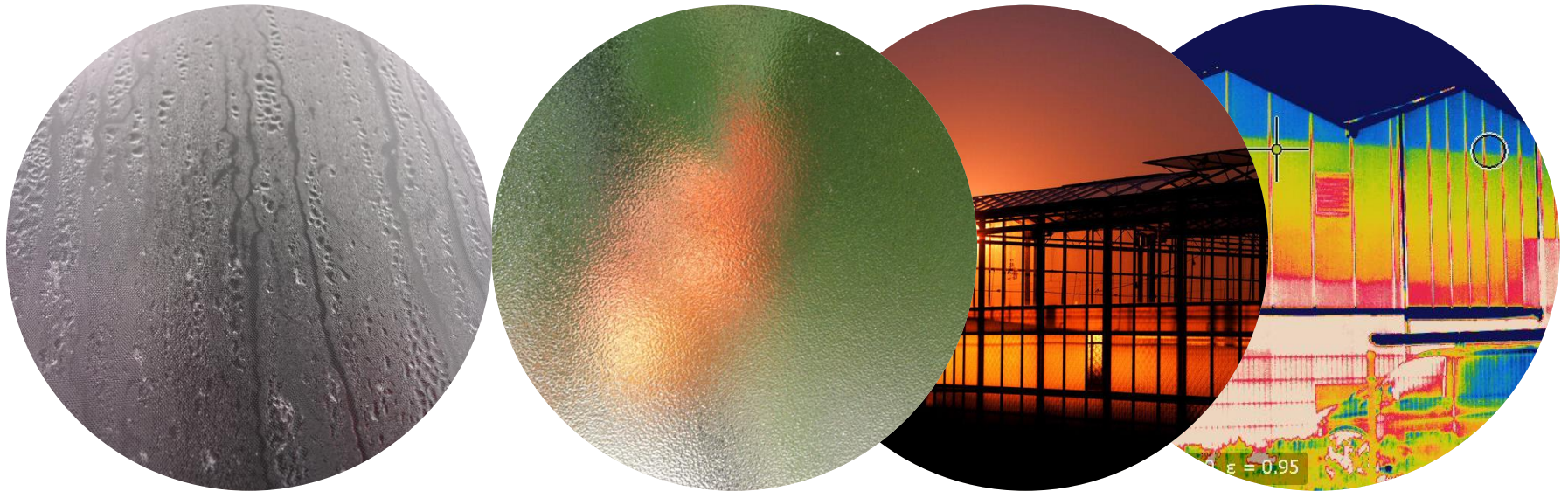
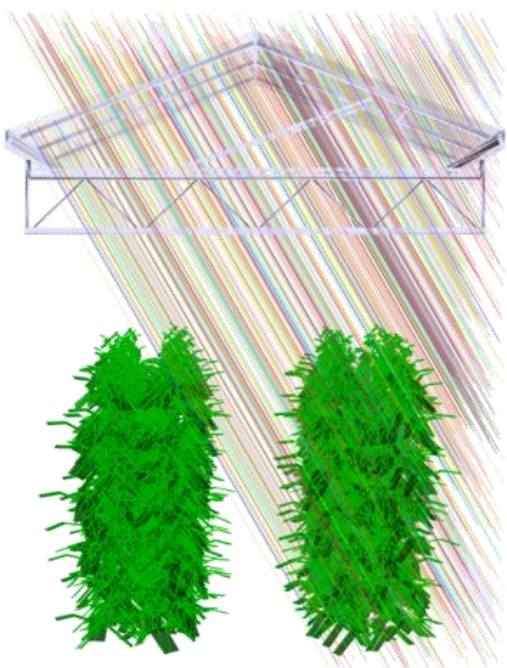


# Wat is het optimale kasdek?

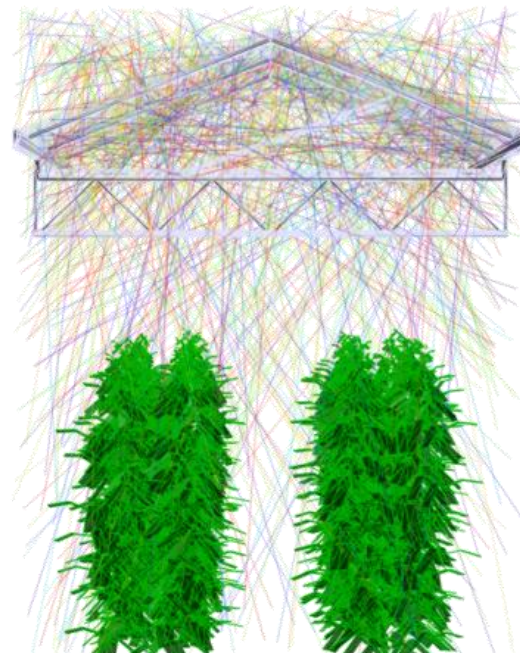
*Licht Event 9-12-2015*

Frank Kempkes, Wageningen UR Greenhouse Horticulture



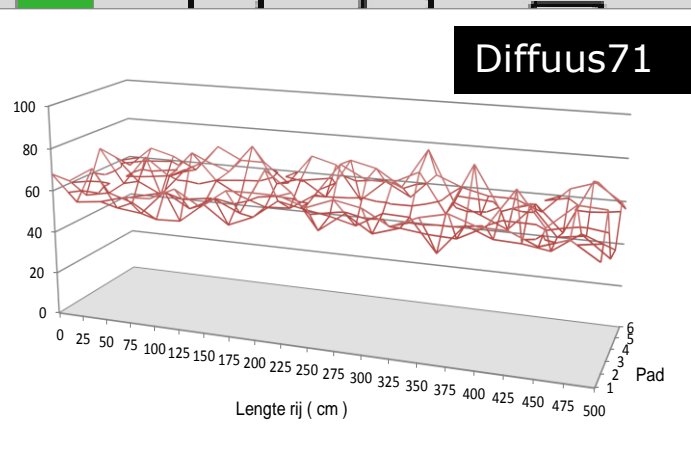
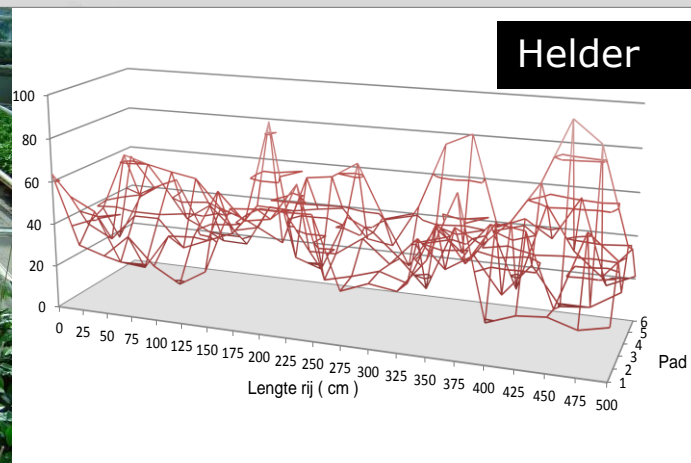


Het optimale kasdek is diffuus!



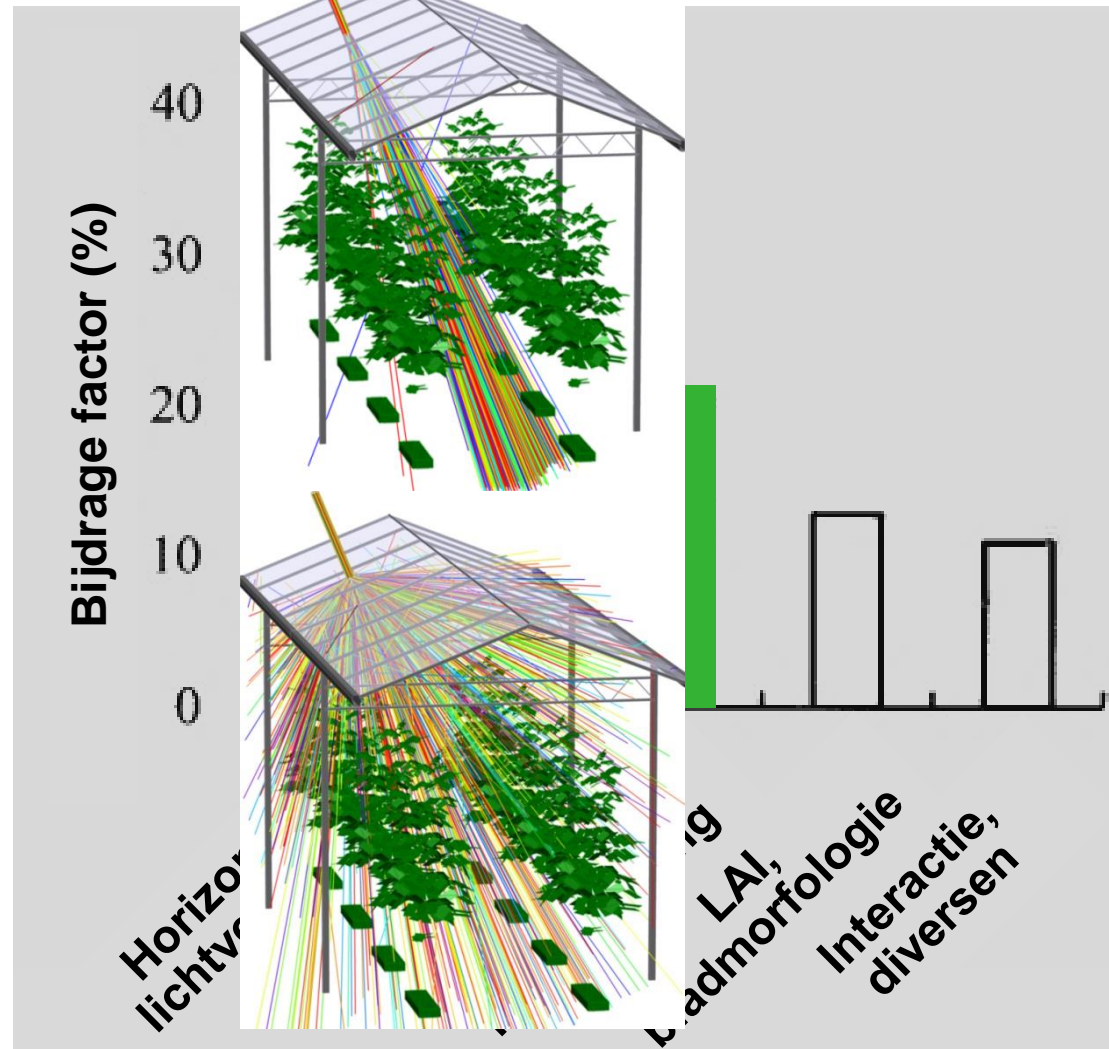
# Diffuus licht – waarom positief?

## Horizontale lichtverdeling



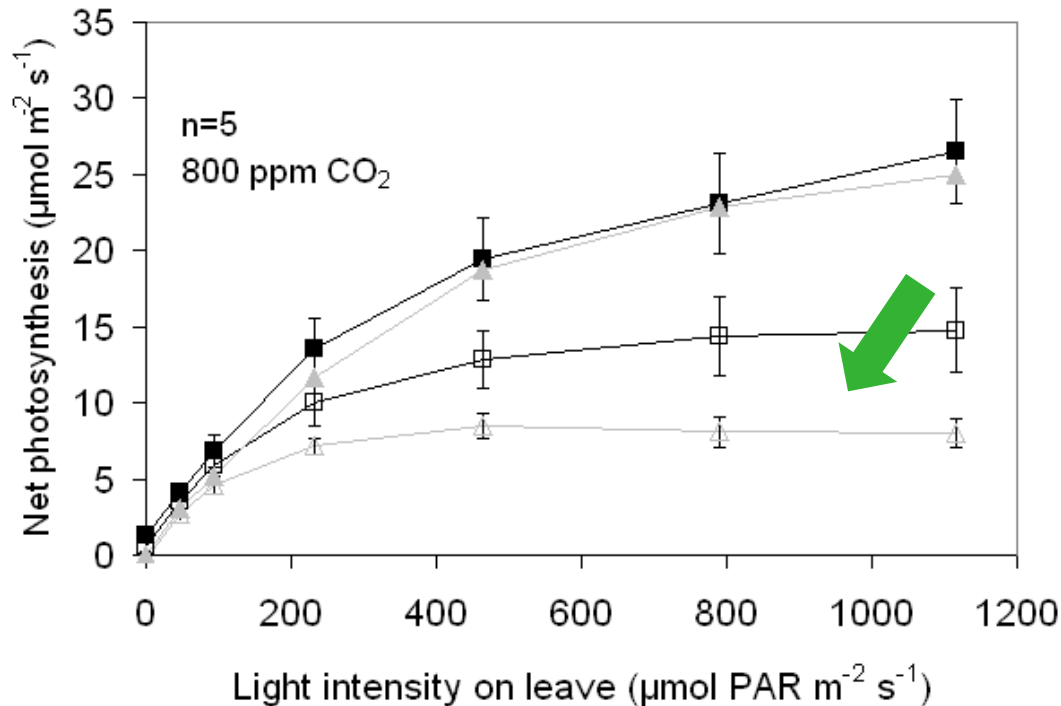
# Diffuus licht – waarom positief?

## Verticale lichtverdeling



# Diffuus licht – waarom positief?

## Fotosynthesecapaciteit

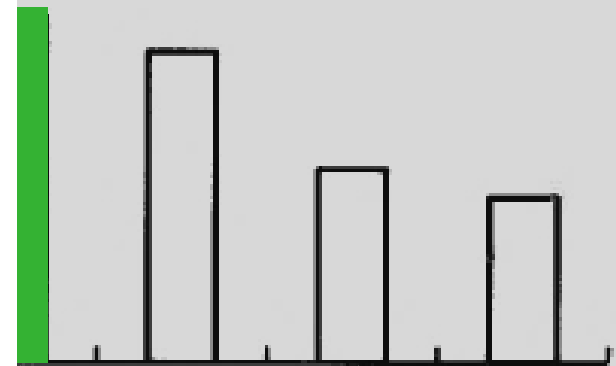


■ diffuse, upper leaves

▲ clear, upper leaves

□ diffuse, middle leaves

△ clear, middle leaves



Ho. lichtv.

Foto. cap.

Verticale lichtverdeling

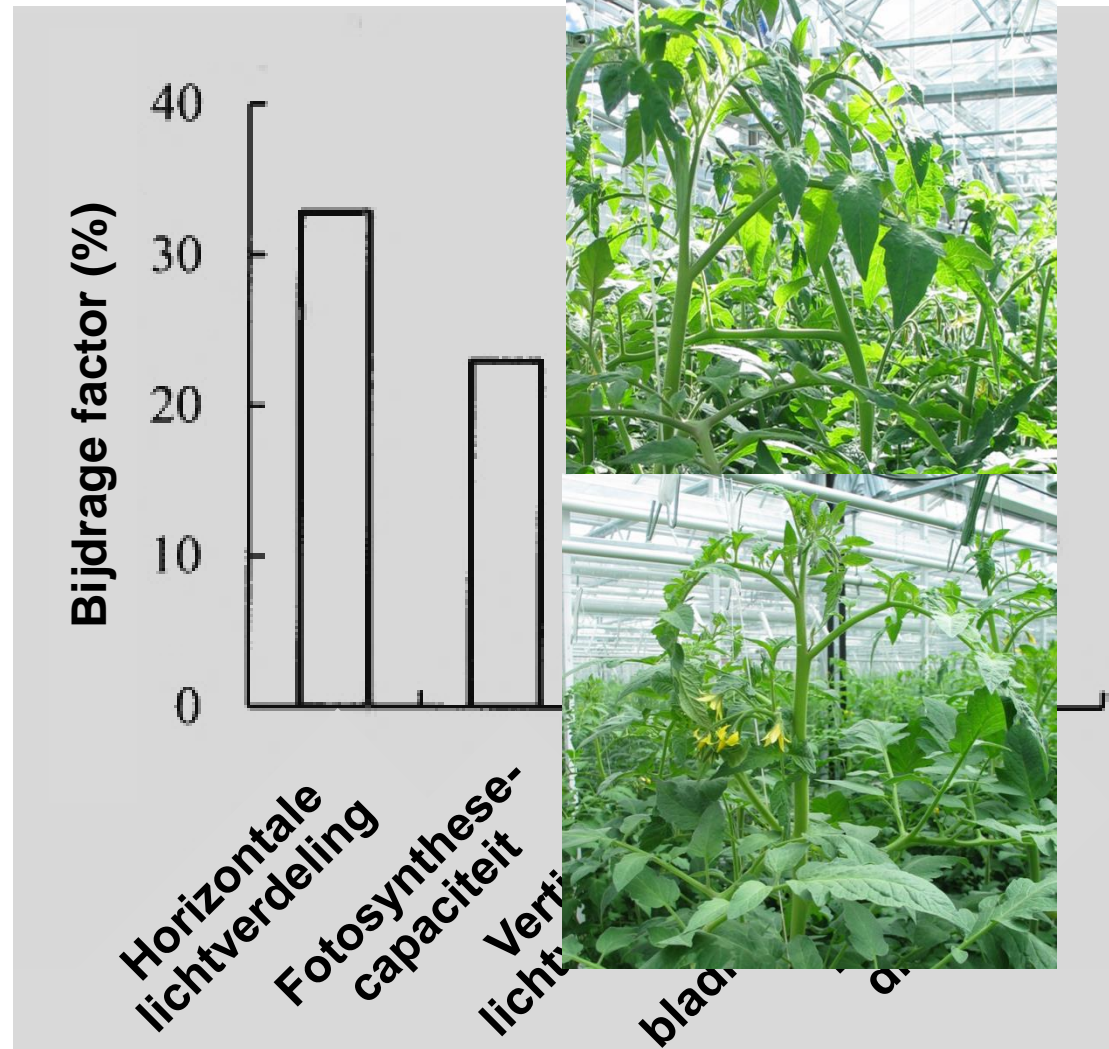
LAI,

bladmorfologie

Interactie, diversen

# Diffuus licht – waarom positief?

## LAI, bladmorfologie



# Diffuus licht – waarom positief?

**Diversen:**

**Meer generatief**

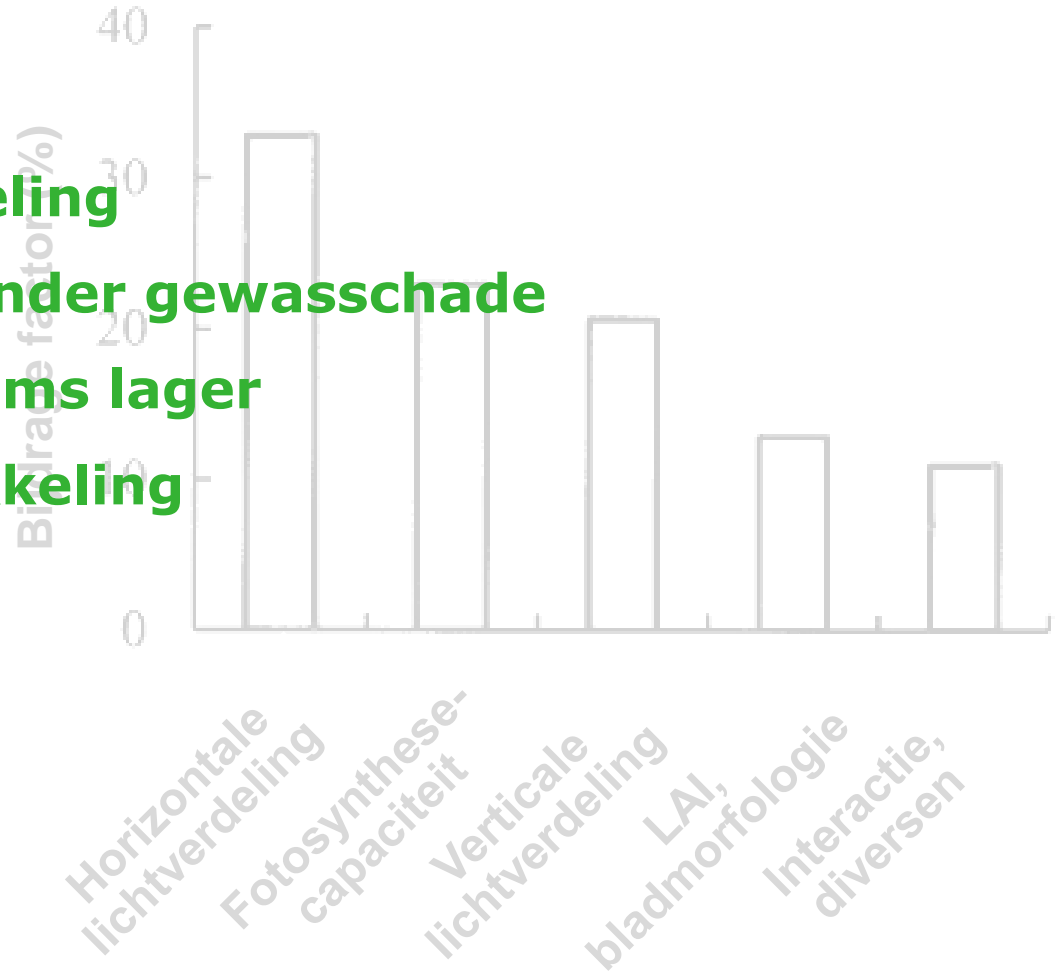
**Snellere plantonwikkeling**

**Meer licht toelaten zonder gewasschade**

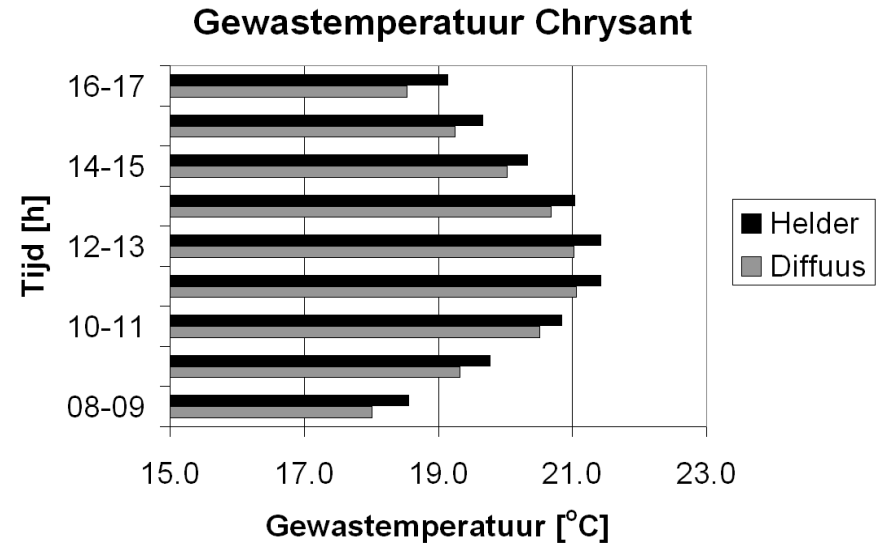
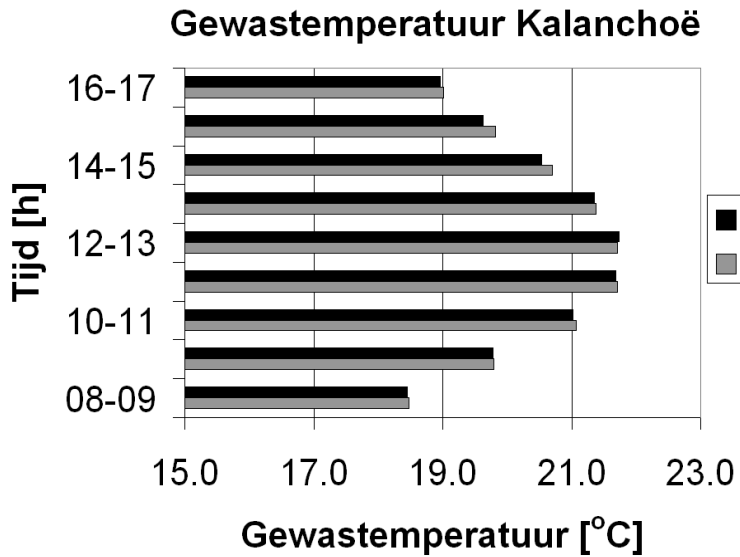
**Gewastemperatuur soms lager**

**Snellere vruchtontwikkeling**

**Zwaardere vruchten**



# Diffuus licht – waarom positief?





# Voorbeelden

- Teveel licht, maar wel goede vertakking bij Anthurium;  
Grote toename versgewicht Ficus



Links naar rechts:  
Toename in licht, temperatuur  
en RV

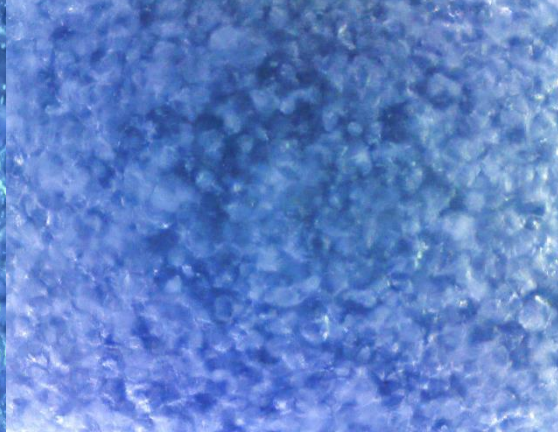
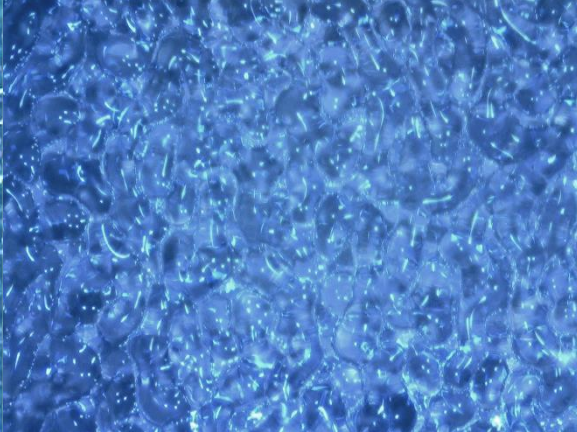
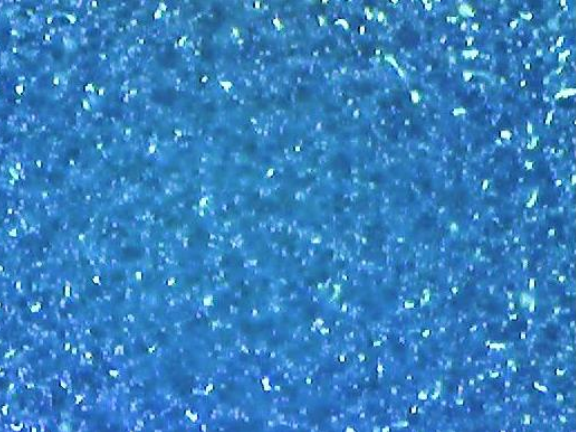


Rechts naar links:  
Toename in licht, temperatuur en  
RV

# Conclusie

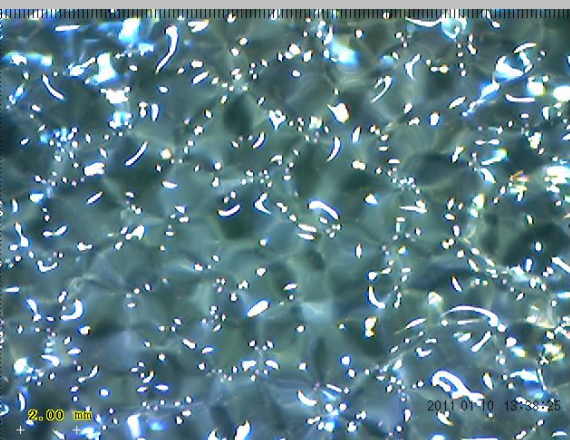
- Diffuus licht is positief omdat
  - Verbeterde lichtdistributie in het gewas
  - Diffuus licht wordt beter geabsorbeerd dan direct licht
  - Hogere fotosynthese onder diffuus licht
  - Lagere gewas temperatuur (chrysanthemum)
  - Hogere groeisnelheid
- Let op mogelijk lagere transmissie kasdek bij "slechte" materiaalkeuze





LH

matt/matt

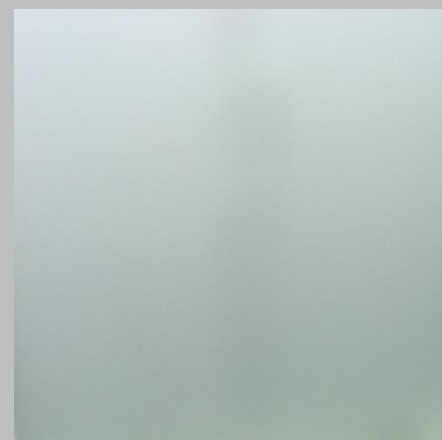


MH

diffuus glas

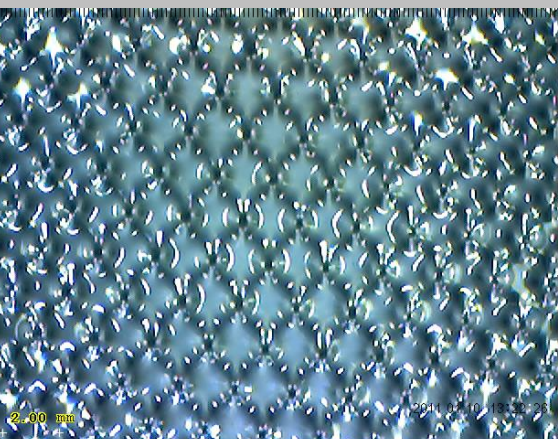
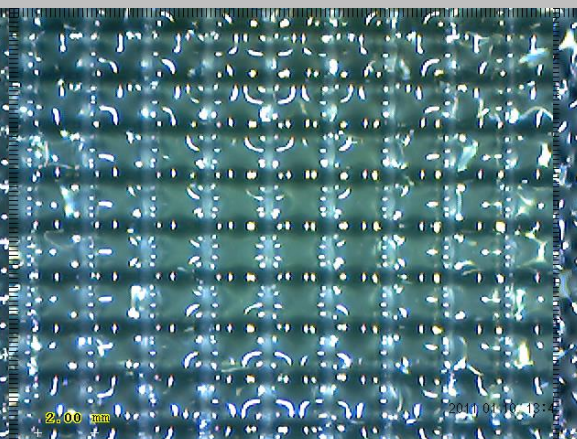
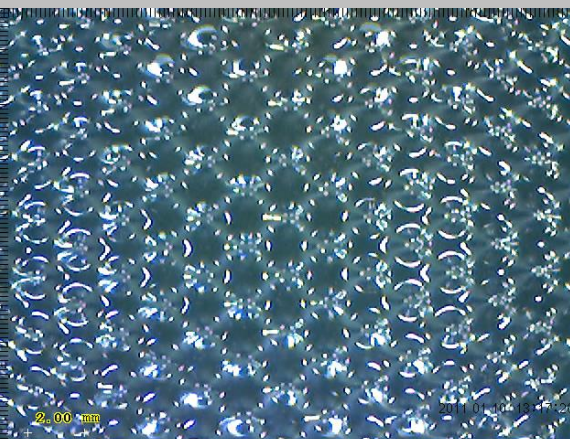
≠

diffuus glas



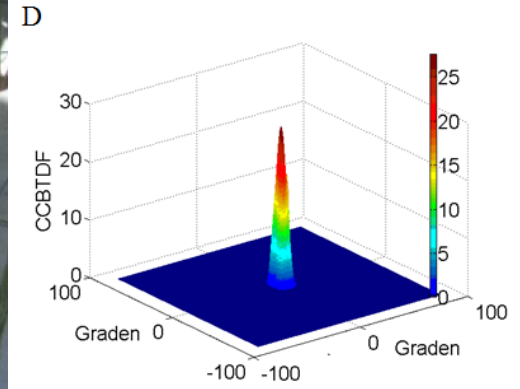
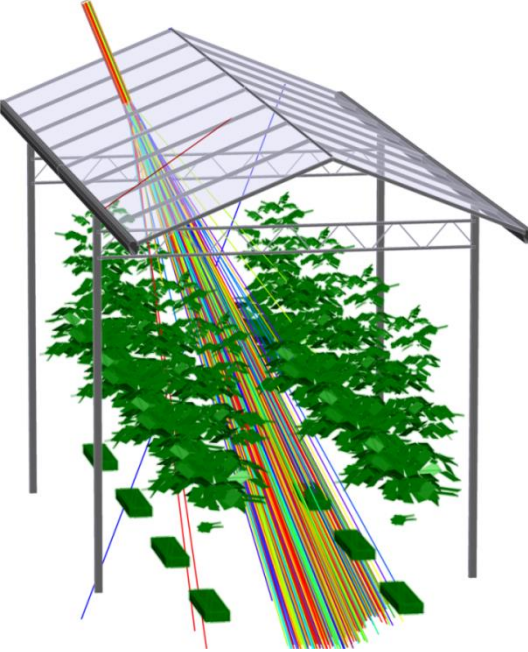
LH-HH

etched

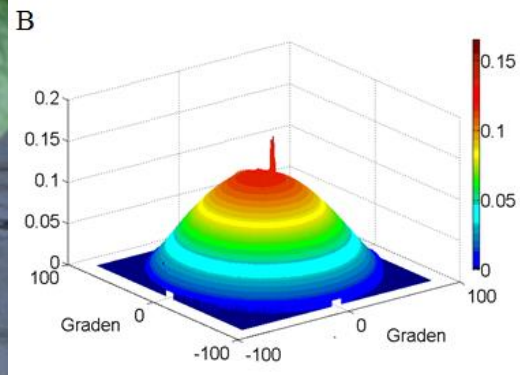
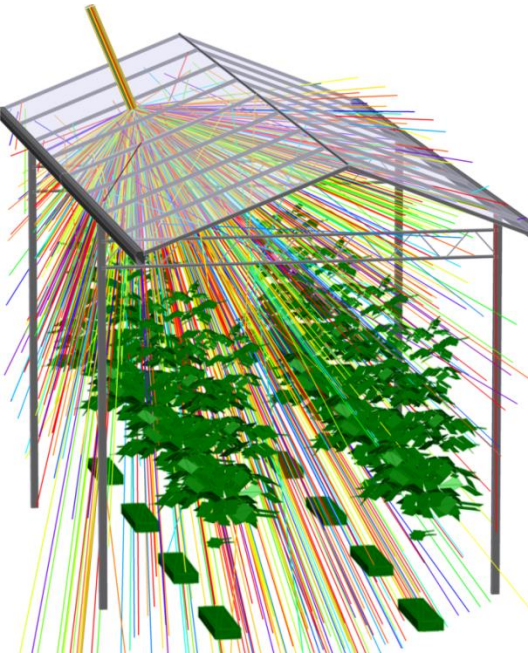


HH

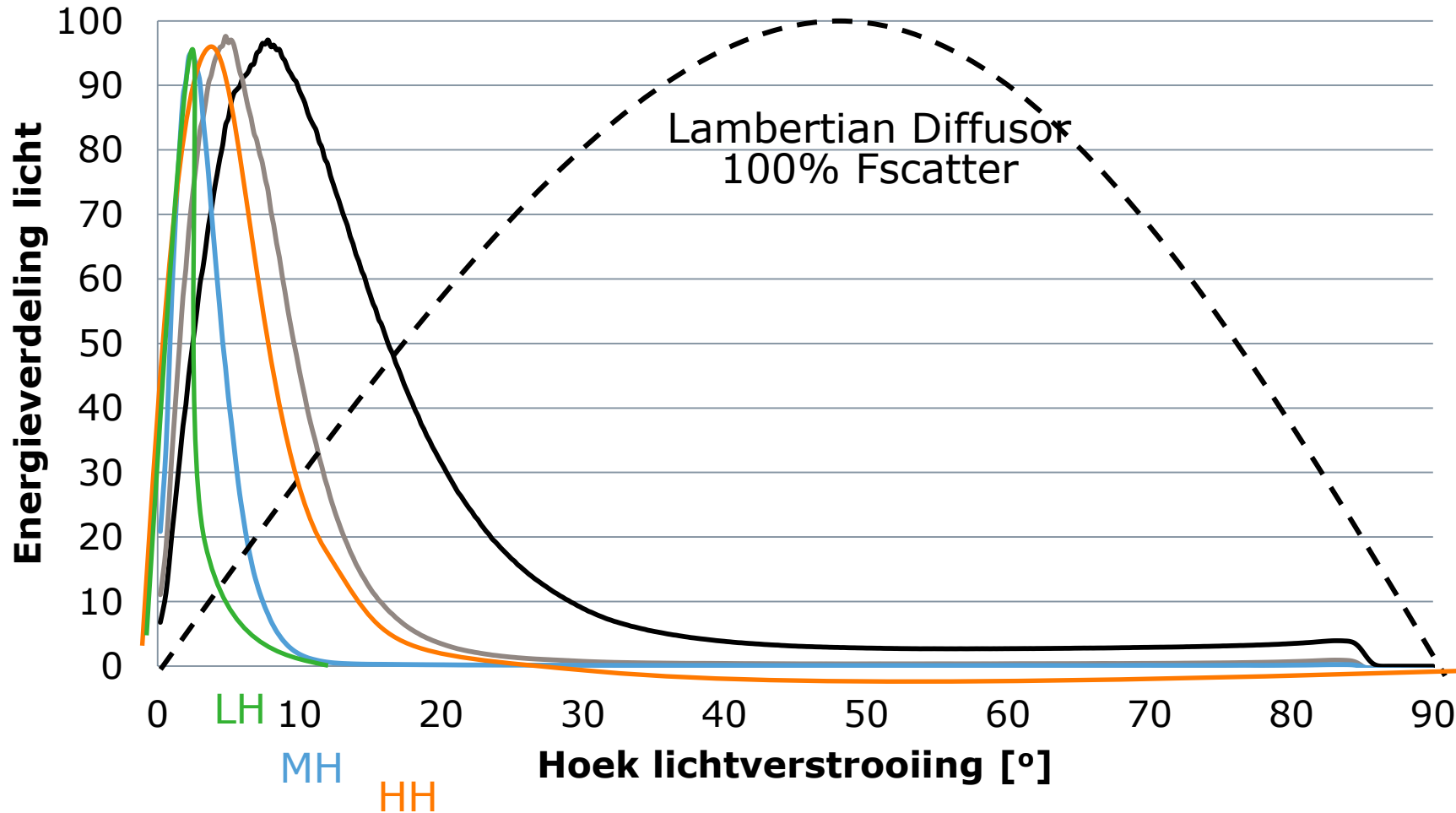
prismatic

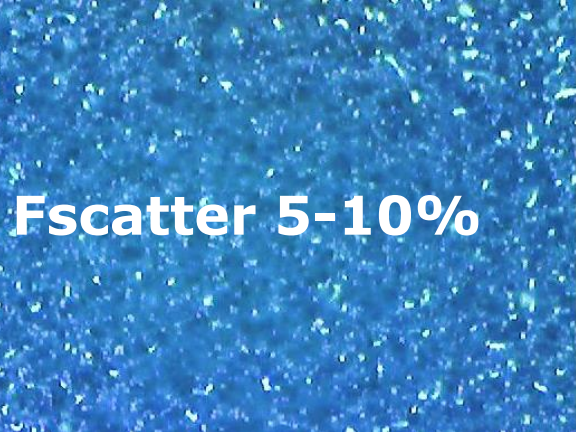


Hoeveel lichtverstrooiing is er (nodig)?

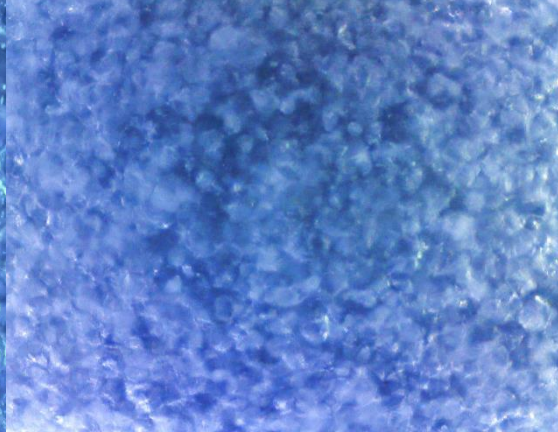
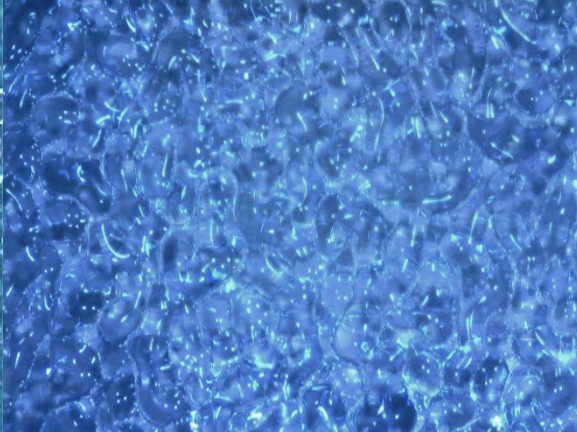


# Diffuus structuur verandert lichtverstrooiing



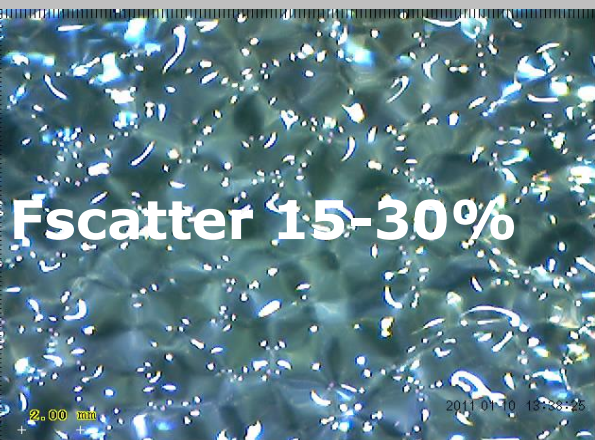


**Fscatter 5-10%**



LH

matt/matt



**Fscatter 15-30%**

**De Fscatter**

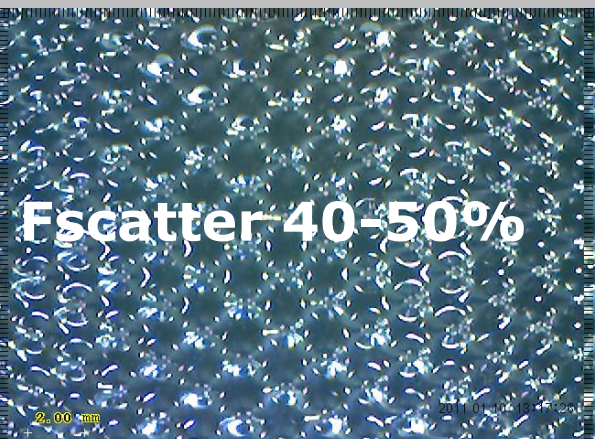
MH



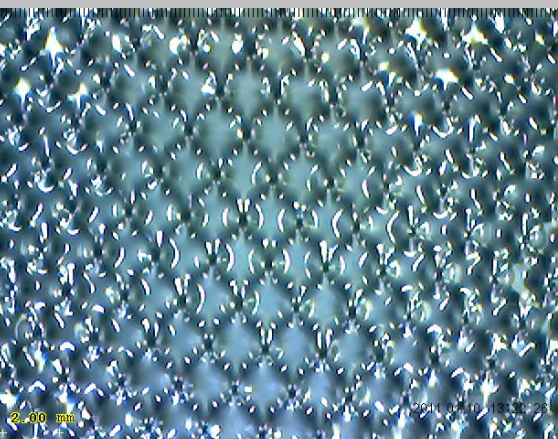
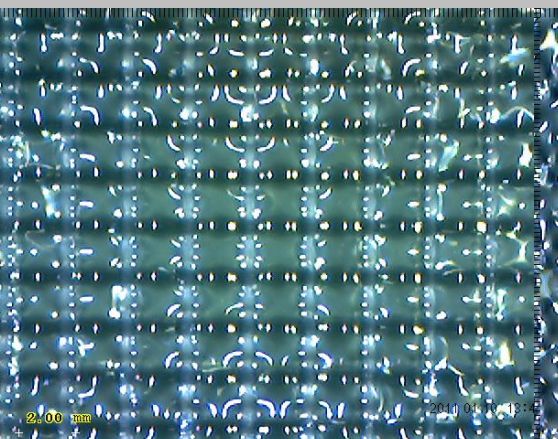
**Fscatter 60-80%**

HH+

etched



**Fscatter 40-50%**



HH

prismatic

# Anti-reflectie "coating" voor hoge lichttransmissie



material	structure	AR	Fscatter	hemispherical transmission
A 0	no	no	0	84.4
A 0 ARAR		2 AR		90.2
A LH	matt/matt	no	ca. 5	83.6
A LH ARAR		2 AR		89.2
A HH	prismatic	no	ca. 50	79.7
A HH ARAR		2 AR		84.3

+5-6%  
door  
AR

-5% door  
structuur

# Het kasdek is (bijna) altijd nat

- Condensatie aan binnenkant glas
  - Glas temperatuur < dauwpunttemperatuur kaslucht





# Condensatie verandert lichttransmissie



hydrofiel



standaard



hydrofoob



# Condensatie verandert (soms) lichtverstrooiing



# Licht kwantiteit

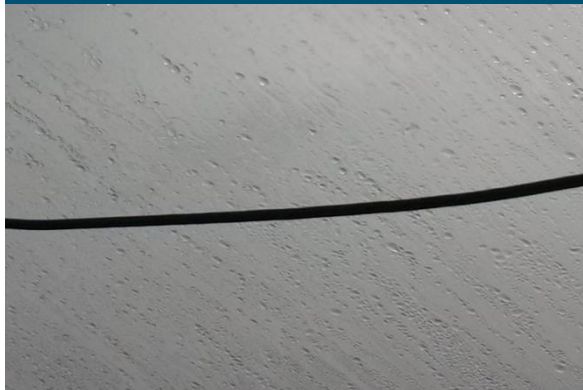


# Licht kwantiteit

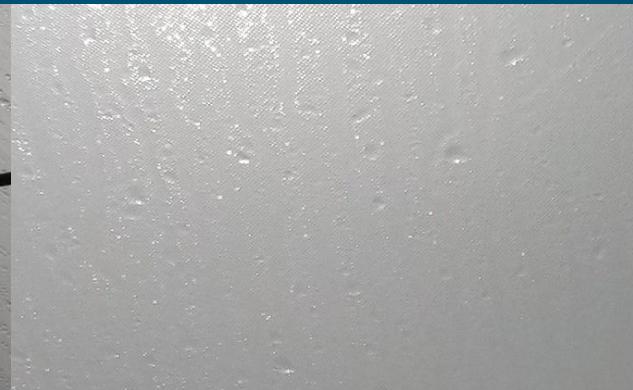
## condensproef in de kas

Blank glas geen coatings	Veel grote druppels
Piramideglas 1 structuur	Minder druppels en kleiner binnen
Piramideglas 1 structuur	Vrijwel geen druppels zichtbaar ruit is buiten wel nat
Piramideglas 2 structuur	Fijnere druppelstructuur dan piramideglas 1
Geëtst glas	Enkele druppels vooral water film

Blank glas geen coatings

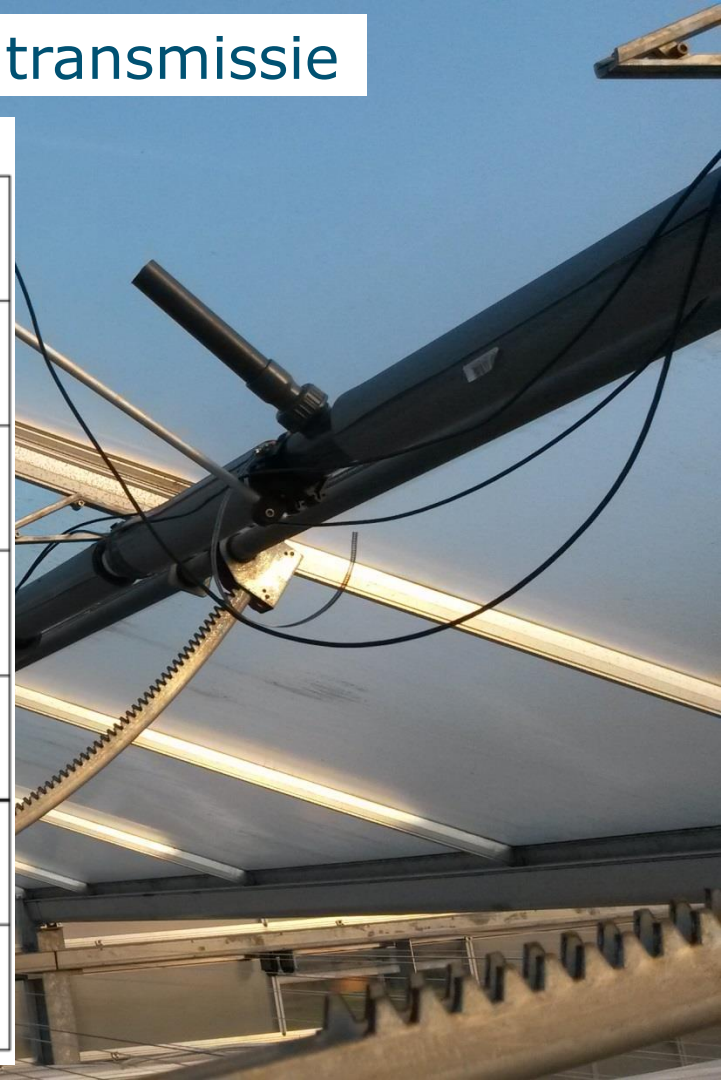
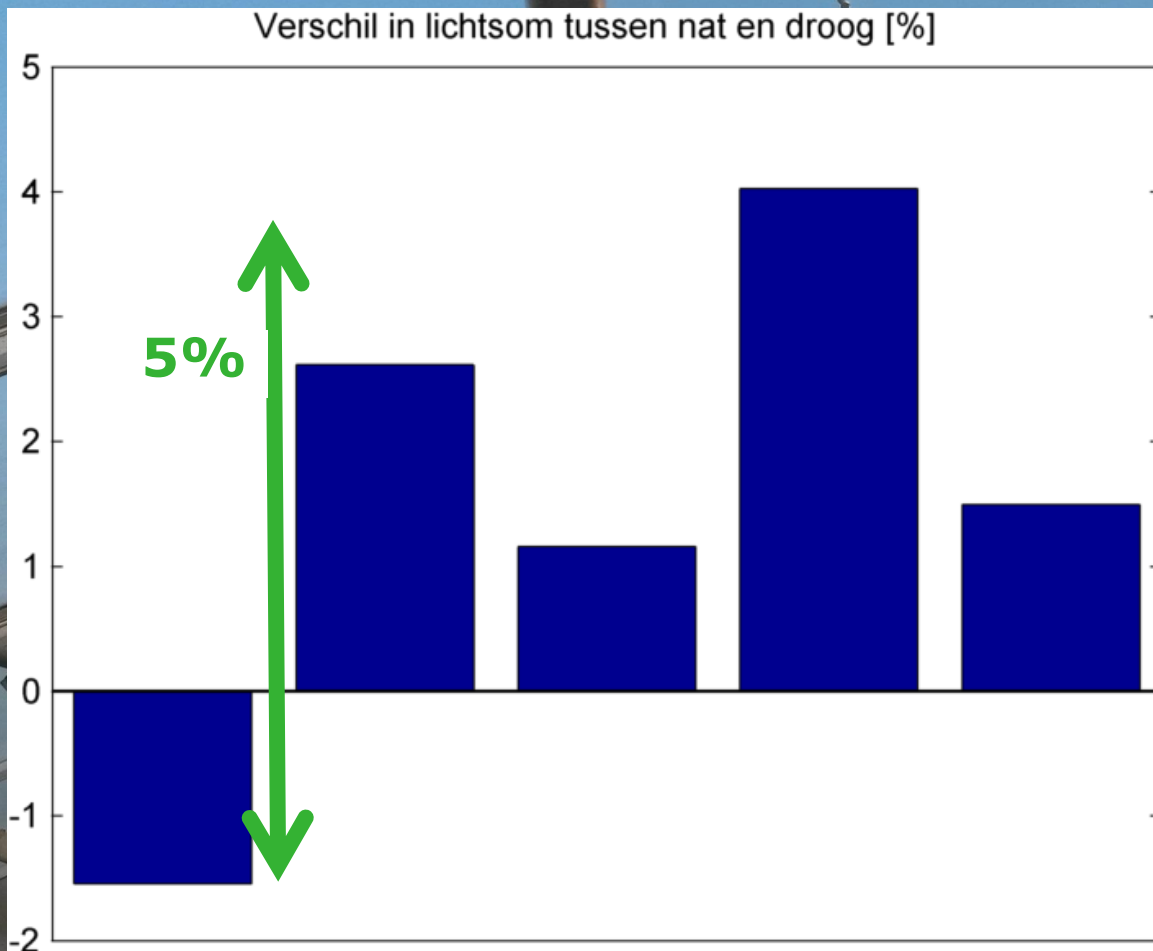


Piramideglas 2 structuur binnen



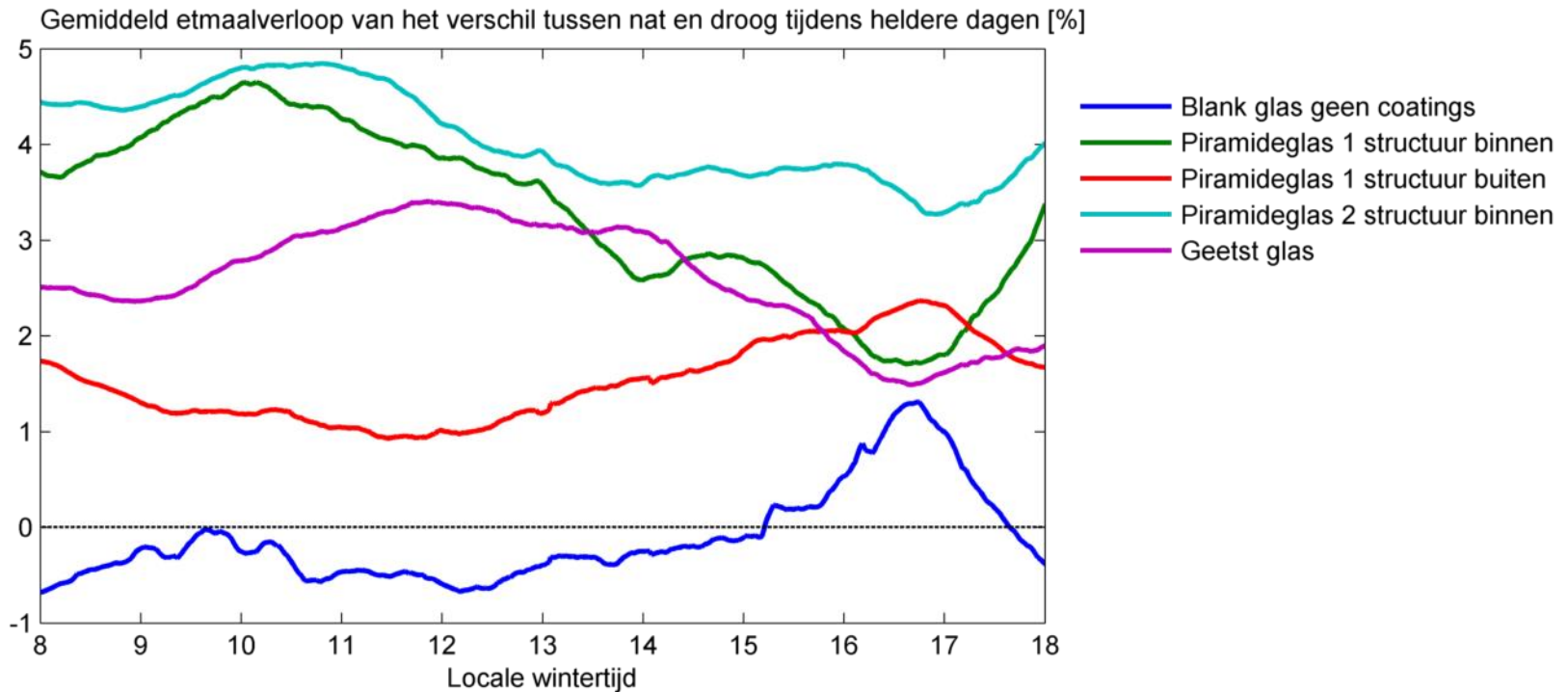
# Meetresultaten

- Wat is het effect van condens op de transmissie



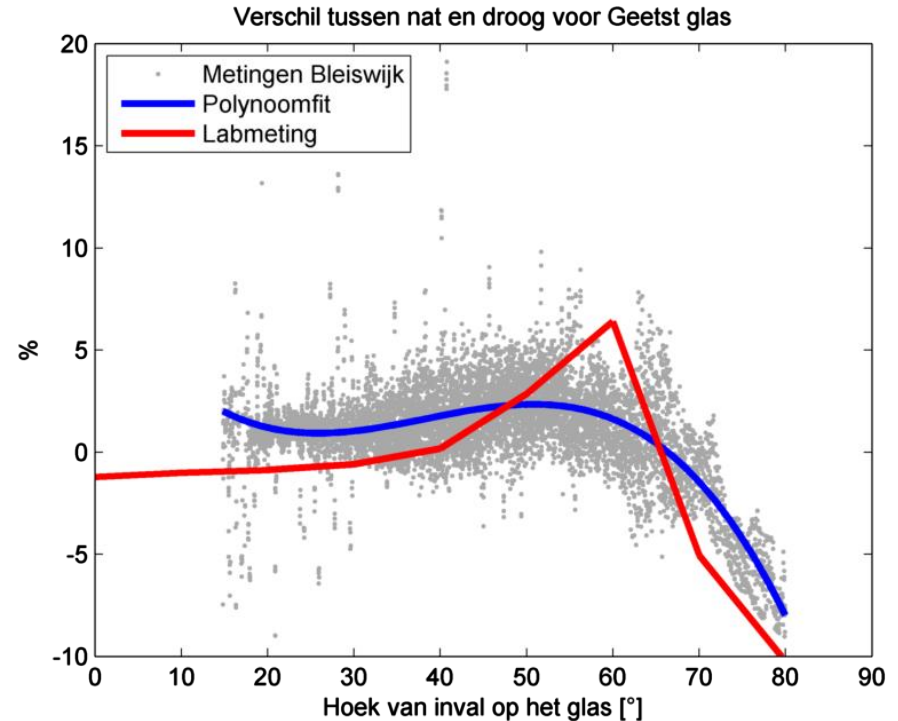
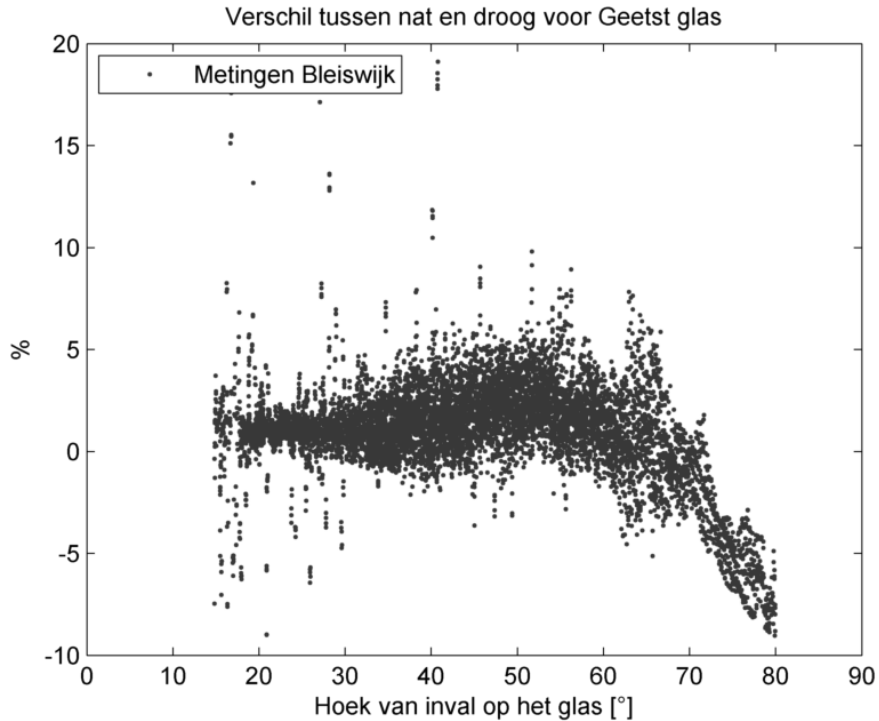
# Meetresultaten

- Gemiddeld etmaalverloop verschil tussen nat en droog
- Alleen bewolkte momenten ( $\text{fracdiff} > 0.9$ )



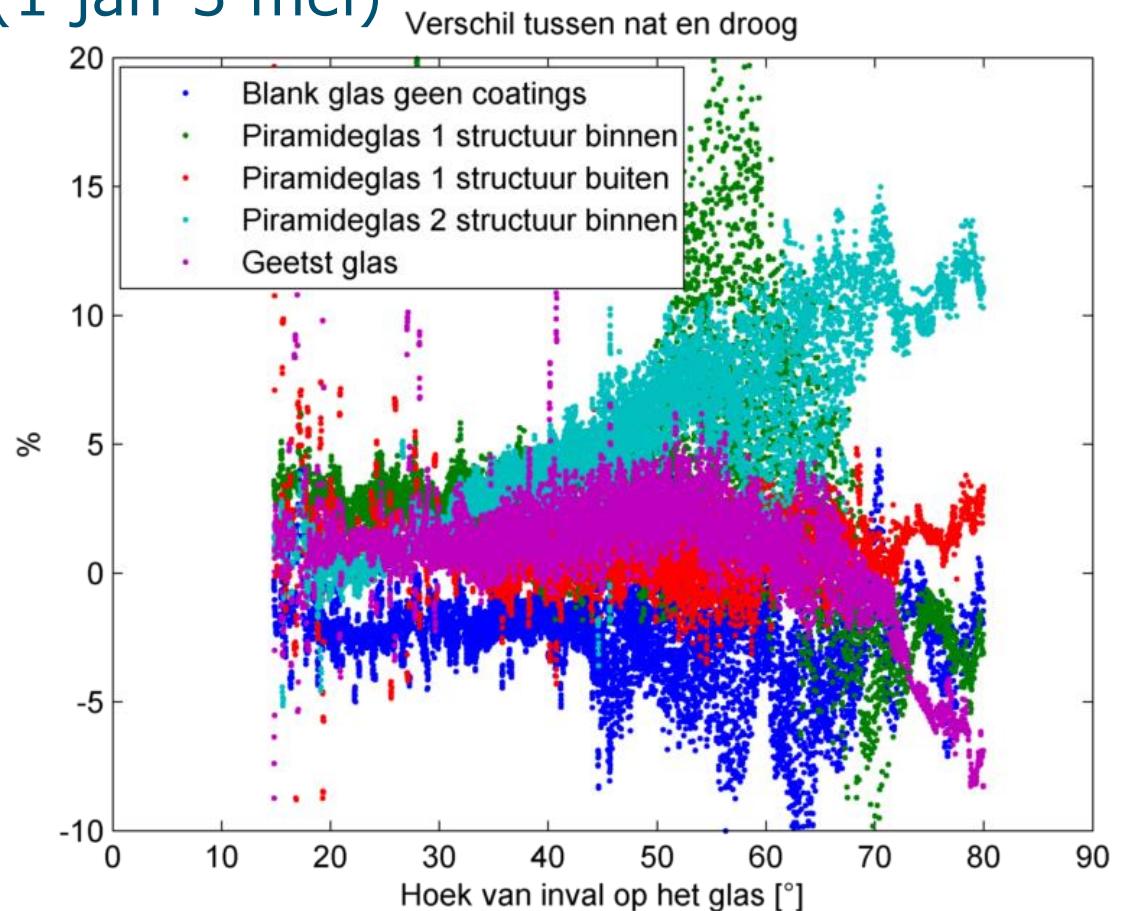
# Meetresultaten

## ■ Verschil tussen nat en droog, hoekafhankelijk



# Meetresultaten

- Gemiddeld etmaalverloop verschil tussen nat en droog
- Alleen heldere momenten (fracdiff < 0.3)
- Hele meetperiode (1 jan-3 mei)





# Conclusie

- Verschil labmetingen en “praktijk metingen” te groot
- Grote spreiding (met name bij piramide glas) bij de “praktijkmeting” geeft aan dat meting beïnvloed wordt
  - waardoor?
- Er bestaan geen metingen volgens een norm (reproduceerbaarheid)
- Volgend jaar wordt zo’n norm & meetprocedure ontwikkeld

# Vragen?

