

# Glass foam substrate

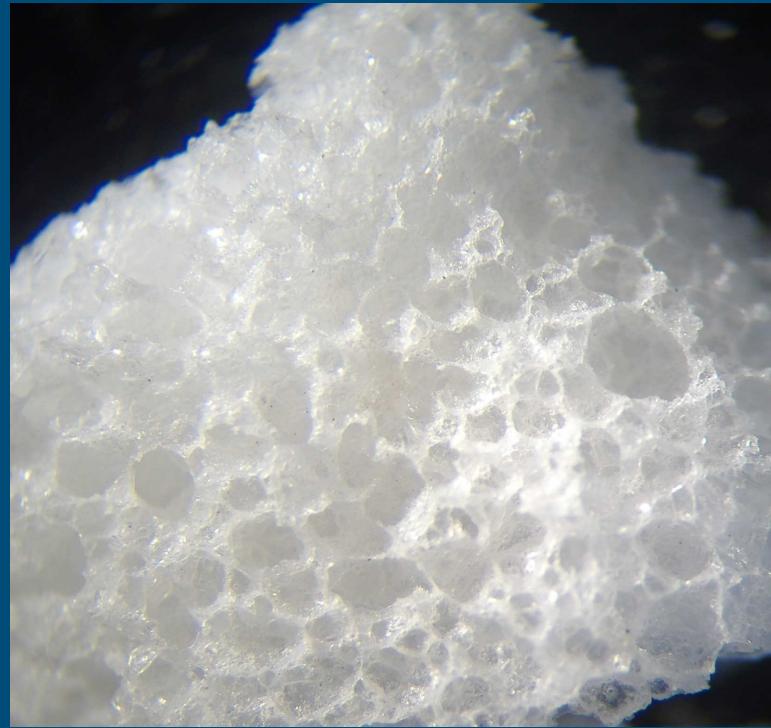
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# INTRODUCTION: glass foam

Reworked (recycled) glass bottles

Earthstone International N.M.; Growstones



**WAGENINGEN UR**  
*For quality of life*

# INTRODUCTION: science and industry

## ■ Advantages

- Sustainable + easier recyclable
- Improved understanding / new tests
- Impact on growers

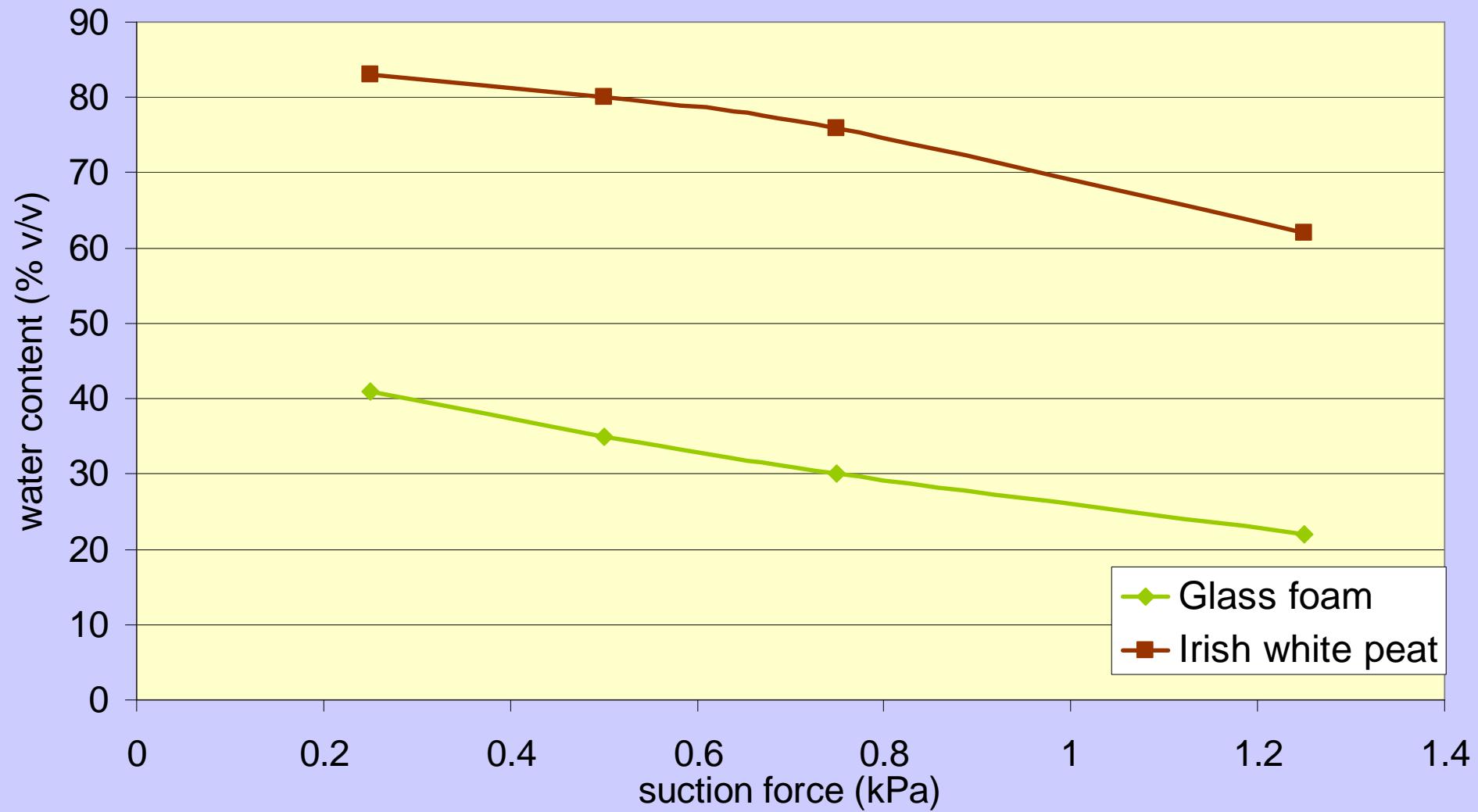
## ■ Conditions

- No negotiated outcome, nothing left out
- Separate irrigation regime / drainage systems

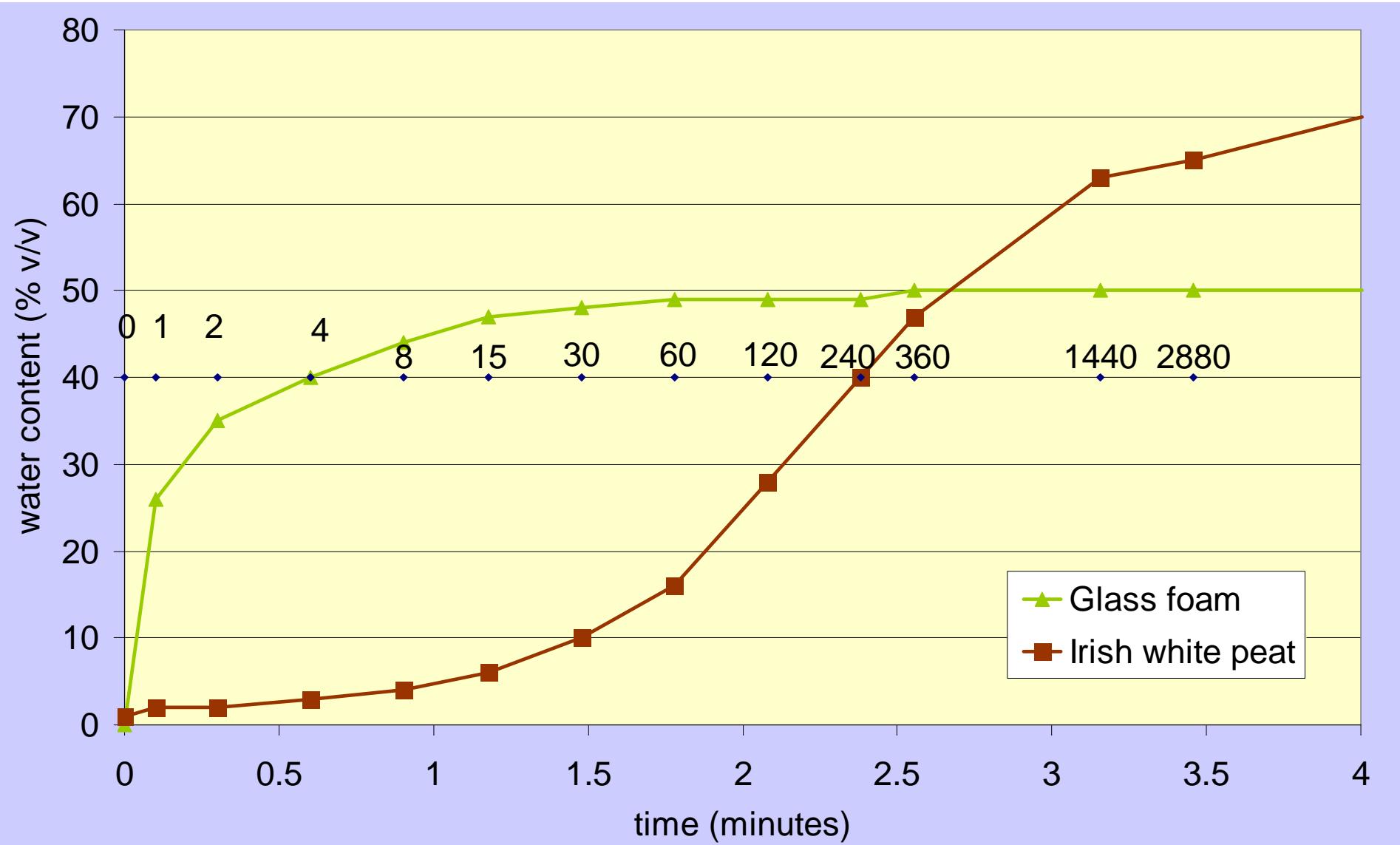
# INTRODUCTION: stepwise evaluation

- Lab tests
  - Basic toxicity with phytotoxkit test
  - Water retention curve / Rehydration rate
  - Nutrient analysis of the 1:5 extract /pH buffer test
- Short term cultivation (cucumber)
- Long term cultivation (tomato)

# RESULTS LAB: water retention



# RESULTS LAB: rehydration rate



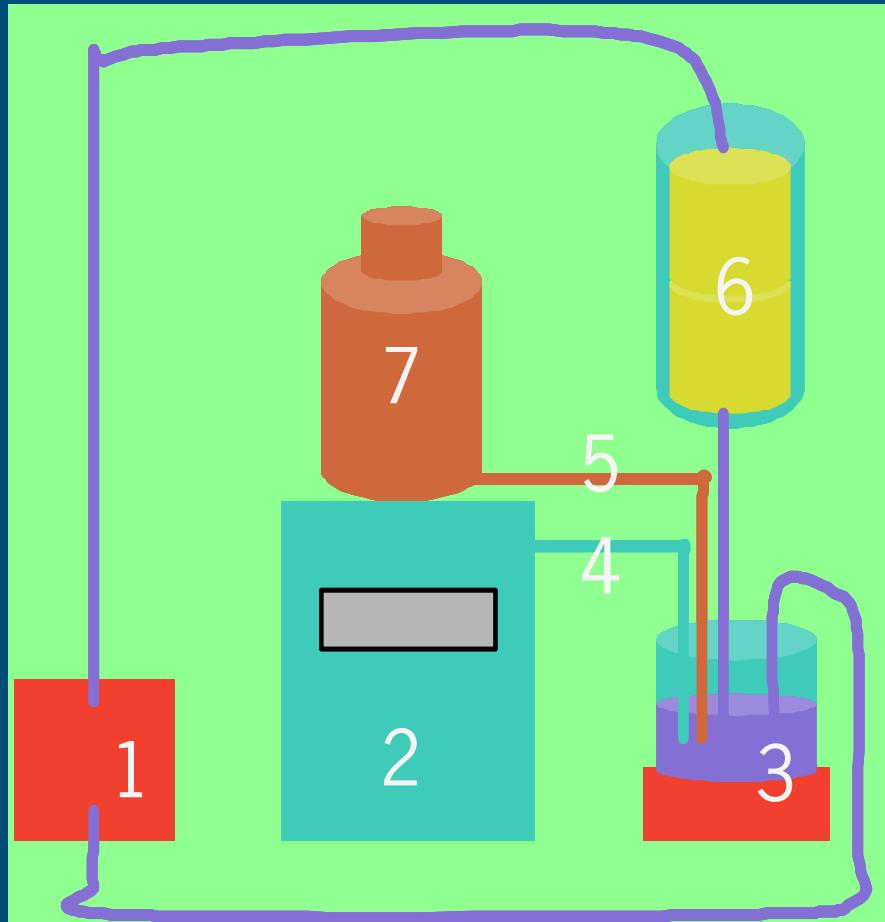
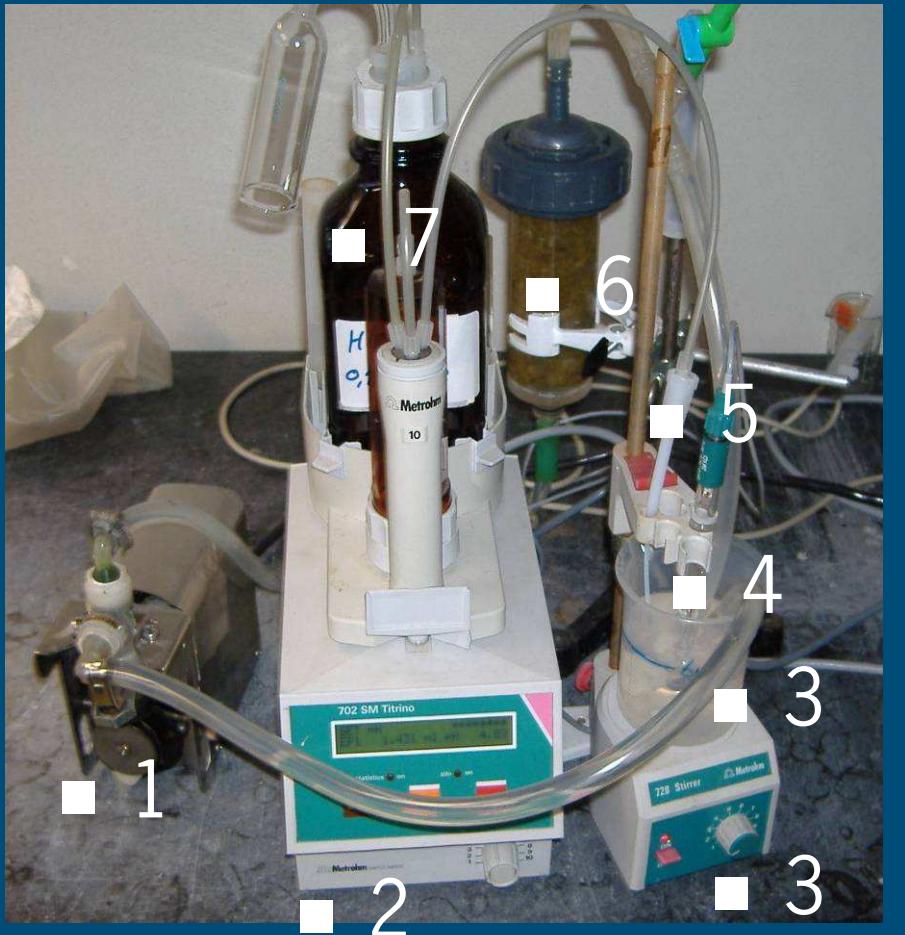
# RESULTS LAB: nutrient analysis

## ■ Nutrient analysis (1:5):

- pH 10.8
- EC  $0.1 \text{ dS.m}^{-1}$
- Na  $0.3 \text{ mmol.l}^{-1}$
- Ca  $0.3 \text{ mmol.l}^{-1}$
- HCO<sub>3</sub><sup>-</sup>  $0.2 \text{ mmol.l}^{-1}$
- Si  $0.08 \text{ mmol.l}^{-1}$
- B  $1.2 \text{ micromol.l}^{-1}$



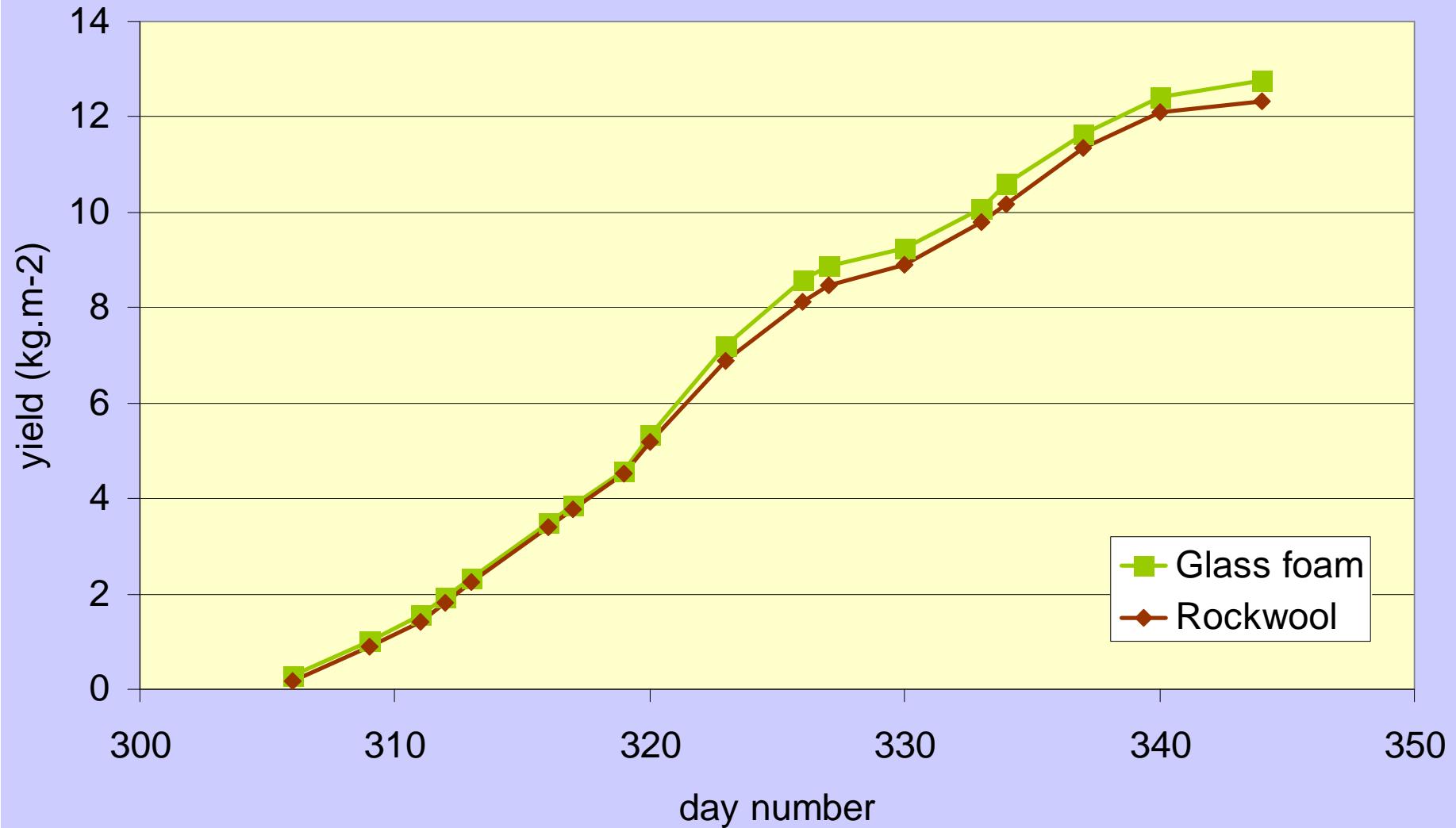
# RESULTS LAB: buffer capacity



Dosage for rinsing is 10 L of 1.0 mmol.L<sup>-1</sup> of HNO<sub>3</sub> per (12 L) bag



# RESULTS CUCUMBER: yield



# RESULTS CUCUMBER: silicon levels

Glass foam: waxy



$1.6 \text{ mmol.L}^{-1}$  Silicon

Rockwool: shiny



$0.04 \text{ mmol.L}^{-1}$  Silicon

# RESULTS CUCUMBER: balance gen/veg

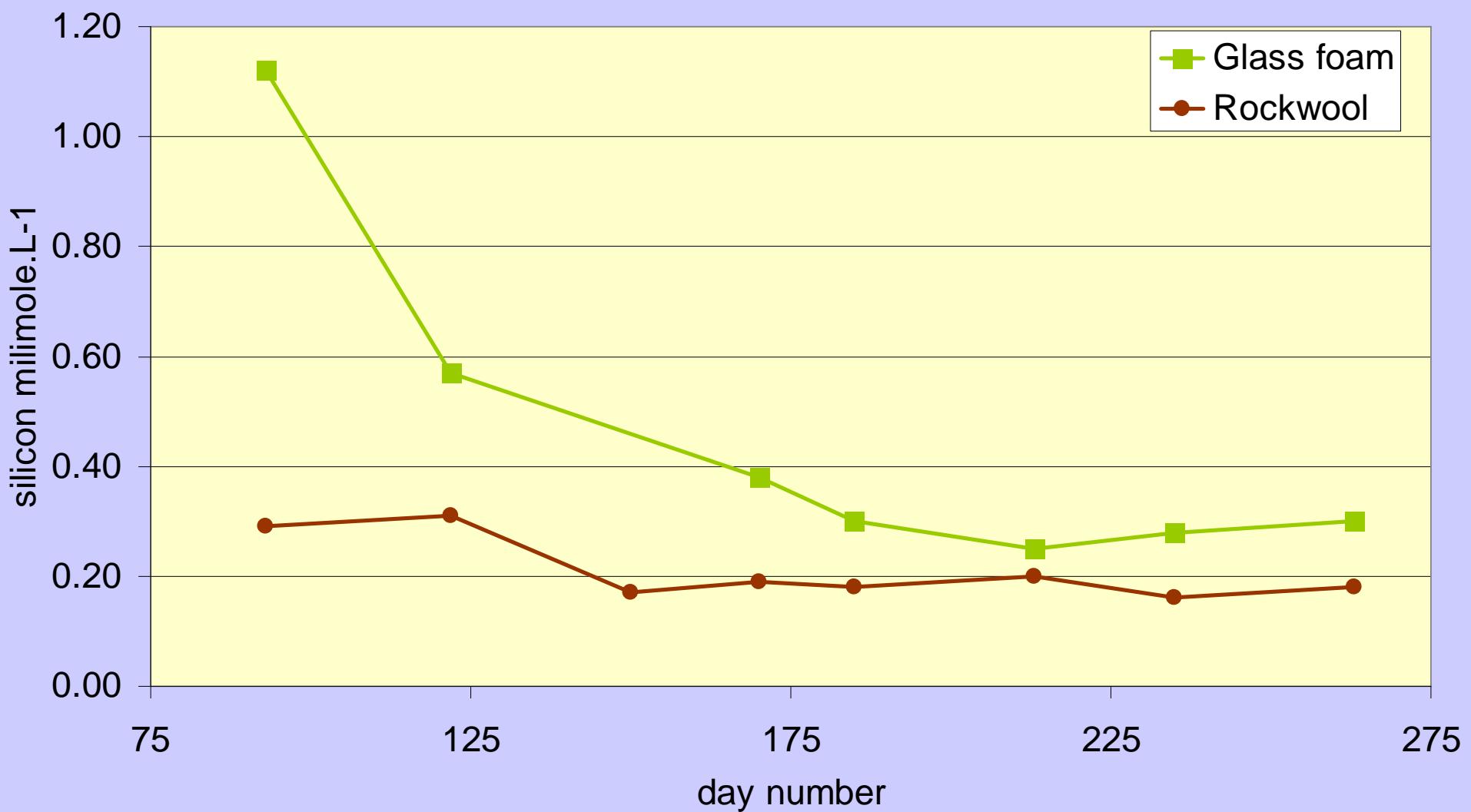
| Percentage of plants affected |         |                         |
|-------------------------------|---------|-------------------------|
|                               | Pythium | Downwards cupped leaves |
| Glass foam                    | 1       | 6                       |
| Rockwool                      | 7       | 65                      |

## RESULTS CUCUMBER: roots

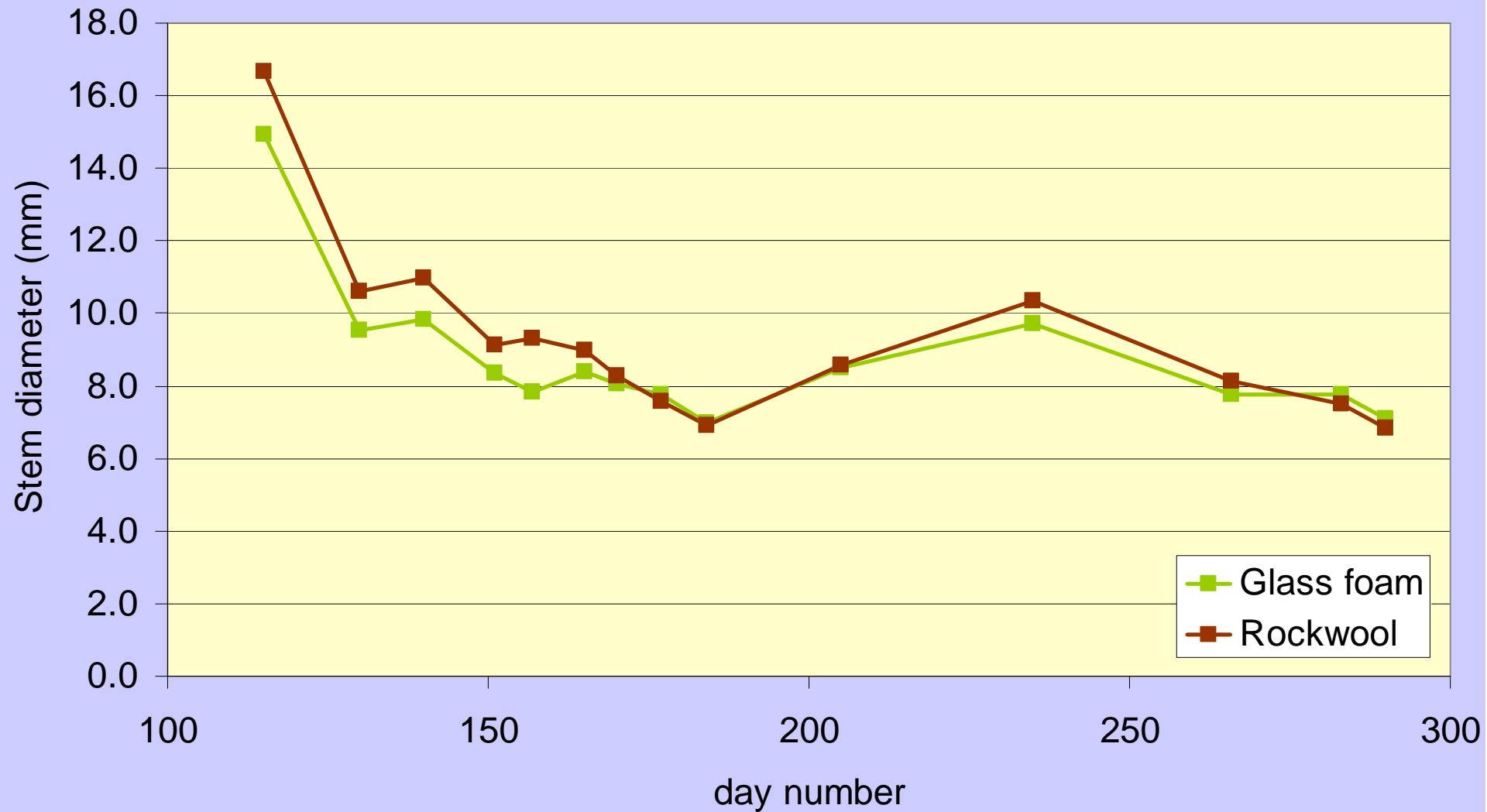




# RESULTS TOMATO: silicon



# RESULTS TOMATO: balance gen/veg



# RESULTS CUCUMBER: balance gen/veg

Percentage of blossom end rot, leaf area, stem diameter, stem fresh weight, yield.

|            | BER | LA  | Stem diam. | Stem DM | Yield |
|------------|-----|-----|------------|---------|-------|
| Glass foam | 3   | 100 | 100        | 100     | 100   |
| Rockwool   | 15  | 114 | 106        | 115     | 100   |

# RESULTS TOMATO: roots



# CONCLUSIONS

- Over 40% air at any time = more generative
  - Pythium insensitive (less free water)
  - Earlier yield / smaller stem diameter = more generative
- Rehydration rate 0 to >25% in 1 minute = steerable
- Initial dissolution raises pH to 10 = rinsing at start
- Initial dissolution raises Si level to 2 mmol.L<sup>-1</sup>
- Yield levels are equal to rockwool

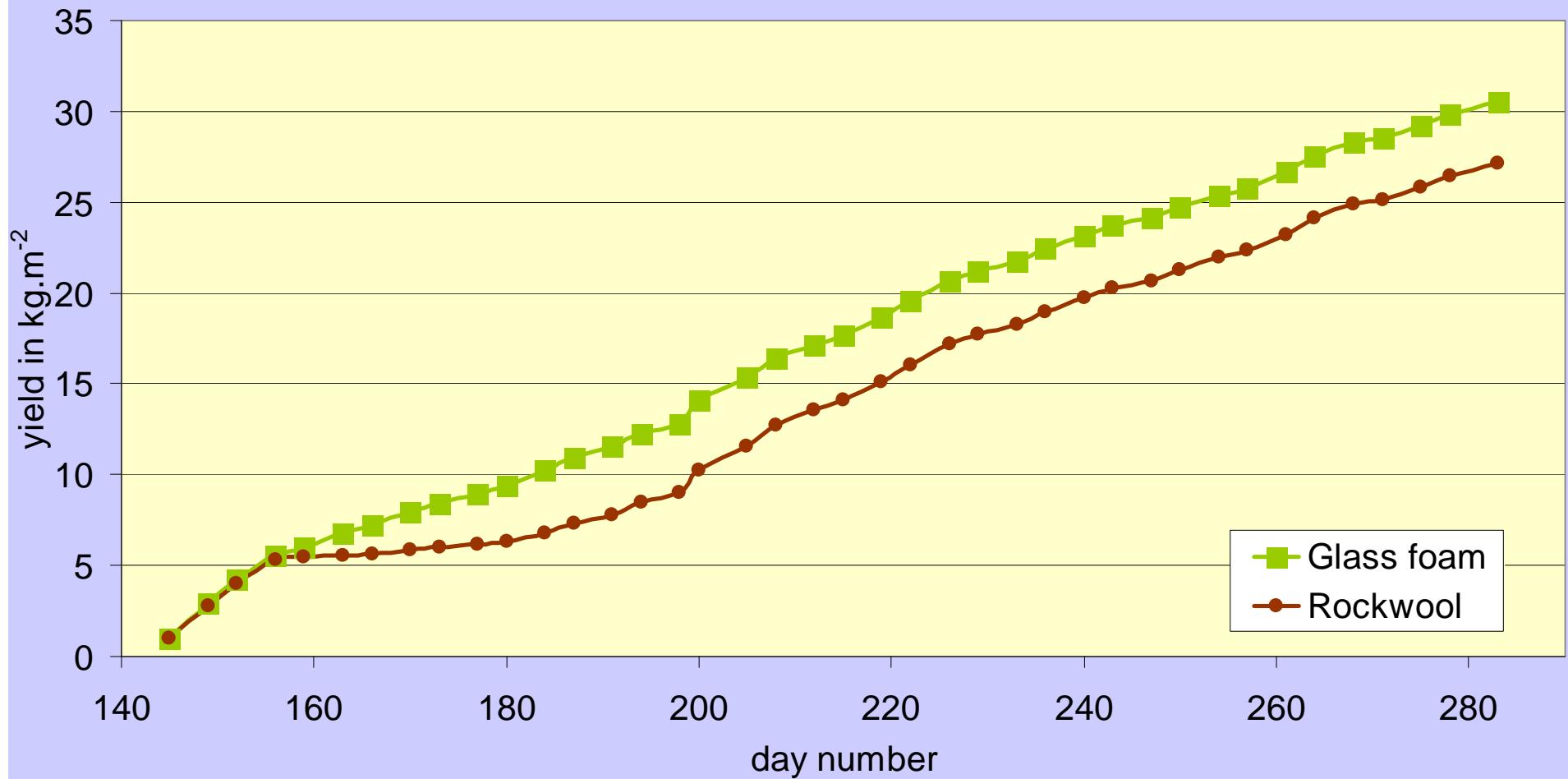
# Wageningen UR Greenhouse Horticulture

## Innovations for and with greenhouse horticulture

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# RESULTS TOMATO: yield



# RESULTS TOMATO: balance gen/veg



# RESULTS TOMATO: balance gen/veg

