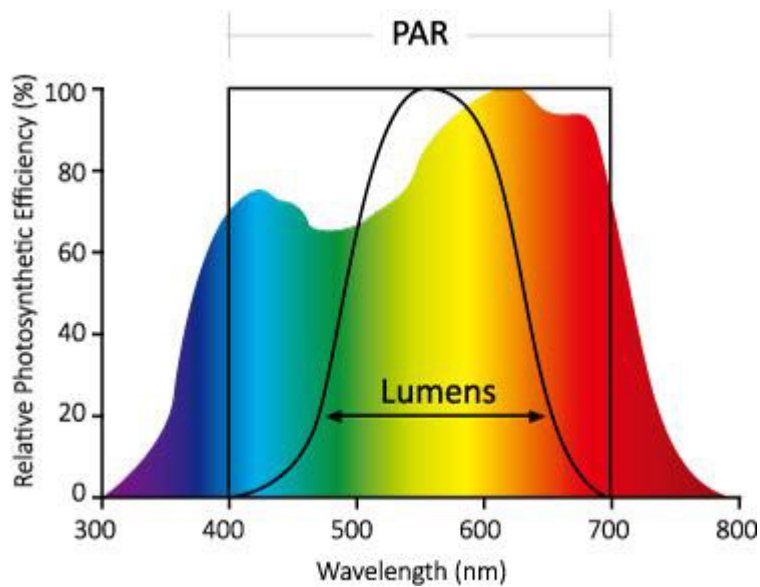


## 1. PAR (Photosynthetically Active Radiation)

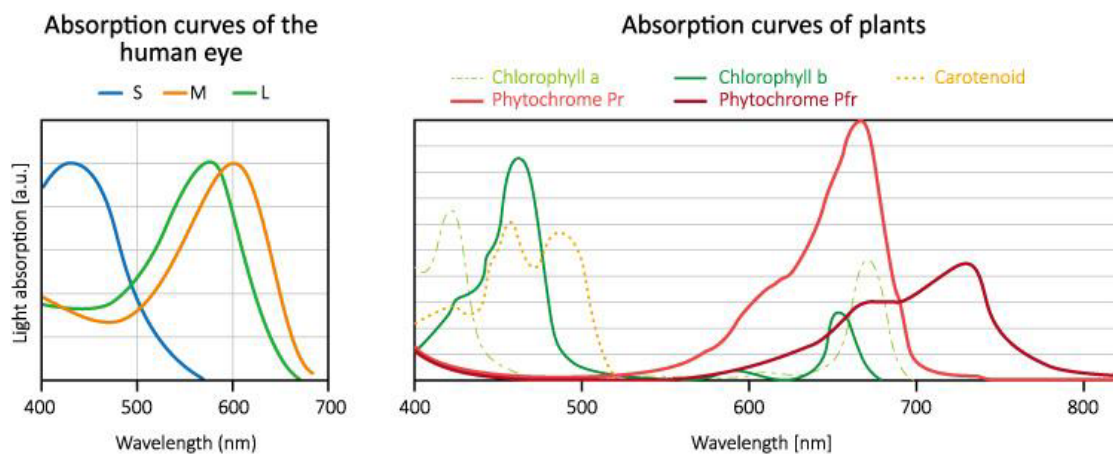
PAR looks at the wavelength range of 400nm to 700nm.



Light is generating a photochemical reaction.

In our eye it is reacting with the photo receptor in different versions S, M and L.

In plants, the light is reacting with Chlorophyll a and b.



## 2. Photosynthetic Photon Flux (PPF)

The total amount of light (PAR) that is produced by a light source each second.

PPF measures the “photosynthetically active photons emitted by a lighting system per second”.

Expressed in  $\mu\text{mol}/\text{second}$ .

PPF does not tell us how much of the measured light actually lands on the plants or any other surface.

Neither it tells us something on the composition of the photons and wavelength of these, having a big impact on the efficiency used by crops.

## 3. Photosynthetic Photon Flux Density (PPFD)

Photosynthetic Photon Flux Density (PPFD) measures the light that actually arrives at the crop canopy.

The amount of light that actually reaches your plants and algae within the PAR region or the number of photosynthetically active photons that fall on a given surface each second.

Expressed in  $\mu\text{mol}/\text{s.m}^2$ .

This also explains why LED grow lights foreseen from advanced optics outperform those without optical controls. Similar to white light applications, a LED emitter has a rather large light distribution – without corrections by optics controls a big piece of the emitted PPF energy doesn’t land on the canopy where you want it.

Optical controls by TIR (Totally Internal Reflection) lenses also improves the leaf canopy penetration in a similar way a diffuse greenhouse glass creates more light scattering and a better homogeneous light distribution over the leaves.



Light is more homogeneously distributed under diffuse light **(B)** compared with direct light **(A)** where many sun flecks in the middle and lower part of the canopy are seen.

## 4. Daily Light Integral (DLI)

Daily Light Integral (DLI) measures the total amount of light that is delivered to a plant every day. DLI is a cumulative measurement of the total number of photons that reach the plants and algae during the daily photoperiod.

DLI measures the number of “moles” of photons per square meter per day and is expressed as  $\text{mol/d.m}^2$ .

## 5. Photon Efficacy

Photon Efficacy refers to how efficient a horticulture lighting system is at converting electrical energy into photons of PAR.

With the PPF and the input wattage, you can calculate the efficiency.

Expressed in  $\mu\text{mol/J}$ .

The higher the number, the more efficient a lighting system is at converting electrical energy into photons of PAR.

But remember this number doesn't tell us anything about the effectiveness of the light on your crops and doesn't count the light frequencies above 700nm.

Need more LED grow lights information , please kindly contact [info@fmelighting.com](mailto:info@fmelighting.com) or visit [www.fmelighting.com](http://www.fmelighting.com) to know more about it .