New innovations for sustainable strawberry cultivation under glass

ISFC 9th January 2025

Stijn Jochems

Worldwide Expertise for Food & Flowers

Introduction

- Stijn Jochems
- Studied Horticulture & Business Management – HAS University of Applied Sciences (NL)

- Project leader with a focus on Climate & LED

- Delphy Improvement Centre
  - 17 years of running trials
  - 250+ cultivations
  - 20+ crops
  - Strong connection with growers

- Located in Bleiswijk, The Netherlands

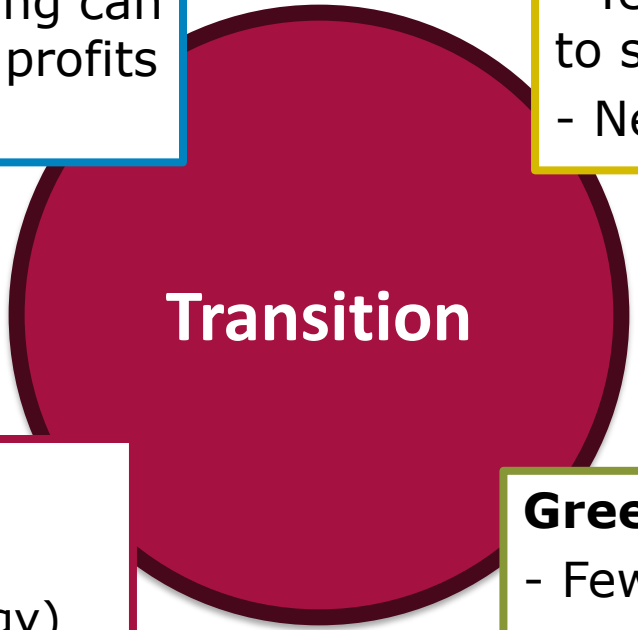
Delphy

Automatisation

- Less skilled labour available
- Objective decision making can lead to higher yields and profits

Climate neutral

- High energy costs
- Techniques and strategies to save energy
- New energy sources



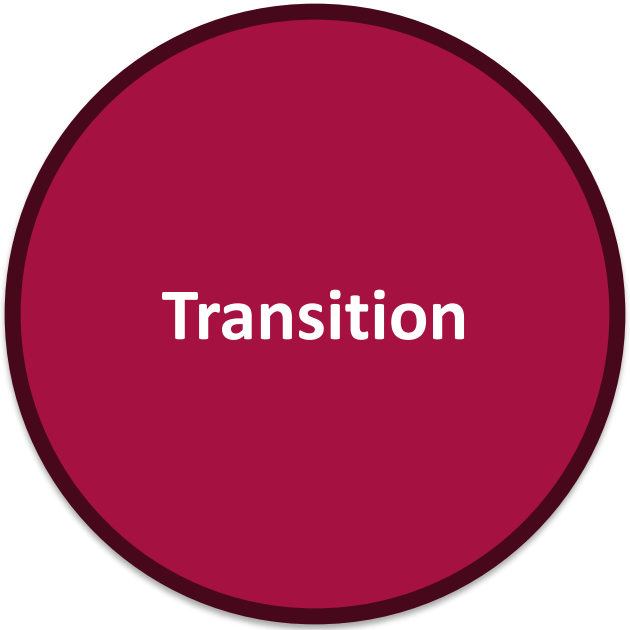
Electrification

- Increasing amount of techniques
- Allowing for more (energy) efficient cultivations

Green crop protection

- Fewer products available
- Resilient growing is crucial

Delphy



- Transition often leads to innovations
- Increasing number of companies outside the horticultural domain enter with new ideas
- What is the impact of some of these innovations?

Delphy

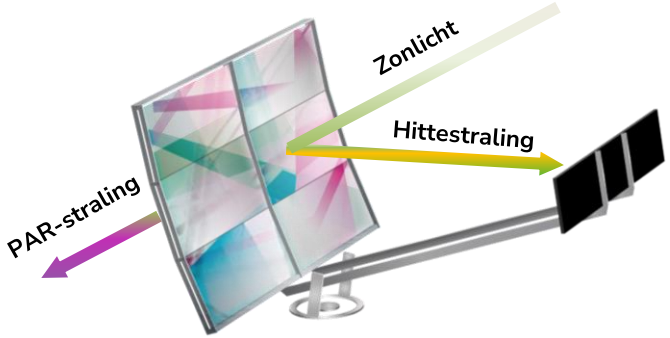
Voltiris

Electrifying greenhouse horticulture

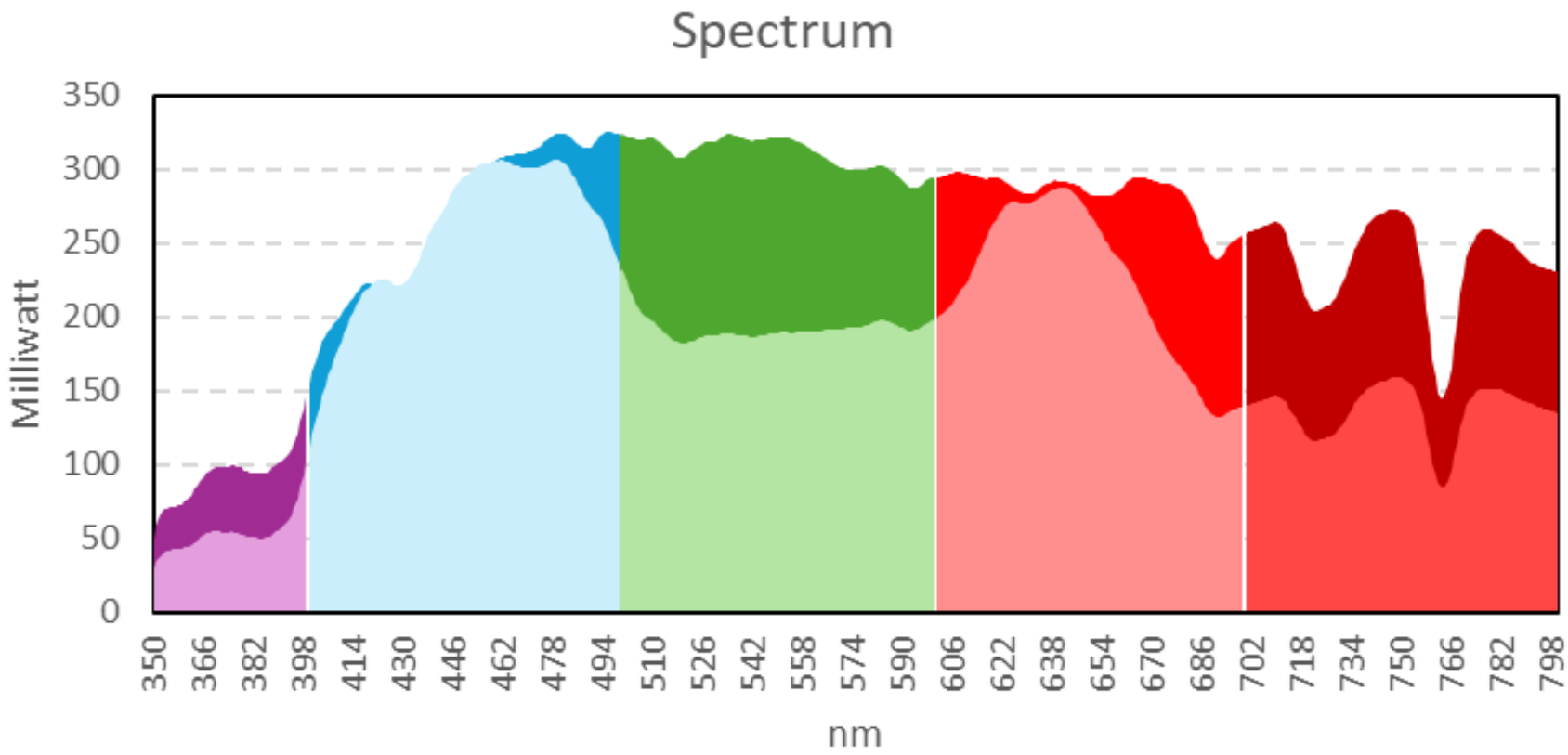
Crucial key in transition to climate neutrality

- Reducing energy input
- Other resources for remaining energy input (electricity)
- Solar energy vs production

Current research at Delphy

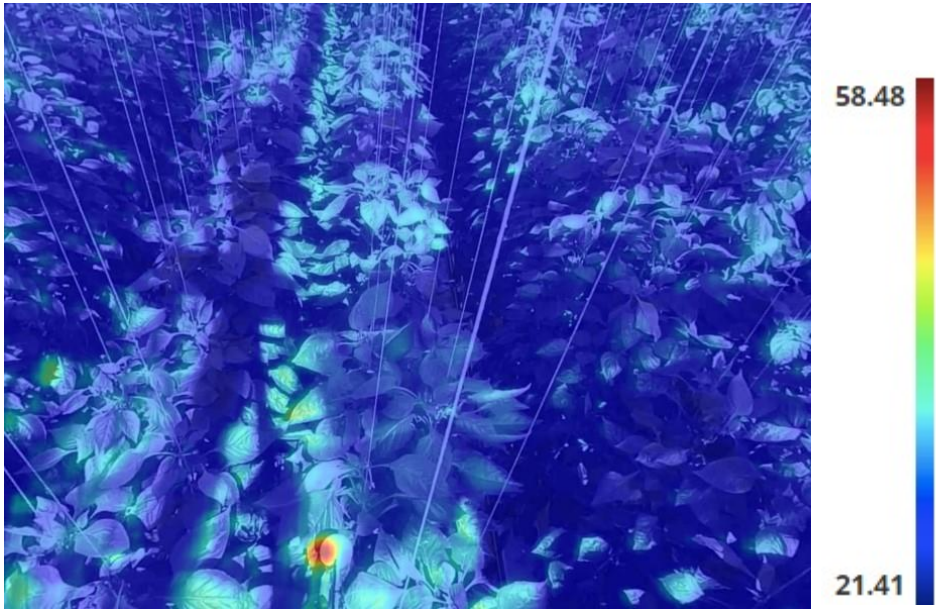


- Solar panels inside the greenhouse
- In combination with light filter/reflectors
  - Reflecting green, far red and infra red
  - Most of PAR is passing trough
- Researching the effect on greenhouse climate, crop development and yield


Spectrum
Milliwatt
350
300
250
200
150
100
50
0
350
366
382
398
414
430
446
462
478
494
510
526
542
558
574
590
606
622
638
654
670
686
702
718
734
750
766
782
798
nm

Delphy

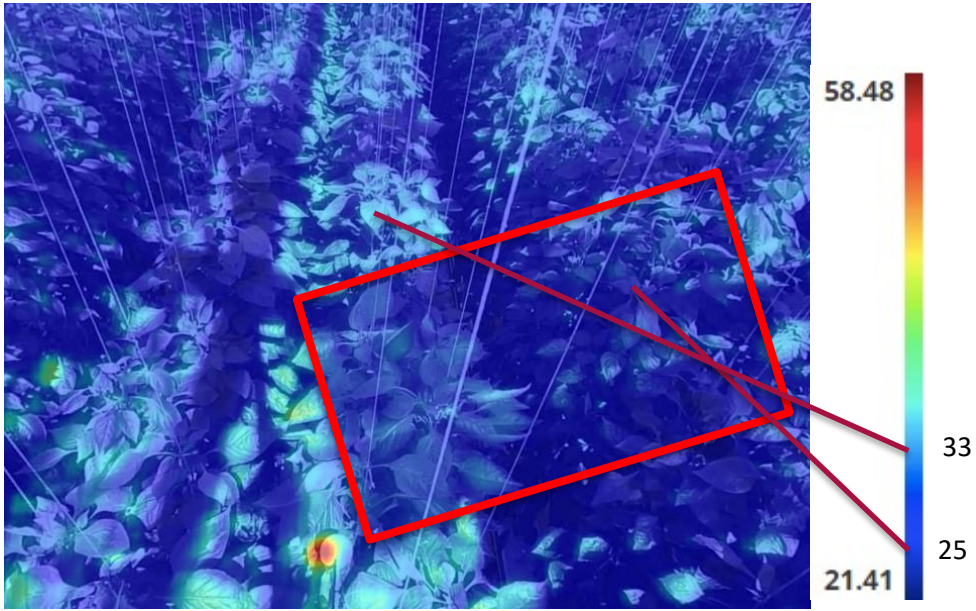
Plant temperature



Delphy

Plant temperature

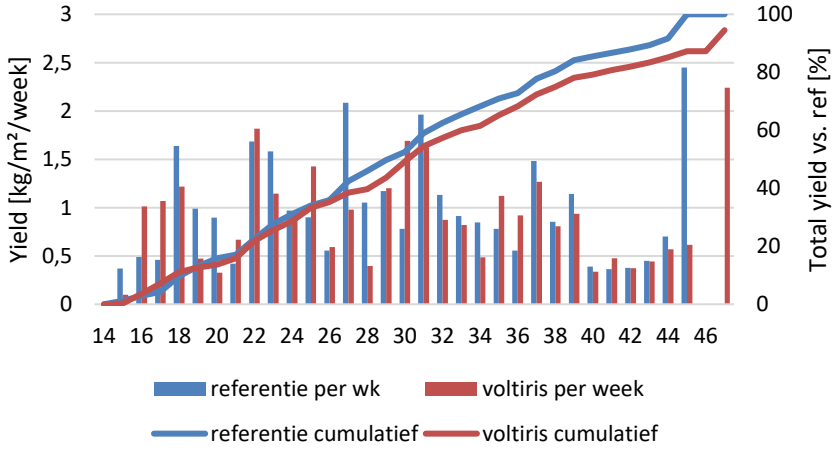
- Difference of 8°C between two extremes

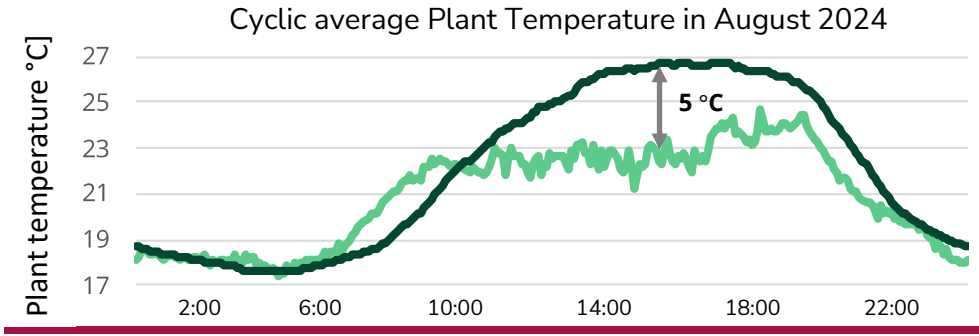


Delphy

Trial results

- Lower greenhouse temperature in summer
- Bigger difference between plant and greenhouse temp
  - Less infra-red
  - Advantage in summer?
- Yield difference of 6%, mainly caused by light loss. Next research will be focused on strawberries and climate strategy.

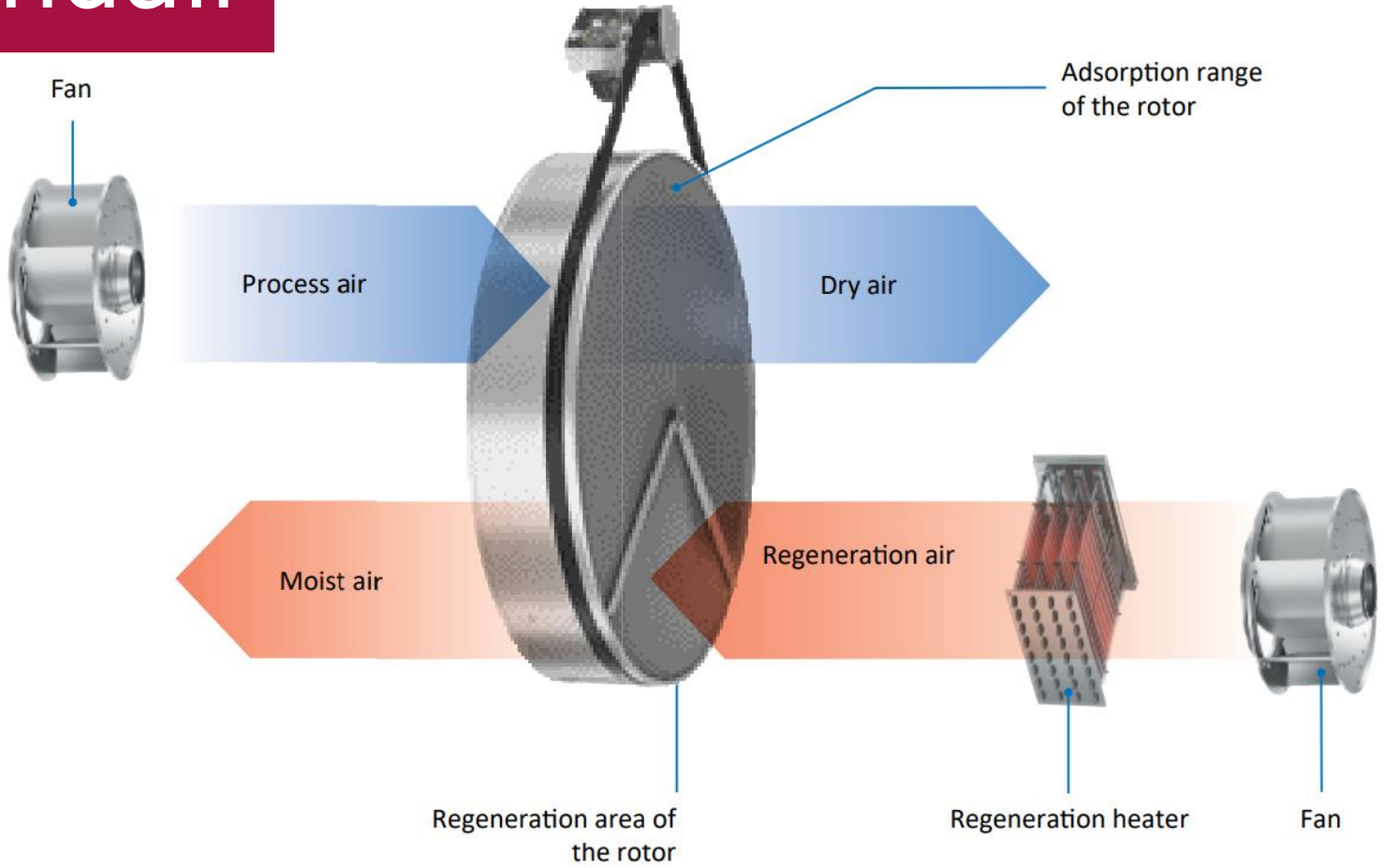




Delphy


Condair

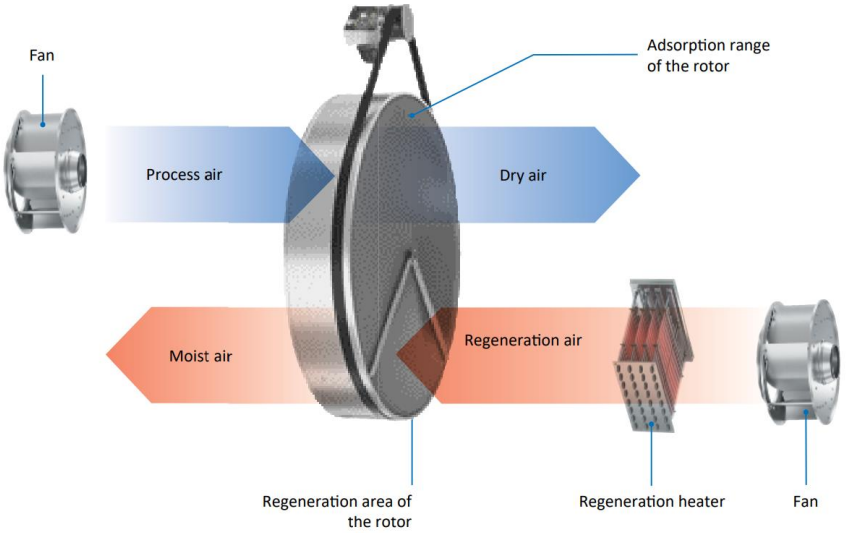
Condair


Fan
Adsorption range of the rotor
Process air
Dry air
Moist air
Regeneration air
Regeneration area of the rotor
Regeneration heater
Fan

How it works

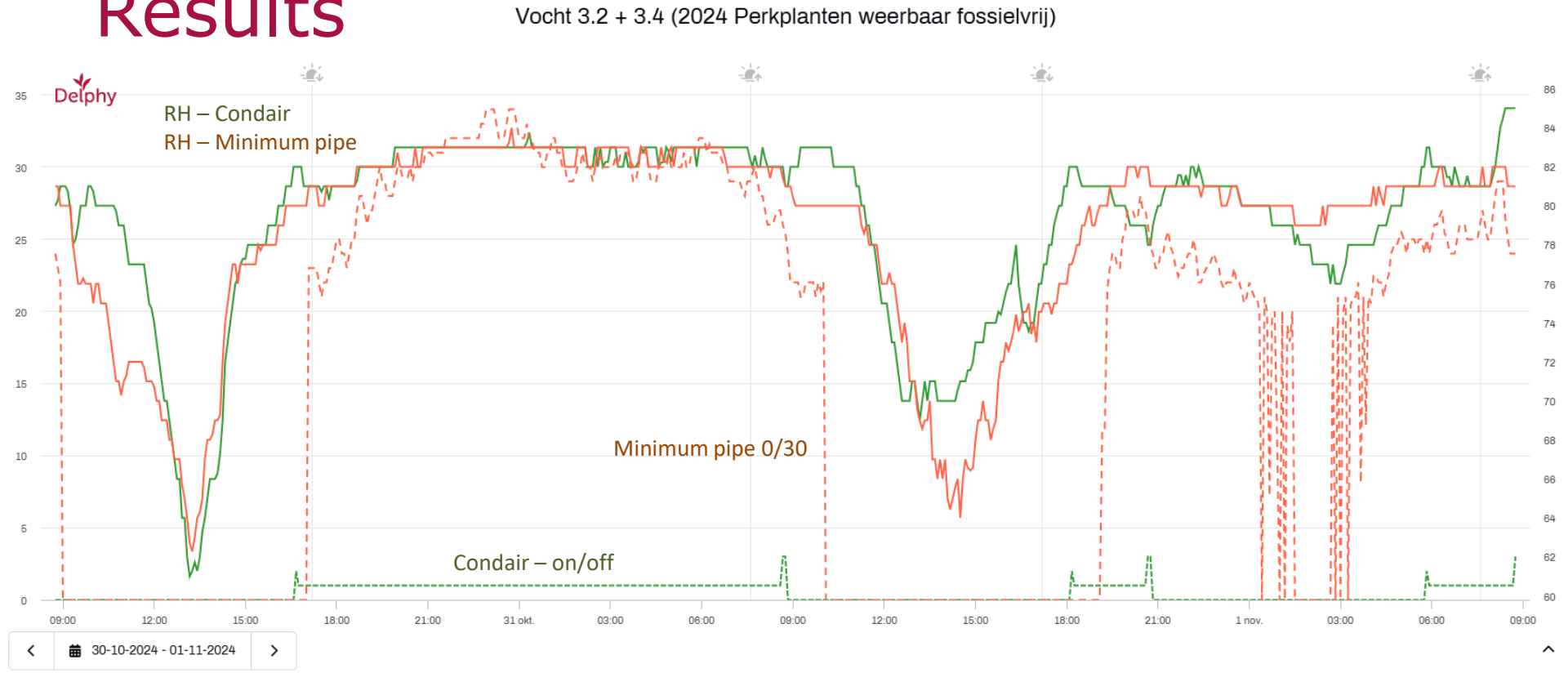
- Works well in cold conditions
  - Different from condensation dryers

- Draws in humid air
- Rotor ‘captures’ moisture (silica)
- Dry air is returned to greenhouse
- Part of the air is heated and, after regeneration, sent outside
- Cyclical process



Delphy

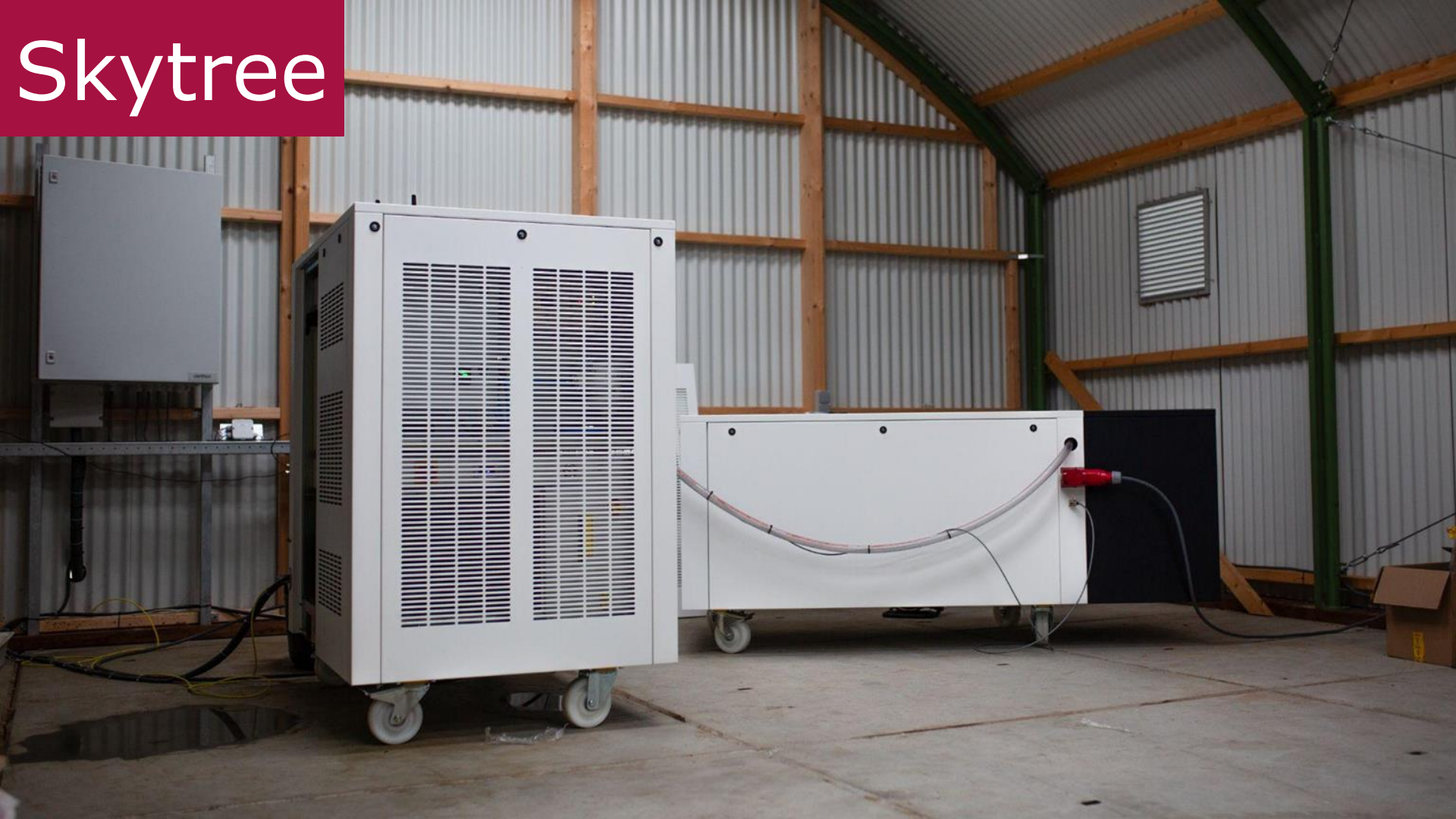
Results



- Able to control humidity energy efficiently

Delphy

Skytree



CO_2: Opportunities for Direct Air Capture

- CO_2 is crucial: Without CO_2, yields can be 20-30% lower
- Fossilfree cultivation (no CHP): different heat sources
- Geothermal energy, heat pumps and/or electric boilers → no local source of CO_2
- Liquid CO_2 can be unreliable and expensive
- Reliable and circular CO_2 is a prerequisite for sustainable horticulture in 2040

Delphy

SkyTree test at Delphy

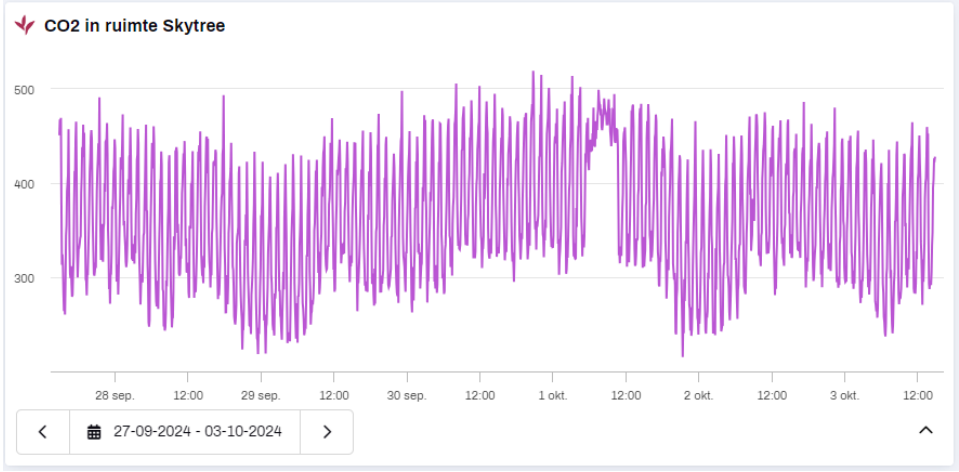
- 1 SkyTree Cumulus unit used since September 2024

- Goals:
  - Learn more about practical application
  - Effect on crop
  - Optimalise technique

Delphy

Results SkyTree

- Application of SkyTree Cumulus
  - About 12kg CO_2/dag harvested
  - Fills a 30kg tank
- Supplying around 10-20% of needed CO_2
  - Windows open : 2 hours of dosing
  - Windows closed: up to 2 days
- Usage [kWh/day]
  - 11-12 KWh/kg CO_2



Delphy

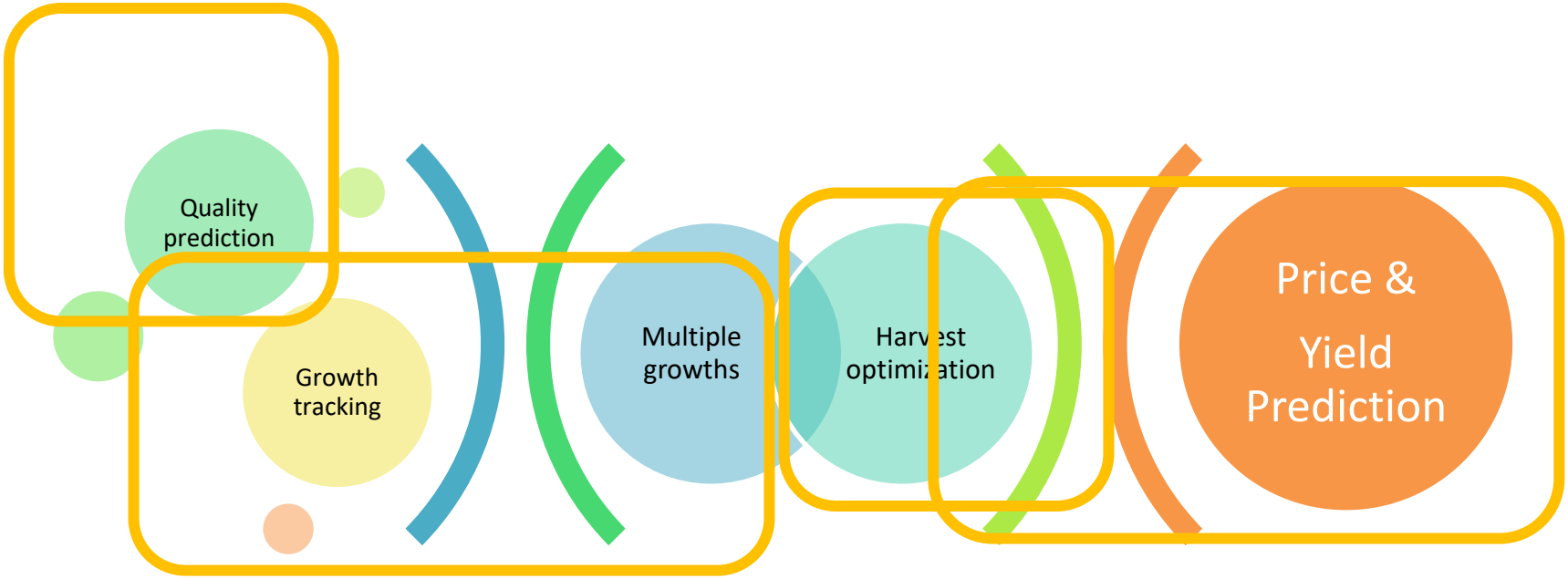
Fruit quality (with TU Delft)

Background

- The strawberry sector moving towards:
  - Increasingly collecting data
    - Climate
    - Crop development
  - Looking for ways to stabilize production and quality
  - Trying to maximize outputs while reducing inputs

- **Goal:** reducing waste and increasing rendability and efficiency of strawberries

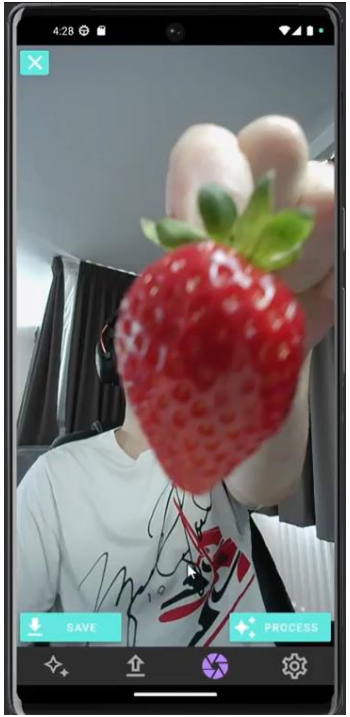
Delphy


Quality prediction
Growth tracking
Multiple growths
Harvest optimization
Price & Yield Prediction
Single-Fruit Level
Batch-of-Fruits Level
Greenhouse Level

Delphy

Results

- Model has been made to predict Brix and ripeness
- Can help objective decision making when picking
- Helps reduce waste in the chain by knowing yield and quality in advance



Delphy

Delphy

Thank you for your attention!

Worldwide Expertise for Food & Flowers