a hybrid system with LEDs. The big advantage of LEDs is that they last at least three times as long as SON-T lights. With electricity prices higher in Belgium than in the Netherlands, Belgian growers can recoup their investment in more efficient LEDs slightly more quickly than their Dutch counterparts.

## Summary

In 2017 the Den Boschkant and Primato nurseries in Flanders invested in 75  $\mu\text{mol}/\text{m}^2/\text{s}$  interlighting. Now both nurseries have a total lighting capacity of 255  $\mu\text{mol}/\text{m}^2/\text{s}$ . The growers are very satisfied with the winter quality and the yields they have achieved with this system. Marja and Leo Verdonck have since replaced their SON-T lights, while Kevin Pittoors is mainly concentrating on fine-tuning the crop after a more gradual start to his lighting strategy.



## The challenge

A new name and a new face as a columnist in this issue of In Greenhouses. That's right: my name is John van der Lee and I grow pink beef tomatoes in Baku Azerbaijan with my wife Jolanda. The first question I asked when the recruiter suggested this job was: where is it? I really had no idea and knew nothing about Azerbaijan, but we went there to have a look with an open mind and no prejudices.

Baku is a very large city with over 3 million inhabitants. It was quite impressive. For the most part, I saw multitunnels and other plastic greenhouses with wooden structures. In between all these traditional buildings, some new projects are emerging. Some are high-spec Dutch designs and others are Turkish ones with light metal structures and plastic roofs. The government is promoting the investment climate, so you see investors building greenhouses starting at 10 hectares. Sometimes there isn't even a qualified grower present during the build.

Baku Agro Park was more or less the same. We came for the first time in June 2018 to have a look and the season was already finished. They had to stop a month early. The season normally starts in mid-August and ends in mid-July. Zira (part of Baku on the coast) is well known as the most important tomato production area for Azerbaijan and Russia. It is like a brand name for the Russian market.

So there we were in between Russia, Turkey, and Iran with an investor who really wanted to make a success of his company but knows nothing about tomato growing himself, a company with no labour structure or knowledge of growing. But we were so overwhelmed by the thirst for knowledge, the hospitality, the spirit and the drive of the Azerbaijani people, who are fighting to build up the country into a western society, that it didn't take us long to make our decision to go and take up this challenge. I am looking forward to sharing our experiences this year in this column.

John van der Lee  
Tomato grower in Azerbaijan