

Fresh Food Production for EDEN ISS



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Aim of cultivation experiments

- Selection crops
- Maximize fresh food production
- High harvest index
- Organize continuous production by careful planning of seeding and harvesting
- Design cultivation recipe for fresh food crops



Climate chambers in Wageningen

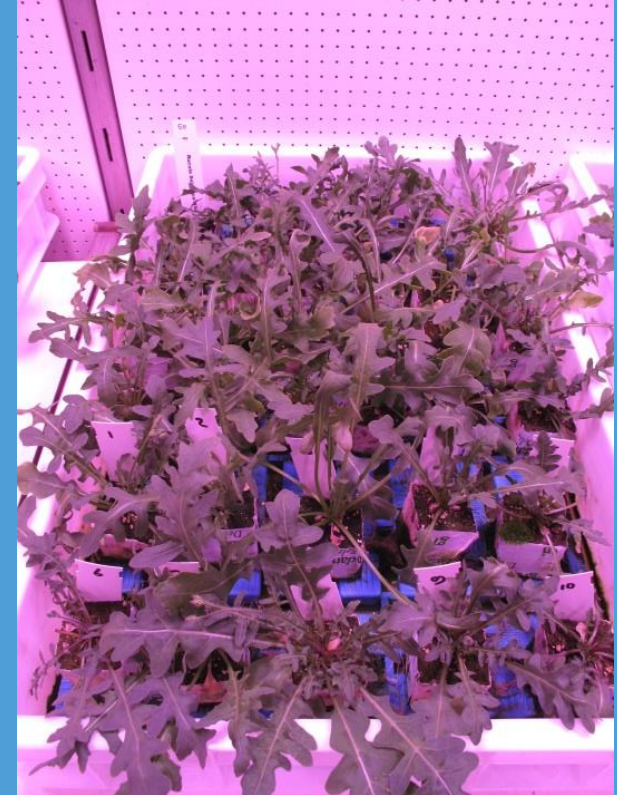


Experiments

- 4 light intensities (200, 300, 450, 600 $\mu\text{mol m}^{-2} \text{s}^{-1}$)
- 2 temperatures: 21/19° and 25/23°C
- Leafy greens, herbs, fruit crops
- Full tray for single harvest, spacing as necessary
- Full tray for spread harvest



Crops





Crispy Green



Red Romaine (Outredgeous)

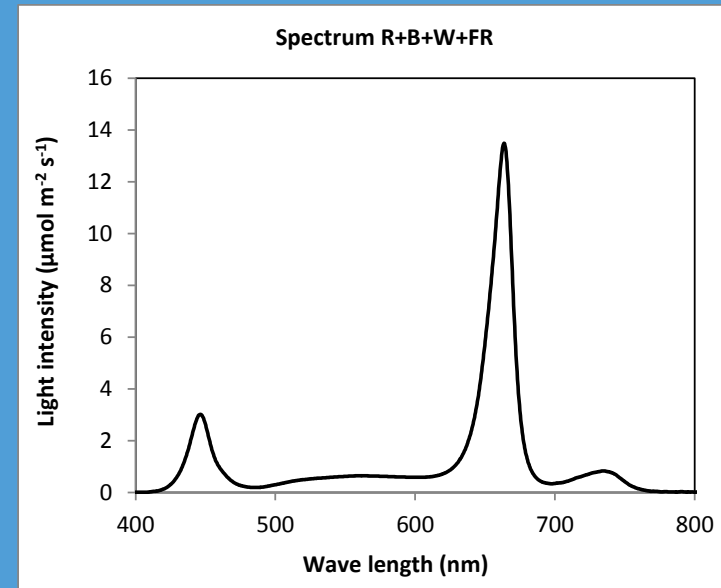


Batavia

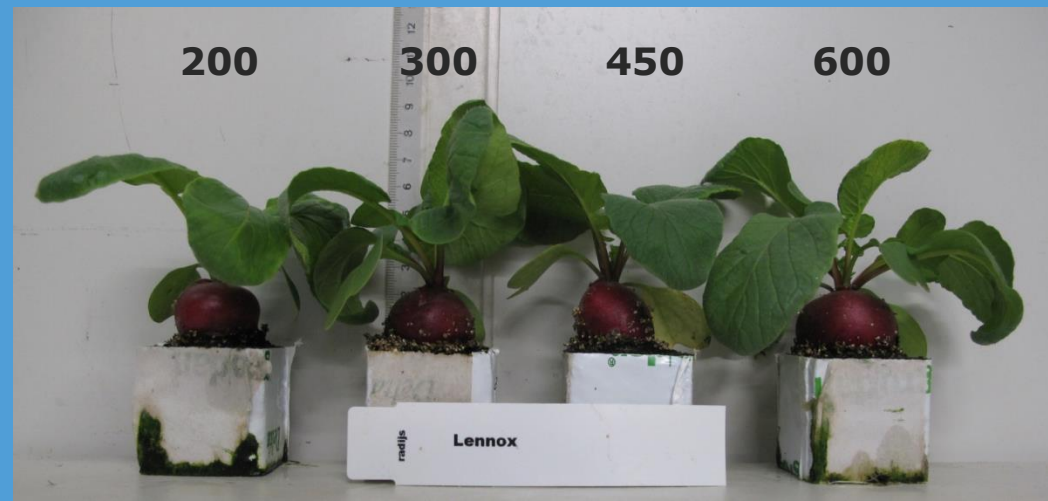
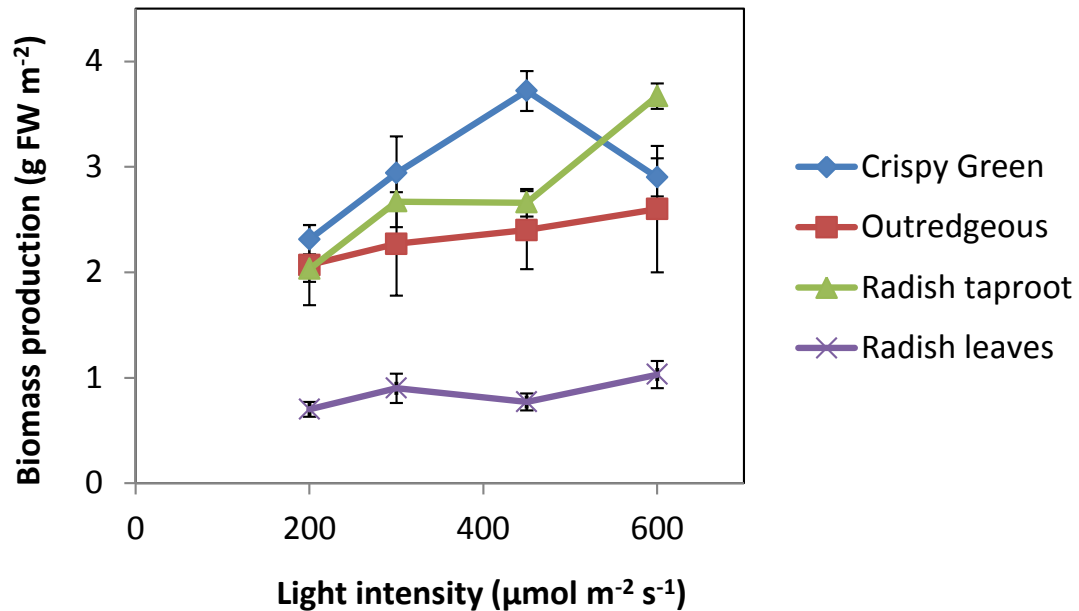


Growth conditions

- Temperature 21/19°C and 25/23°C day/night
- Relative humidity 65-70% and 80-88%
- CO₂ concentration 700-800 ppm
- Light intensity 200-600 $\mu\text{mol m}^{-2} \text{s}^{-1}$
- Light spectrum red/white/blue/far red
- Daily light scheme simulate dawn/dusk



Effect of light intensity



Influence of light on chives



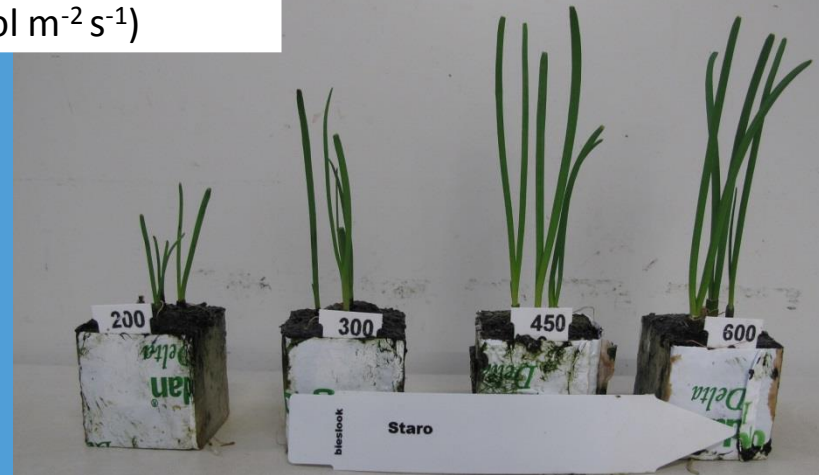
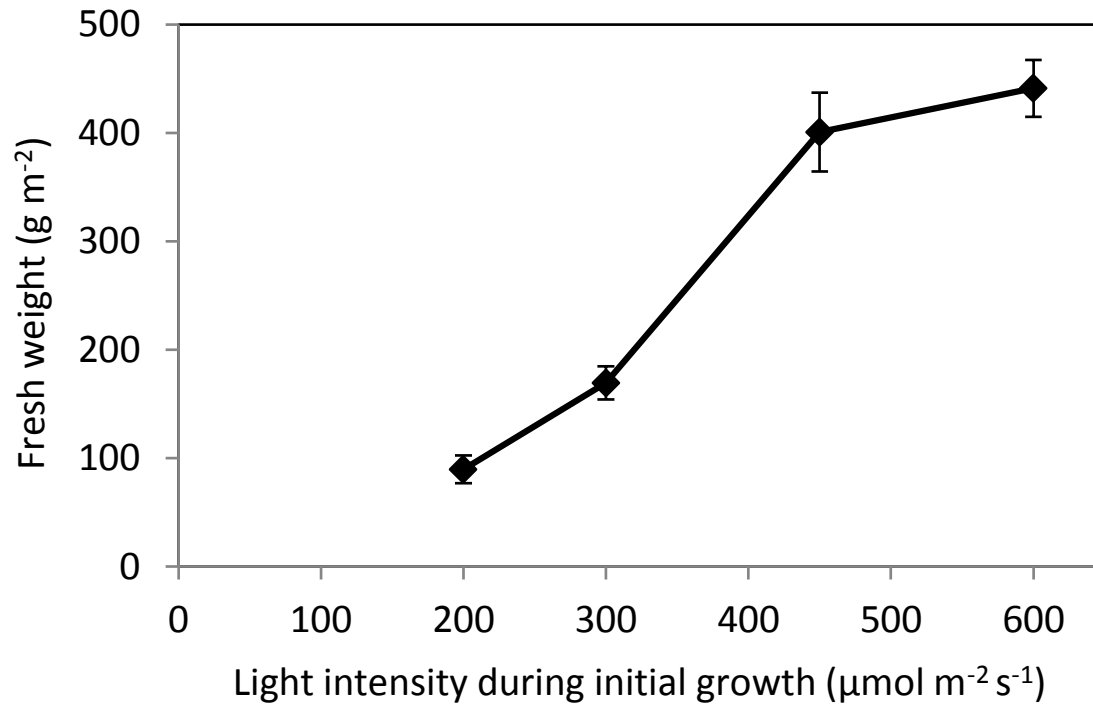
1.5 1.2 1.8 2.2 kg m^{-2}



$300 \mu\text{mol m}^{-2} \text{s}^{-1}$

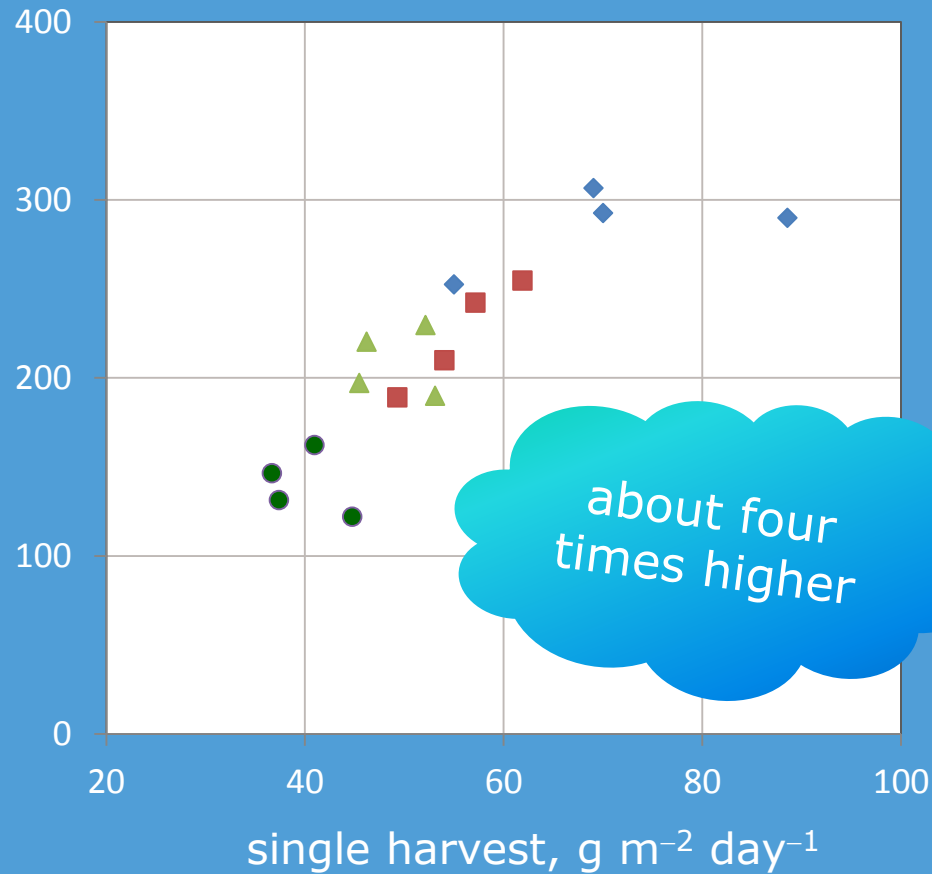


Regrowth at $300 \mu\text{mol m}^{-2} \text{s}^{-1}$



Space use efficiency

spread harvest, $\text{g m}^{-2} \text{ day}^{-1}$



◆ Crispy green



■ Outredgeous



● Batavia

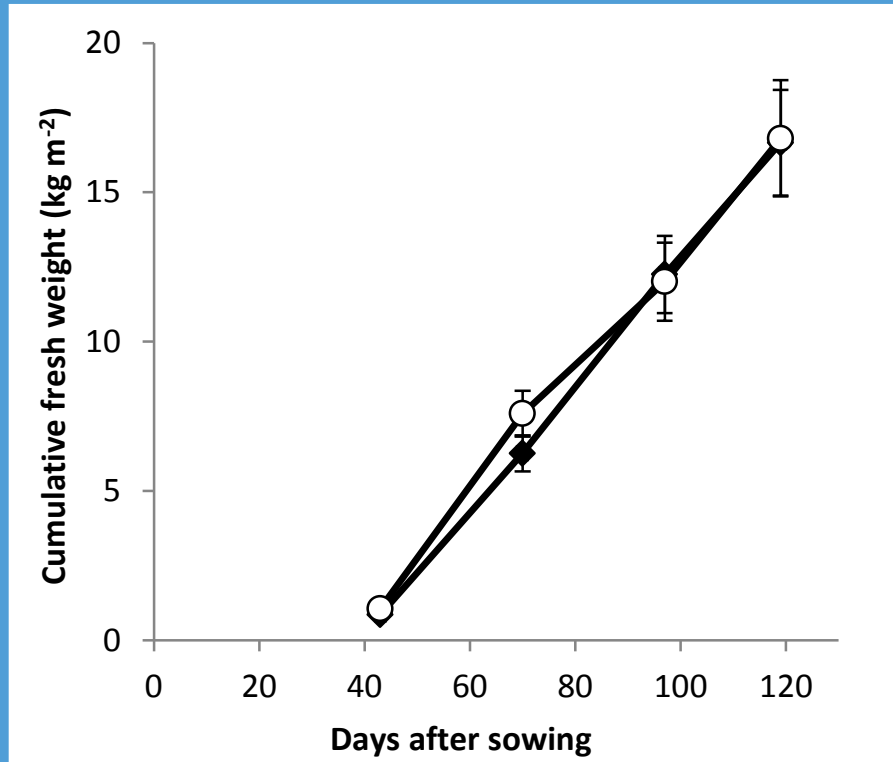


● Spinach

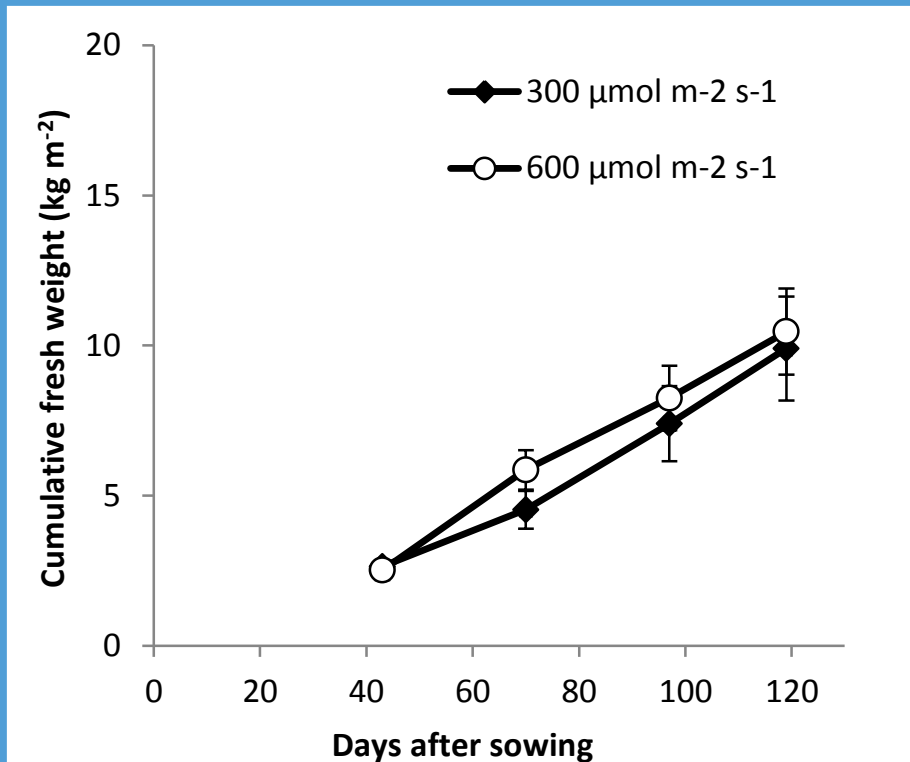


Effect of temperature: Parsley

21/19 °C



25/23 °C



Roots of Parsley and chives



21°C

25°C



21°C

25°C

Effects of temperature

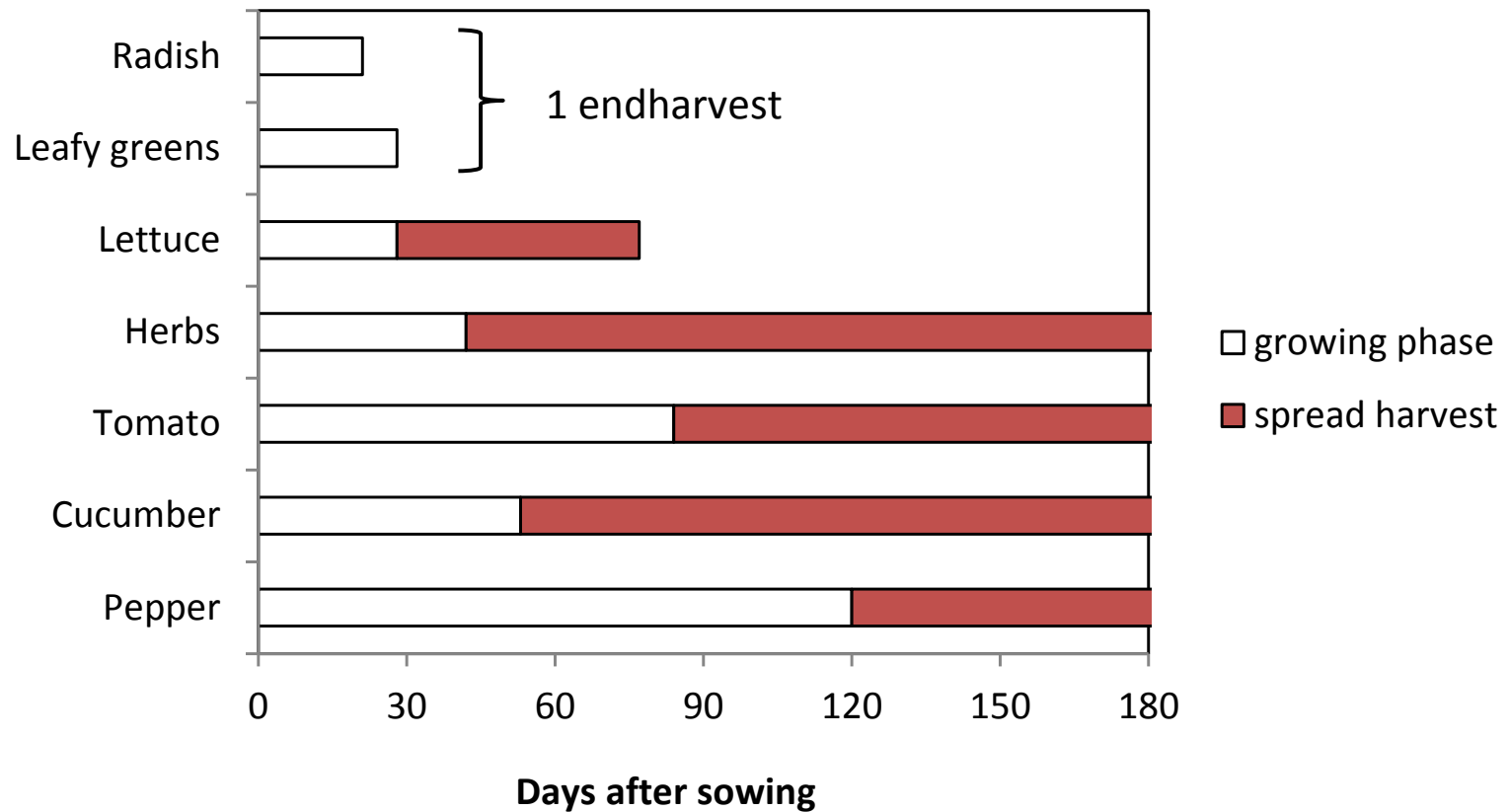
- 25°C increased production of some crops
(Red mustard, rocket, chives)
 - 25°C decreased production of radish
 - Poor regrowth at 25°C
- Advice: cultivate all crops at 21/19°C

Production at 21/19 °C; 300 $\mu\text{mol m}^{-2}\text{s}^{-1}$

Crop	FW per cultivation (kg m ⁻²)	Period (weeks)	Remark
Lettuce	25	11	Spread harvest
Tomato	5.0	16	3 weeks harvest
Cucumber	19.4	16	8 weeks harvest
Radish*	12.8	3	
Rocket	6.2	4	
Red Mustard	7.1	4	
Swiss chard	7.9	7	
Spinach	1.9	7	
Herbs	18	17	regrowth

* Taproot and leaves

Cultivation scheme per crop



Production per week (productive trays)

Crop	FW (kg week ⁻¹ tray ⁻¹)	Trays	Plants tray ⁻¹	Weekly FW (kg)
Lettuce (Crispy)	1.0	2	20	2.0
Tomato	0.4	4	4	1.5
Cucumber	0.6	5	2	2.9
Radish	1.0	1	66	1.0
Leafy greens	0.2	7	40 - 150	1.7
Herbs	0.3	2	150 - 450	0.6
Total		21		9.7

Conclusions

- Cultivation at 21/19° C and 300 $\mu\text{mol m}^{-2} \text{s}^{-1}$
- Radish and chives at 600 $\mu\text{mol m}^{-2} \text{s}^{-1}$
- CO₂ 750 ppm
- Spread harvest for lettuce increases production
- Fresh production per week: max 10 kg

Cultivation recipe

