

Plant lighting



Marco Leißing



content

- Choice of theme
- Photosynthesis
- Application
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- Conclusion

choice of theme

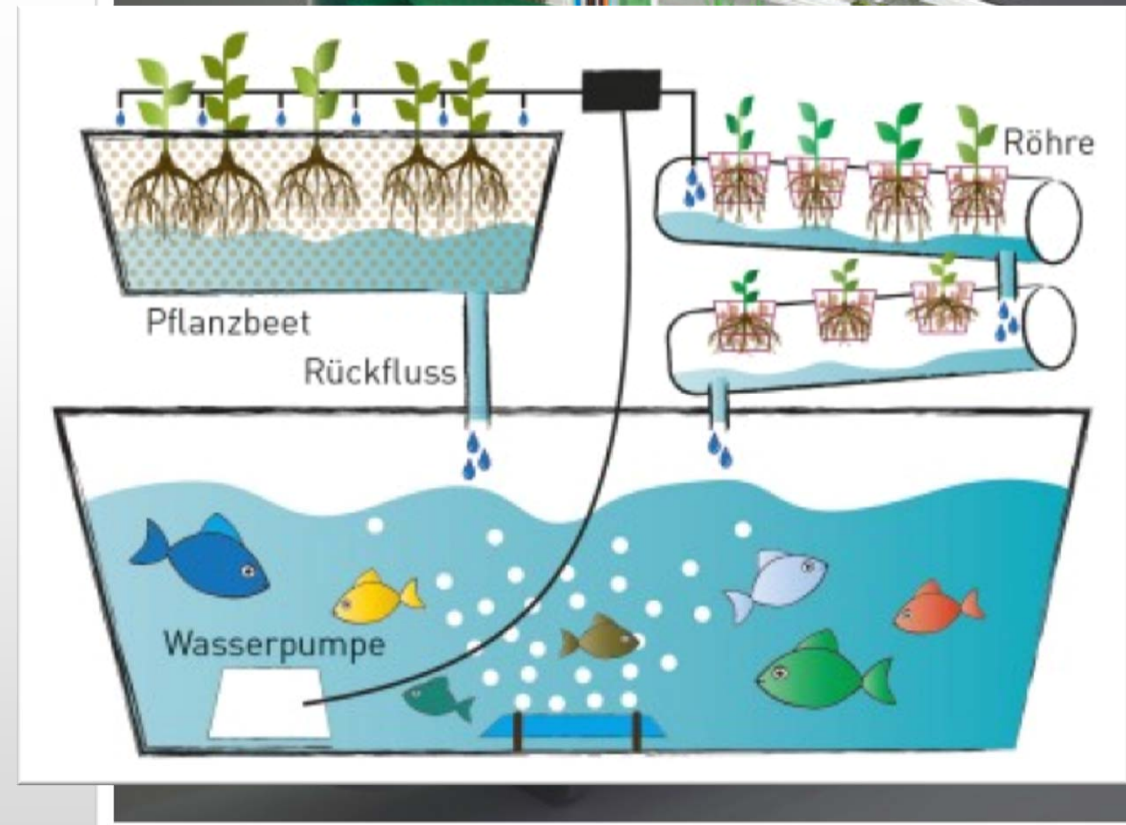
- Why illuminate plants artificially?
- Increasing population
- Conurbations
- Regionality
- inFARMING®
- The company Infarm



Quelle: <http://weburbanist.com/2015/01/11/worlds-largest-indoor-farm-is-100-times-more-p>

choice of theme

- Aquaphonik
- Philips-kitchen

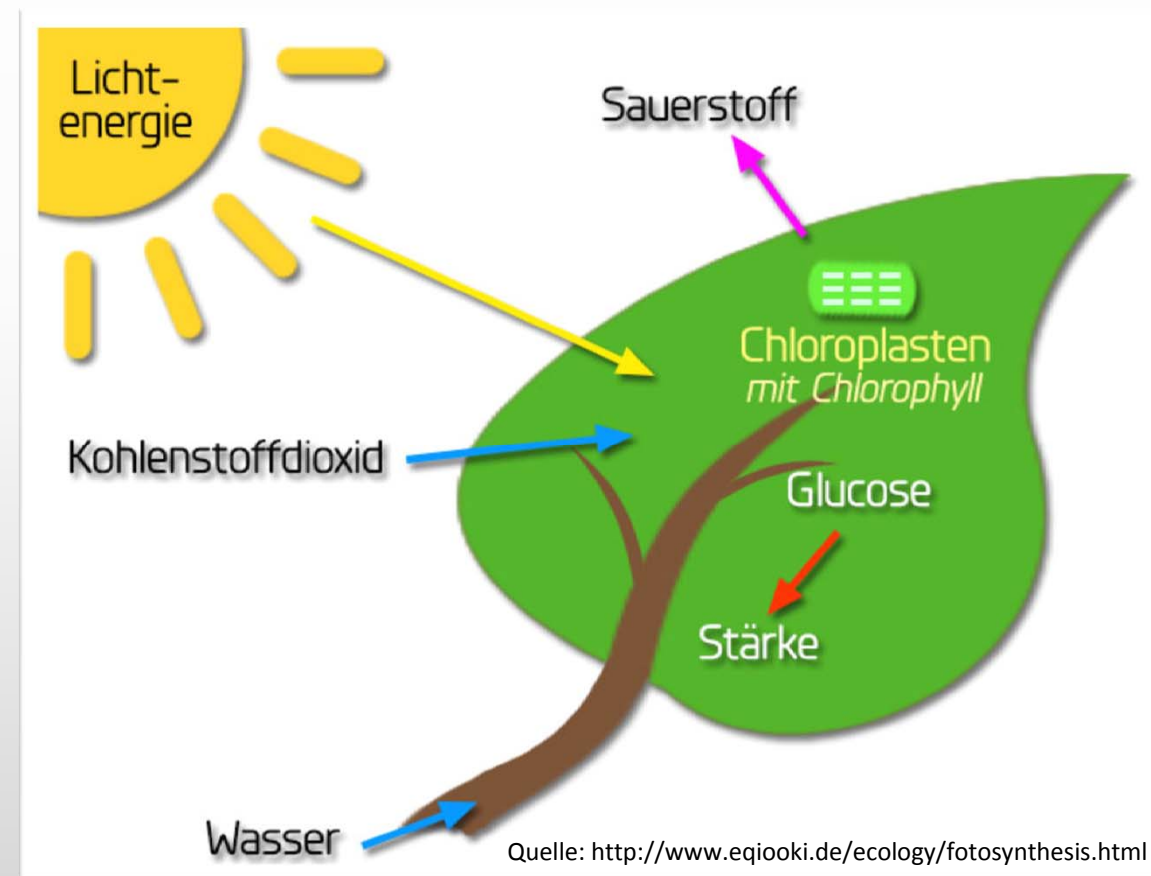


Quelle: <https://11tech.wordpress.com/2009/08/28/spaciges-gadget-philips-baut-mini-farm-fur-die-kueche/>

photosynthesis

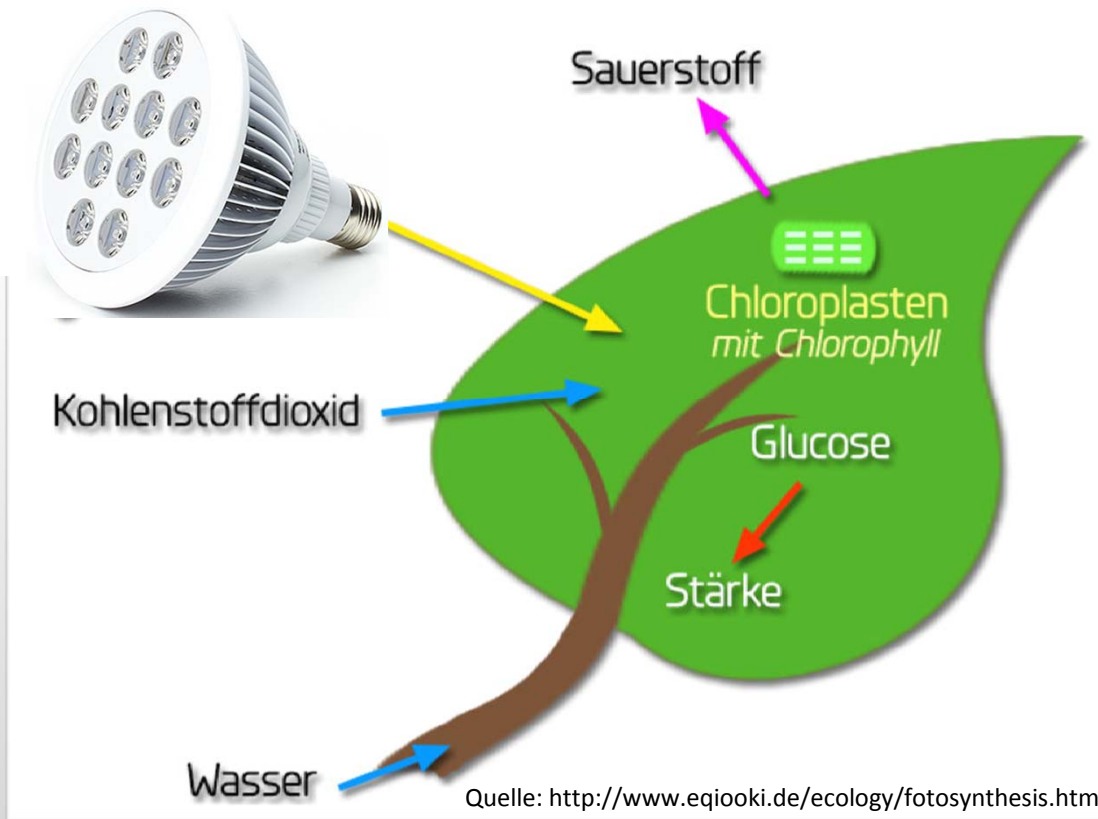
photosynthesis

- Photosynthesis
- CO₂ + water + nutrients + light
- Glucose
- Light energy



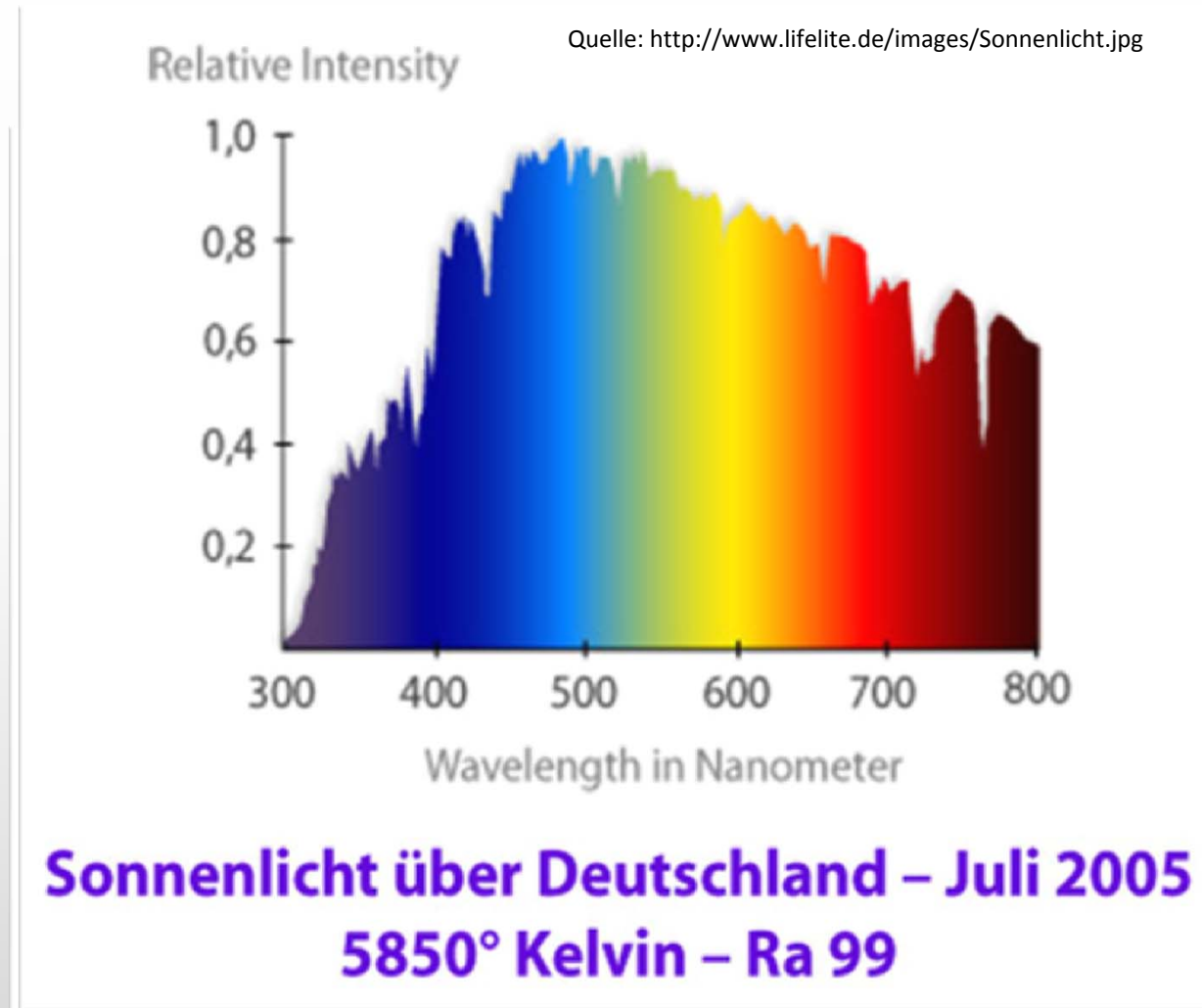
photosynthesis

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- CO₂ + water + nutrients + light
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photosynthesis

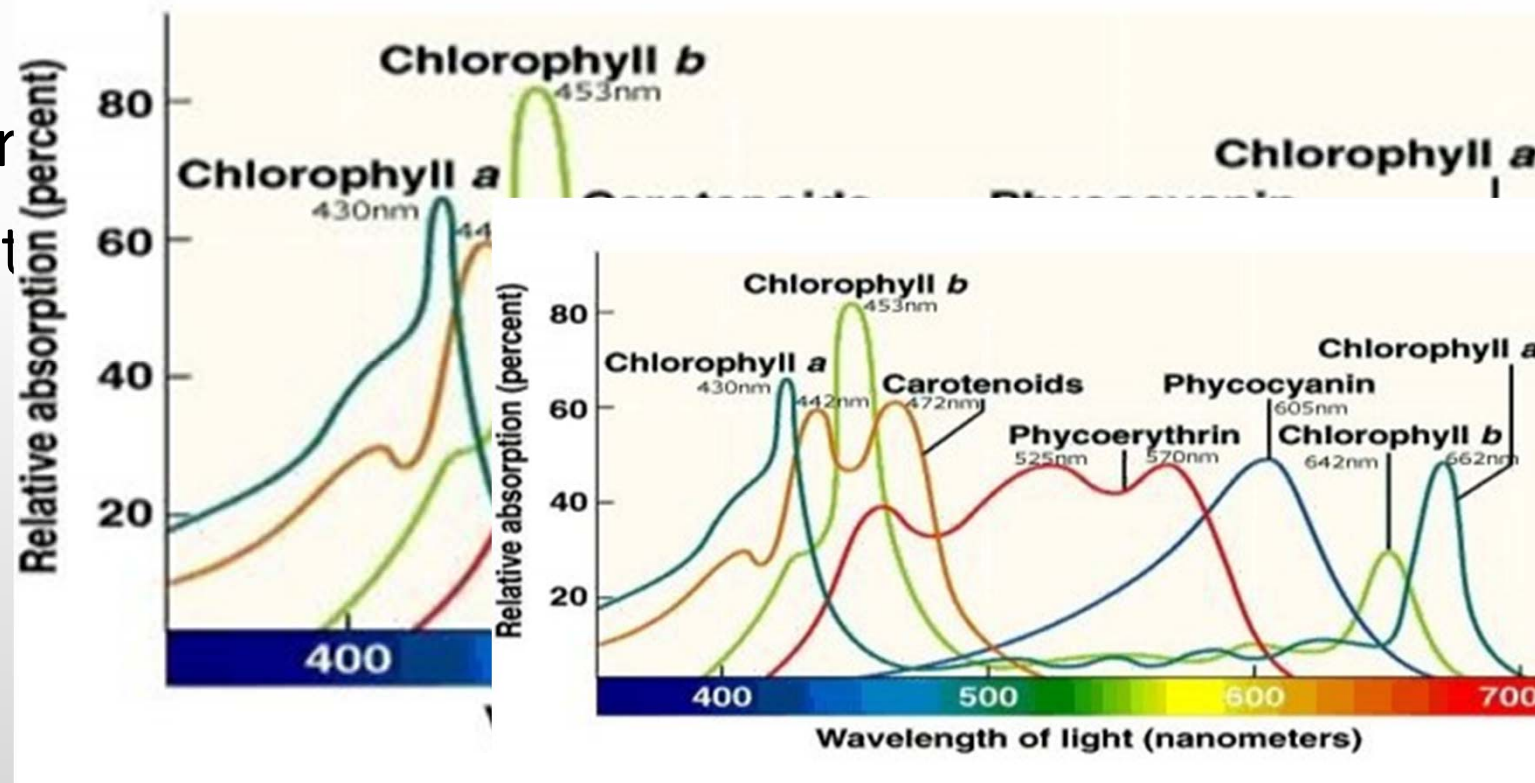
- Why is the plant green?
- Plant sensitivity curve
- Wavelengths needed
- Efficient lighting



Quelle: <http://www.redusystems.de/de/innovation/pflanzen-brauchen-gesamtes-par-spektrum/>

photosynthesis

- Chlorophyll a und b
- Ratio 3:1
- Chlorophyll a → ener
- Chlorophyll b → phot



Quellen: <http://www.lumen-laden.de/products/a10-w-led-pflanzenlampe/>

application

application

- Supplementing the daylight
- Extension of the day
- Replacement of daylight

application

- Supplementing the daylight
 - Natural intensity low
 - Total amount of radiation
 - Effectiveness → intensity, duration, degree of supplement to daylight



Quelle: <http://www.mpg-trier.de/island/MPG12/files/agrarwirtschaft/gewaechshaeuserkultur.h>

application

- Extension of the day
 - Short intervals of artificial light
 - Manipulation of flowering time

application

- Replacement of daylight
 - No daylight
 - Phytotron
 - 100% control of parameters



Quelle: <http://www.faz.net/aktuell/gesellschaft/kriminalitaet/hanfplantagen-in-holland-verdacht-auf-dem-dach-13412085.html>

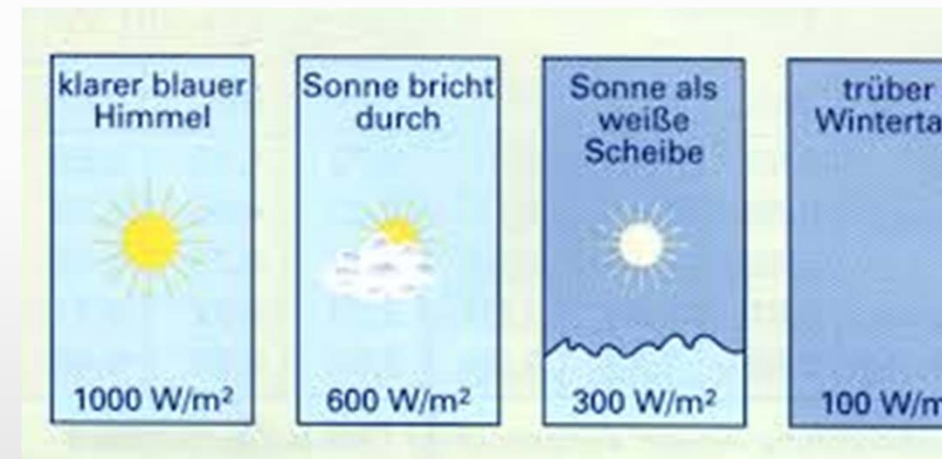


Quelle: <http://www.rhenac-greentec.de/systeme-fuer-pflanze>

lamp types

lamp types

- Vis-spectra
 - cool (6500 K) → growth
 - warm (2700 K) → blossom
- irradiance E_e [W/m^2]
 - 200 – 300 [mW/m^2] for strawberry
 - 60.000 [mW/m^2] cereal plant
- lamps
 - Power in W
 - Illuminance in Lux



Quelle: <http://www.schulungsstelle-traunstein.de/Energieberatung/background/5304029665089601f/530402966806ae3530402966806f4b2a/index.html>

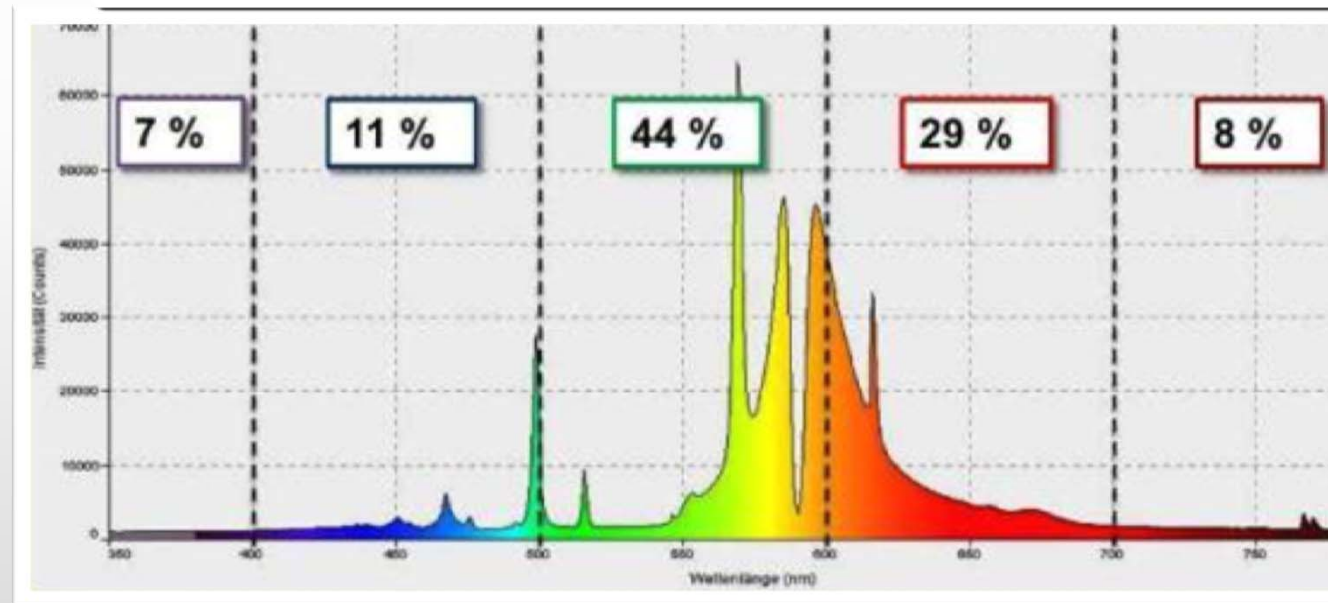
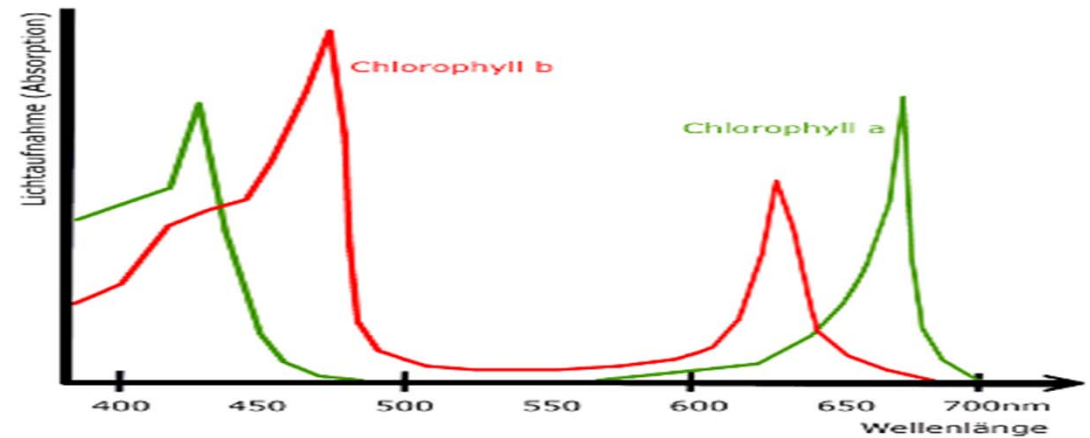
lamp types

- Sodium vapor high-pressure lamp (HPS, NDL, SON....)
 - Gas discharge of sodium vapor
 - High energy efficiency 31%
 - Light efficiency 130-150 lm / W
 - Lightcolor 2000K
 - Robust
 - Lifespan up to 30.000 h
 - Workhorse in horticulture



lamp types

- Sodium vapor high pressure lamp
 - Flower and fruit growth



Quelle: <https://www.lfl.bayern.de>

lamp types

- Energy saving lamp / Fluorescent lamp
 - Mercury discharge low-pressure lamp
 - Integrated ballast (compact)
 - Very low heat generation
 - Energy efficiency 15-20 / 29 %
 - Light efficiency 70/100 lm / W
 - Wide range of color temperatures
 - sowing , wintering , Primary care



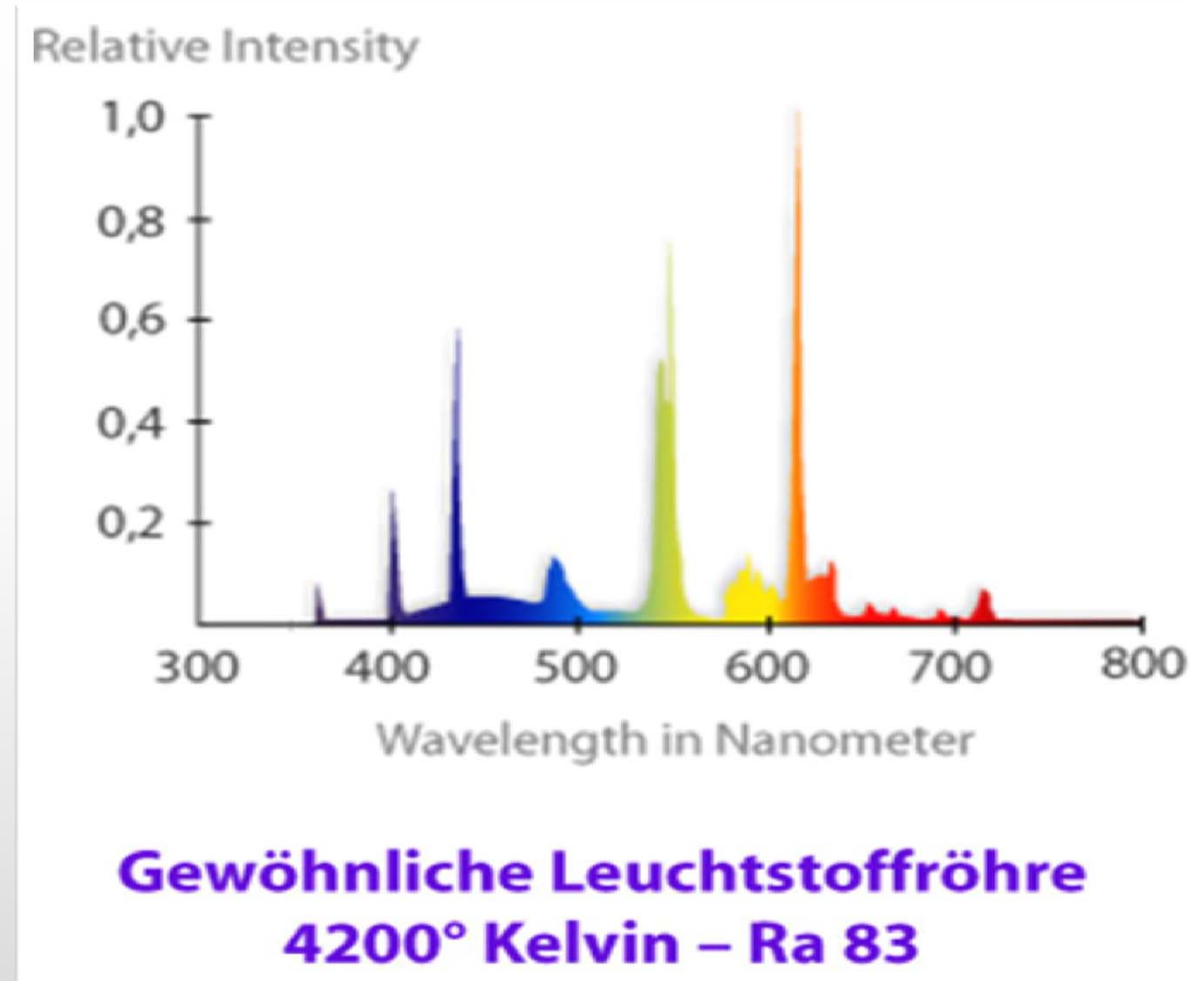
Quelle: <http://pflanzen-lampen.de/>



Quelle: <http://rumed.de/premium-line/licht/>

lamp types

- Energy saving lamp /
Fluorescent lamp



Quelle: http://www.lifelite.de/images/Gew_1.jpg

lamp types

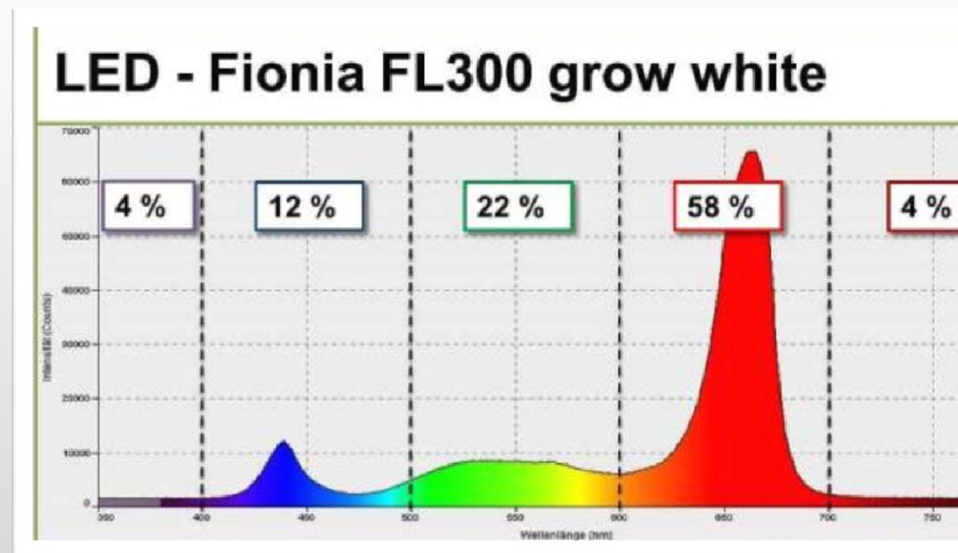
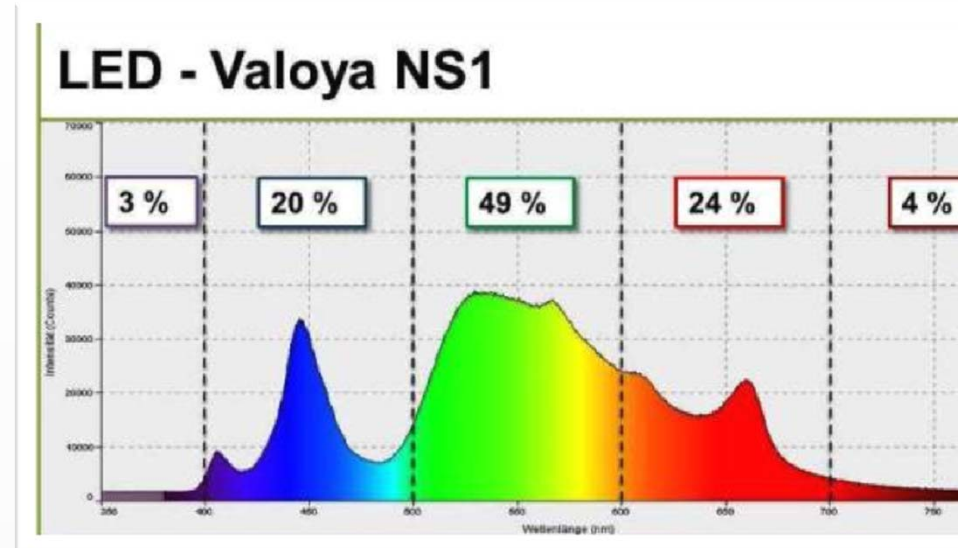
- LED (Light Emitting Diode)
 - Modern and highly effective
 - Energy efficiency 75-80%
 - Light efficiency up to 300 lm / W
 - Very low heat generation
 - active or passive cooling
 - Color temperature adjustable



Quelle: <http://www.valoya.com/products>

lamp types

- LED (Light Emitting Diode)
 - Light range depends on task



Quelle:

https://www.lfl.bayern.de/schwerpunkte/regenerative_energien/12000

conclusion

- LED technology will lead
- Low energy costs
- Setting the wavelengths
- Last variable parameter
- reproducible quality
- Lower demand on
 - Water
 - Energy
 - Time
- Industrialization

Quellen

Idquellen:

- Hand mit Pflanze ,Quelle: <https://presentationpictures.wordpress.com/2010/07/15/kleine-wachsende-pflanze-auf-hand-junge-pflanzen-young-plants-growing-growth/#jp-carousel-79>

xtquellen:

- <http://weburbanist.com/2015/01/11/worlds-largest-indoor-farm-is-100-times-more-productive/>
- <http://philippinen-projekt.de/de/aquaponik.html>
- <https://de.wikipedia.org/wiki/Chlorophylle>
- Frauenhofer Umsicht; inFarming
- www.tagesspiegel.de; Gemüse ohne Sonnenlicht
- www.pflanzen-lampen.de; Ratgeber Pflanzenlampen 2016
- Künstliche Belichtung im Gartenbau; PHILIPS AEG
- Mehr Licht für mehr Wachstum; PHILIPS

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