

English

PHILIPS

Horticulture
LED Solutions

Lettuce & leafy greens



Your recipe for growth.
Predictable yield.
Full control.

Stand out with consistent quality, better taste, color, and longer shelf life

Whether you want to grow lettuce and leafy greens in an open field, greenhouse or vertical farm, light is an essential element for the photosynthesis needed to grow your crops. But not all light is equal. Natural light levels can vary from day to day and hour to hour, resulting in unpredictable yields and quality. HPS lamps are traditionally used as a supplemental light source. The heat produced by HPS lamps limits the amount of light that can be added, since too much heat can impair crop growth and development. Supplemental LED lighting, on the other hand, emits very little heat, giving you the flexibility and control to grow the perfect crop all year round – whether it's a head of lettuce, basil or herbs.

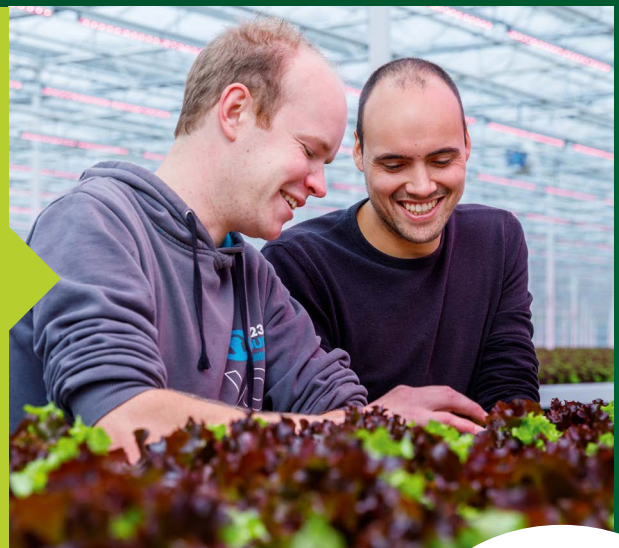
What can happen when

Did you know...
you can control your entire growing process?

“

Our customers are impressed with **the high quality and longer shelf life** of the greenhouse crops”

Ben van den Beuken, Siberia – The Netherlands – Lettuce and leafy vegetables



Did you know...
you can improve all aspects of your leafy greens with one lighting technology?

“

We can get **better coloration, better structure, tastier herbs, better shelf life and energy savings** with LEDs.”

Jukka Pehkonen, Famifarm – Finland – Lettuce and herbs



Light is needed for plant growth. The light that powers plant growth is called Photosynthetic Active Radiation (PAR). Unlike the PAR light of sunlight, Philips GreenPower LEDs have a dedicated spectrum optimized for lettuce and leafy greens, consisting of mainly blue and red PAR light for the highest photosynthetic efficiency.

A dedicated spectrum is one of the most effective ways to optimize your recipe for growth. GreenPower LED lighting from Signify can help you realize better control and higher yields. Imagine what it can do for your business.

Did you know

Why LED?

Why Signify?

Make your choice

Philips products

you optimize your light?



“

The first LED lighting solution was so profitable we decided to install it in our new greenhouse as well.”

Erno Laukkarinen, Nurmitarhat Oy - Finland - Herbs and lettuce

Did you know...
you can grow more basil per square meter?

Did you know...
you can speed up growth and produce an outstanding product?

“

Using Philips LEDs, we've experienced great results: **very fast-growing, amazing colors, great biomass and aromatic and tasty produce.**”

Brian Bain, Ecobain Gardens - Canada - Leafy greens



Did you know...
you can control your growing climate more efficiently and effectively?



“

At GrowWise Center we can control and measure all factors influencing plant growth **to develop the right growth recipe, tailored to your customer's needs.**”

Roel Janssen, GrowWise Center - The Netherlands - Leafy vegetables, soft fruits and herbs

Grow your business with LED lighting

Basil and other herbs grown under LED lighting have a more intense taste and aroma and a longer shelf life. With a dedicated light recipe you will be able to influence the amount of volatile organic compounds which can optimize these characteristics.

For example, studies have confirmed that arugula grown in a city farm or multilayer cultivation set-up with special LED lighting, can contain ten times higher vitamin C* content than the normal daily amount recommended. Special light recipes can also be used to reduce nitrate levels and intensify flavor.

* The recommended daily intake of vitamin C suggested by the United States National Institutes of Health (NIH) for men age 19 and older is 90 mg/day and for women age 19 and older it is 75 mg/day.

As a grower, you are always aiming for the best recipe for growth – working to optimize results, minimize risks, and increase yield. Of course you also want to have maximum control over your investment and operational costs, and take full advantage of LEDs to improve your business results. A successful LED-based growth strategy provides three key benefits for greenhouse or multilayer cultivation.



Predictable growth

LED lighting gives you better control over your climate and your crop, so you can produce high yields of high quality crops at the right time. Multilayer cultivation in particular also gives you more flexibility in steering your cultivation schedule. Get more uniform heads of lettuce, exactly when planned, to meet customer needs. You are in charge with LEDs.



Higher quality

The right light and growth recipe can help you tailor the size, taste, and nutritional value to meet specific customer demands. Grow lettuce and leafy greens with lower nitrate

levels and longer shelf life and reduce the risk of tip burn.

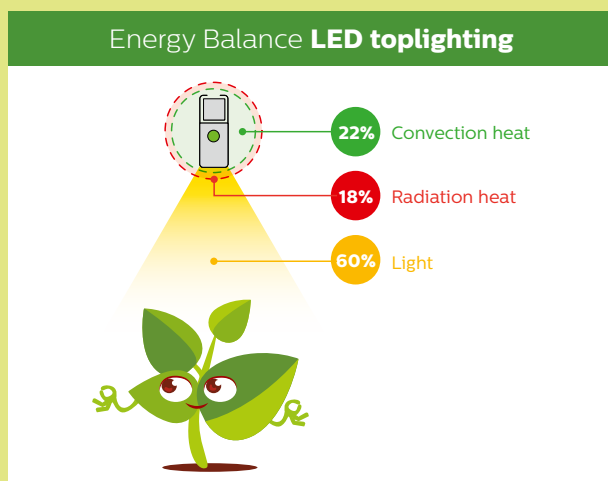
By controlling all components within the cultivation process in a vertical farm you can grow pesticide free, healthier crops.



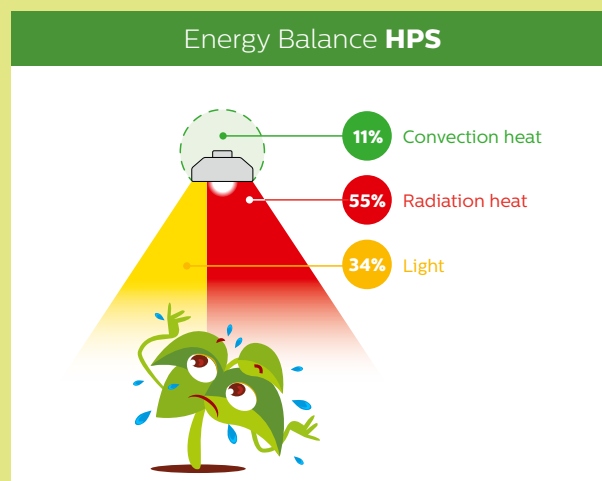
Higher yield

Increase yields with LED lighting compared to natural daylight or HPS lighting. You can apply higher light levels to grow more in the same space and to improve results in every growth phase: higher germination rates, better rooting and accelerate growth. Gain better control over your growing environment, while reducing waste and production cycles year round.

What is the difference between LED and HPS grow lights?



One important aspect is understanding how to grow your crops with LED lighting. When comparing the energy balance of LED lighting versus HPS lighting, each converts electricity into light and heat differently. Using the same amount of energy, LED modules deliver more light and less radiant heat. This does call for new growth strategies for lettuce crops.



High levels of radiant heat can stress or even burn lettuce plants and leafy greens. With LED lighting you can control heat and light separately. You can apply higher levels of light to plants with much less radiant heat than HPS lighting. A lower crop temperature means you will have to raise the ambient temperature in your greenhouse and manage the related change in climate. Learn more about the influence on your climate from our experienced plant specialists.

Why partner with

You want to be sure to get a rapid return on your investment and have all aspects of your project carried out professionally. With Signify, your project is in experienced hands. Signify is the global leader in the lighting sector and has built up a substantial track record in more than 500 projects in the horticultural lighting market since 1995. This includes over two decades of dedicated experience developing LED-based light recipes that optimize growth in a greenhouse or vertical farm environment. By collaborating with leading growers and research institutes around the world, we gain knowledge that is used to fine-tune our Philips GreenPower LED solutions so they provide the greatest value to growers.

Getting the most out of your business

With our extensive lighting know-how and plant expertise, Signify can offer growers the best advice on how to successfully grow with Philips LEDs. We supply the most reliable techniques and LED products for growing indoors, in both greenhouses and vertical farms.

Proven growth recipe for your crop

You can rely on our plant specialists for advice about the range of possibilities with supplemental lighting based on the specific needs of your crop and customers. Each plant specialist has a background in agricultural science and is continuously involved in research trials with universities, agricultural research institutes and individual growers to stay up to date on the latest results with Philips LED lighting. They can help you adapt your facility to take advantage of the benefits of Philips LED lighting, control heat and light separately and manage the related change in

climate settings in your greenhouse or vertical farm with LEDs. Growers investing in vertical farms or multilayer set-ups can benefit from the resources of Philips GrowWise Center. Here we research and develop growth recipes so we can provide advice about the right seed varieties, spacing strategy, humidity, temperature, and other factors influencing growth to get you the highest yield per square meter. You can also carry out trials of your own varieties at our GrowWise Center and BrightBox test facilities to fine-tune crop characteristics, like shelf life, coloration, vitamin and nitrate content, etc.

Lighting design & installation

Our application engineers work closely with your local Philips Horti LED partner to draw up a detailed lighting design for your project. Our engineers can help you select the correct light intensity, lighting distribution, and layout to maximize your results.



Extensive lighting knowledge and plant expertise



Understand the growers business thanks to our Horti experience and global network



Most reliable LED solutions suited for horticulture

Signify?

Did you know

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Make your choice

Philips products

“

The color is much deeper,
darker and richer with LEDs.
And the taste is better.”

John Bonner, Great Lakes Growers, USA

Realistic business case and financial assistance

The payback period for your Philips LED investment depends heavily on your growth strategy, marketing approach, financial situation, etc. Factors that affect the payback include the price you get for your crop, the energy costs in your region, your geographic location and your local climate.

To help you make a realistic decision about your new lighting installation and how you can get the most out of your LED investment, our key account manager provides you with a business case calculation based on your goals, crop and growing situation. It shows how long it will take you to repay the investment, as well as your savings and additional potential earnings over time. This realistic business case can be used to support your financial planning and to convince your financial backers. Signify can also help you in the process of financing your LED investment.

Local support every step of the way

We work with a global network of certified Philips Horti LED partners and one of our local partners is always involved in your project. Based on the detailed lighting design prepared together with our application engineer, the local partner is responsible for installing your Philips LED solution. Beyond that, we offer grower training courses to help you expand your knowledge, as well as specialist support after installation.



“

Customers prefer the excellent taste and appearance of our lettuce over our competitors' product.”

Hitoshi Wada, Innovatus

At Signify we understand that your business is unique and that there are many factors involved when considering complementary LED lighting for your leafy greens. We offer a unique approach that brings together different competencies dedicated to helping you make the best decision to grow your business.

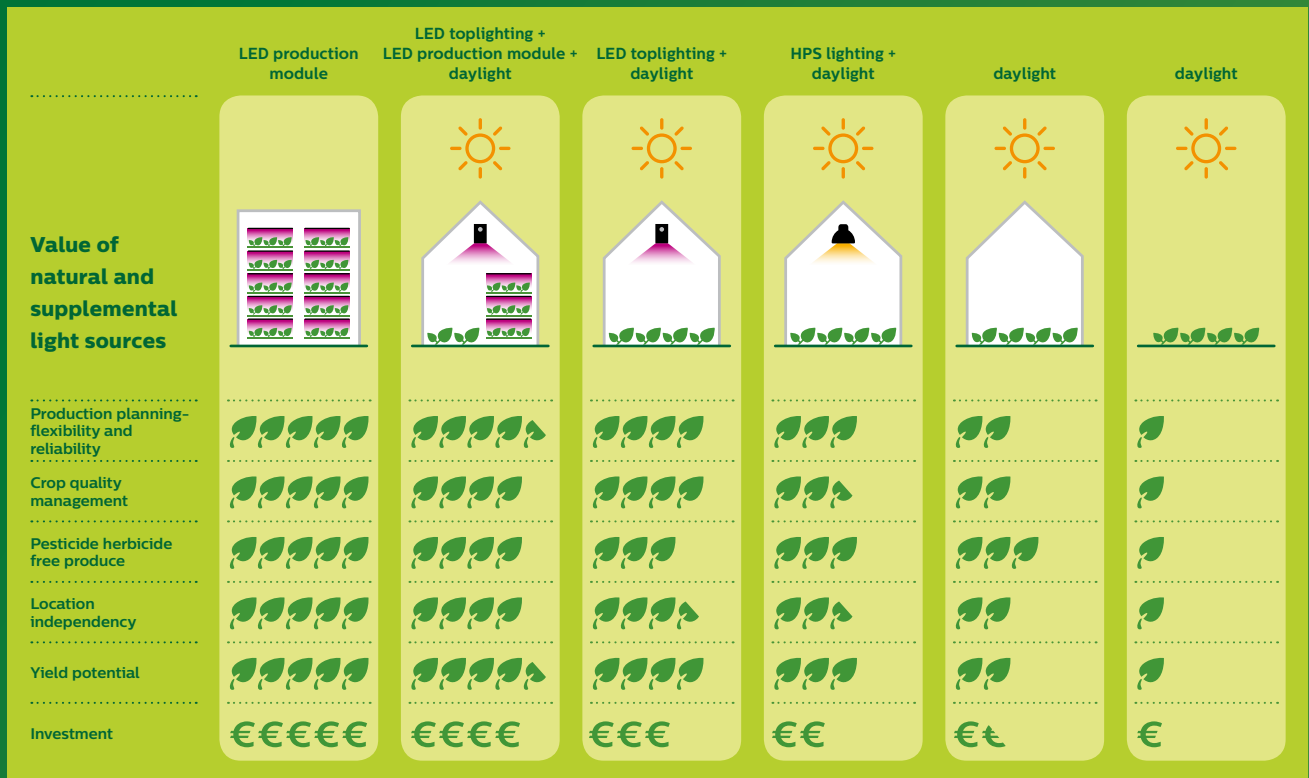
- Did you know
- Why LED?
- Why Signify?
- **Make your choice**
- Philips products

What is **your best option?**

What is your most effective lighting installation?

Specific challenges of growing lettuce crops with LED lighting include achieving the right coloration, preventing tip burn, and getting compact and heavy heads of lettuce. An additional question for vertical farms and multilayer set-ups is how to make the most efficient use of space and ensure a continuous stream of product all year-round.

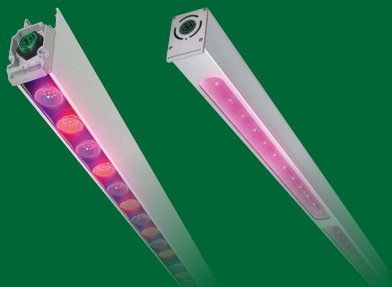
Your most effective lighting installation depends on your situation. For greenhouses, it is important to consider the layout and height of your greenhouse, the existing supplemental lighting you are already using and limitations in your electrical capacity. Philips GreenPower LED toplighting is ideal in a new greenhouse where the electrical installation and uniformity can be optimized in the design-in phase.



Reliable Philips GreenPower LED products **for growth like never before**

Due to its large global network, Signify has the resources to provide high quality and cost-efficient product offerings for both small and large projects worldwide. Every grower has different needs, so we offer a variety of Philips GreenPower LED products that support you in making the most of your crop and growing situation.

Philips GreenPower LED toplighting



Where to use?

- Replace HPS in existing greenhouse
- Add additional LED light to your HPS installation
- New installation

Key benefits

- High yields
- High and consistent quality
- Excellent taste and coloration
- Long shelf life
- Optimized greenhouse climate
- Reduced energy costs
- Less water usage
- Decreased risk of tip burn

Philips GreenPower LED production module



Where to use?

- Vertical farm/city farm/indoor growing, without sunlight
- Multilayer set-up
- For young plant production and full cultivation cycles

Key benefits for propagation of young plants

- Higher germination rate, better rooting, less transplant shock, less losses
- Better control over planning; finished plant; field holding (post-harvest treatment)
- Year-round young plant availability
- Shorter propagation cycle, higher yield
- Consistent quality, high level of uniformity
- More flexibility due to in-house propagation
- Consistent cost of production year-round

Key benefits for full crop production

- Less losses of plants, higher production
- Shorter production cycle, higher yield
- Better ability to manage fluctuations in supply and demand
- Higher and consistent quality, steer specific traits like color, taste, nitrate levels, shelf life
- Consistent cost of production year-round
- Pesticide free cultivation

Philips GreenPower LED products combined with our dedicated light recipes open new opportunities for growers of lettuce and leafy greens to increase yields and move to predictable year-round production. Our dedicated horticultural LED lighting with an extensive lifetime of up to 35,000 hours and a proven track record across the globe will increase the quality of your crop and guarantee more predictable growth. Our LED lighting products deliver excellent lighting uniformity and ultimately consistent growth results. Thanks to passive cooling, our products require less maintenance compared to water- and fan-cooled units. The streamlined product design ensures that light gets to where it is needed for your crops.

The design of a LED module has a significant impact on its overall performance and lifetime. At Signify we take all the necessary steps to make sure your LED products are reliable and provide longlasting performance. We put each component through a battery of stringent technical and mechanical tests. Each Philips LED module is backed by our guarantee of quality to meet your requirements.

For growers and researchers looking for more flexibility and precision in steering the growth of their crops, Philips GreenPower LED production module Dynamic is the perfect choice. It allows you to create light recipes that can be dynamically adjusted with the GrowWise Control System, creating the optimal light intensity and color spectrum during the day or growing process. You can use it to grow an ever-changing variety of crops during the year. Or to investigate the effects of different light recipes or a pre-harvest treatment.

- Did you know
-
- Why LED?
-
- Why Signify?
-
- Make your choice
-
- Philips products**
-

| EU only | | | Global | | |
|--------------------|-----------------------------|-----------------------------|--------------------|---|---|
| | Regular Output | High Output | | Regular Output | High Output |
| Voltage | 400 V | 400 V | Voltage | 200 - 400 V | 277 - 400 V |
| Power | 160 - 190 W | 195 - 210 W | Power | 170 - 185 W | 265 - 285 W |
| Light output | 410 - 520 $\mu\text{mol/s}$ | 600 - 620 $\mu\text{mol/s}$ | Light output | 500 - 550 $\mu\text{mol/s}$ | 800 $\mu\text{mol/s}$ |
| Efficacy | 2.6 - 3.1 $\mu\text{mol/J}$ | 3.0 - 3.2 $\mu\text{mol/J}$ | Efficacy | 2.7 - 3.2 $\mu\text{mol/J}$ | 2.8 - 3.0 $\mu\text{mol/J}$ |
| Ingress Protection | IP66 | IP66 | Ingress Protection | IP66, UL/CSA rating: Suitable for dry, damp and wet locations | IP66, UL/CSA rating: Suitable for dry, damp and wet locations |
| Lifetime | L90B50: 35,000 hrs | L90B50: 35,000 hrs | Lifetime | L90B50: 35,000 hrs | L90B50: 35,000 hrs |

| 120 cm | | 150 cm | |
|--------------------|---|--------------------|---|
| Voltage | 120 - 277 V | Voltage | 120 - 277 V |
| Power | 10 - 25 W | Power | 12.5 - 32 W |
| Light output | 25 - 66 $\mu\text{mol/s}$ | Light output | 31.5 - 83 $\mu\text{mol/s}$ |
| Efficacy | 2.5 - 3.0 $\mu\text{mol/J}$ | Efficacy | 2.5 - 3.0 $\mu\text{mol/J}$ |
| Ingress Protection | IP66, UL/CSA rating: Suitable for dry, damp and wet locations | Ingress Protection | IP66, UL/CSA rating: Suitable for dry, damp and wet locations |
| Lifetime | L90B50: 35,000 hrs | Lifetime | L90B50: 35,000 hrs |

Note: All data is subject to change

Lifetime and maintenance values are given at an ambient temperature of 25 °C | 77 °F. All measured lifetimes are industry standard measurements indicating average length of operation and not a performance claim specific to any individual product.

Head for success with Philips LED technologies

Take control of quality, yield, and costs for your lettuce crops and leafy green cultivation. Philips LED technologies supply the recipe for growth that helps you succeed. Get predictable, high quality, high production crops that help you attract new customers and build preference for your brand. Gain maximum control over your investment and operational costs.



More questions?

Visit our website
www.philips.com/horti
www.philips.com/hortiblog

Write us an e-mail:
horti.info@signify.com

Or tweet us:
[@PhilipsHorti](https://twitter.com/PhilipsHorti)



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Document order number: 4422 944 05848 A
10/2018
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