



Horticultural Lighting

DOE Emerging Trends
Tuesday, January 27, 2015

Imagination at work



**UN reports
food
demand to
increase by
60% by
2050***

Leaders at UN summit take steps to ensure food security
for 9 billion people by 2050 - 23 September 2014 – Source
UN

Urban population*

1950	- 0.7 billion
2014	- 3.9 billion
2050	- 6.3 billion proj.

Populations Fact – Our Urbanising World - August 2014
– Source UN Department of Economic and Social Affairs –

The evolving food farms



Farm



Greenhouse

Indoor Farm



Retail

Supermarket



Home



Lighting as a production tool?



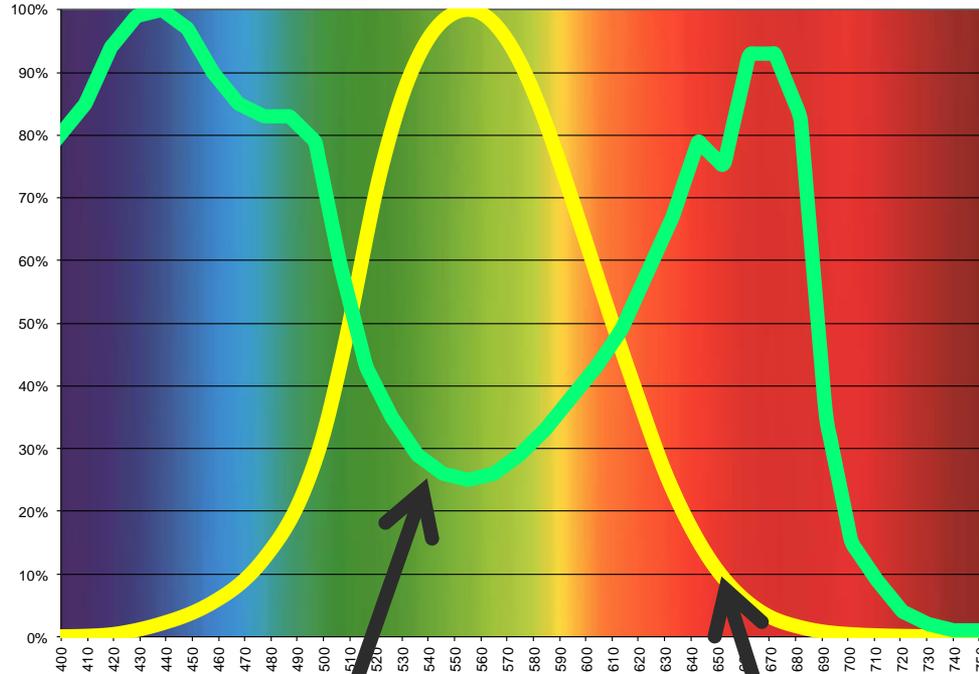
New customer...new needs



Fruits



Leafy Greens



Photosynthetic curve (Plant)

Photopic curve (Human)



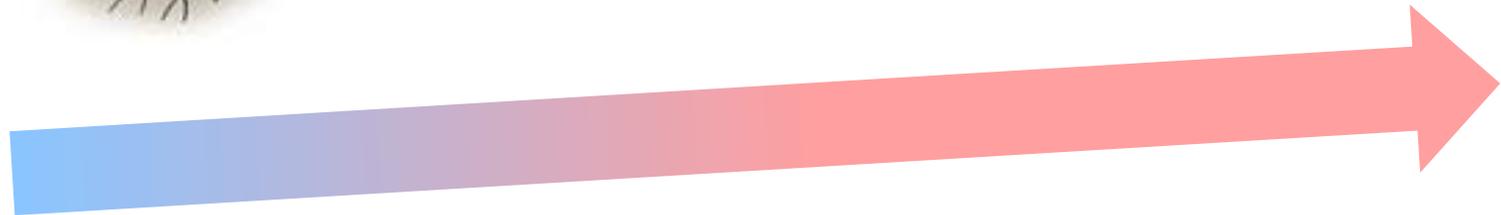
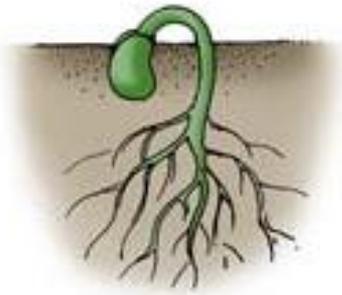
Flowers



Medicine



A plant's nature



Spring

IR / Heat

Summer

Bluer light

Fall

Redder light



The future is today

- Eastern Japan 2013, **25000** Sq. Ft.
- 18 racks each 15 levels, **17000** LED fixtures
- **10000** heads of Lettuce per day (100 fold density increase from outside)
- Grows **2.5X** faster than outside
- Waste from **50% to 10%** compared to outside
- **1%** of water usage compared to outside
- LED **40%** less power than florescent light

