

Welcome to Propagate!2025

Your team for today



Hans van Herk



Annelies Michels



Ad Kranendonk



Marcel Cloo



Yorick van Asperen



These days are all about
Green & Sustainable Propagation





Program for today

10:30 – 10:45	Opening
10:45 – 11:30	Tomorrow's Allies – Tom Groot
11:30 – 12:00	Powering Propagation – Lukas Sigg
12:00 – 12:30	Screen Sense – Paula Rico
12:30 – 13:30	Walking lunch
13:30 – 14:00	Tiny Titans – Fleur Bruinen
14:00 – 14:45	Propagation on the Other Side of the World
14:45 – 15:15	The Strategy of Scent – Jürgen Brokelman
15:15 – 15:45	Coffee break
15:45 – 17:15	Propagate Experience – Innovation pitches
17:15 – 18:30	Closing & drinks
18:30 – 19:30	Guided walk to Hotel Voco The Hague (shuttle possible)
19:30 – 22:00	Walk-in dinner at Hotel Voco The Hague



Tomorrow's Allies: Beneficials in the Propagation of the Future

Tom Groot



Hi, I'm Tom

Integrated Pest
Management Expert



Koppert at a glance

- Macrobial natural enemies
- Entomopathogenic nematodes
- Beneficial microbes
- Pollinators
- Supporting products



A good crop starts with clean plants

Starting material is clean from pests

Propagation should provide clean plants

- For grower
- Export / import requirement

How?

- Clean raw materials
- Strict hygiene in place
- Scouting and monitoring
- Effective (chemical) treatment (to finish)



A good crop starts with clean plants

Starting material is clean from pests

Increasingly hard to guarantee cleanliness

- Fewer chemicals available
- Pesticide resistant pests



A good crop starts with clean plants

Starting material is clean from chemical residues

Growers are under pressure to use less chemicals

- Fewer effective chemicals
- Retailers demands
- Pressure from society

Natural enemies are the sustainable alternative

- Leave no residues
- No resistance problems
- No environmental concerns



A good crop starts with clean plants

Starting material is clean from chemical residues

Beneficial3 items		Side Effects			
Select product					
 Swirski Mite	X				
 Thripor L	X				
 Spidex	X				
Active ingredient2 items					
Select product					
 Gazelle	X				
 Tracer	X				
				GazelleX Acetamiprid	
				spray	drench
				spray	drench
 Swirski MiteX <i>Amblyseius swirskii</i>	egg			4	
	adult			4	1
	population	1	1		
	persistence			1 - 2 WEEKS	0 WEEKS
 Thripor LX <i>Orius laevigatus</i>	nymph	4	2	3	2
	adult	2	1	2	1
	persistence	6 WEEKS	1 WEEKS	< 1 WEEKS	0 WEEKS
 SpidexX <i>Phytoseiulus persimilis</i>	nymph			2	
	adult			2	1
	population	3	1		
	persistence	1 WEEKS	1 WEEKS	1 WEEKS	0 WEEKS



A good crop starts with clean plants

Starting material is clean from chemical residues

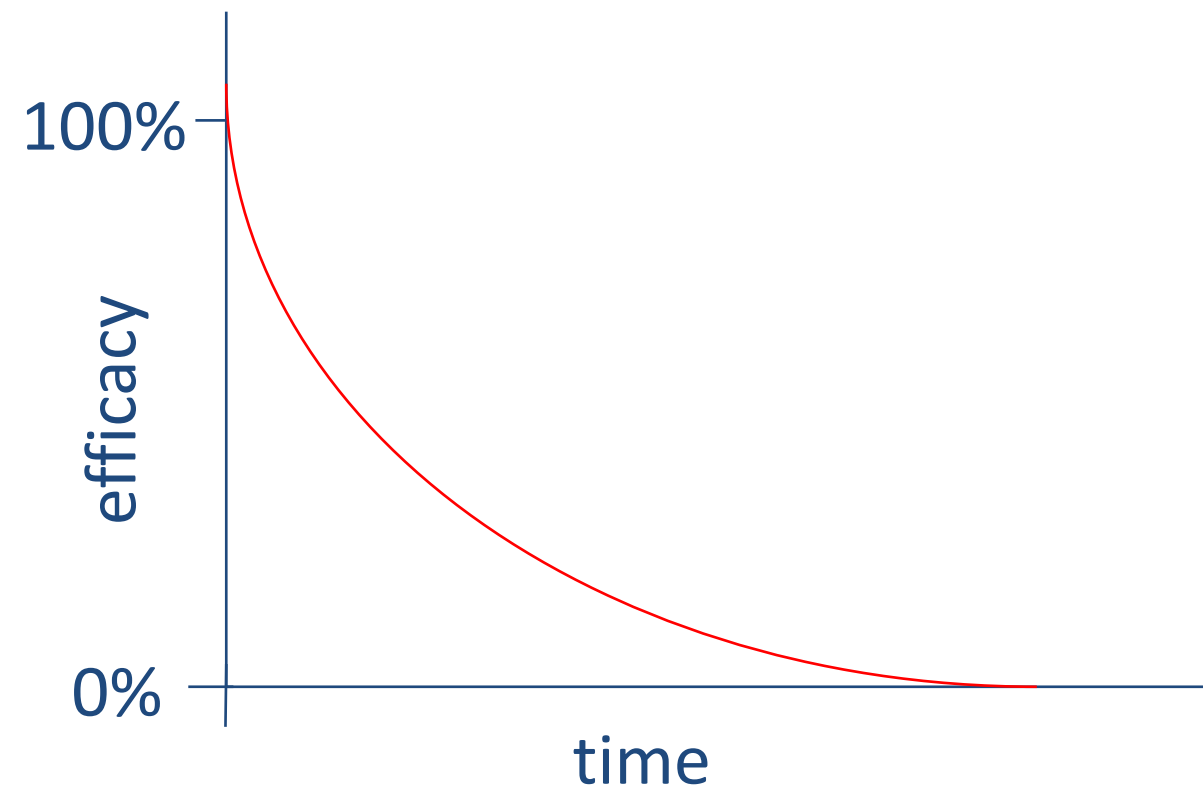
Chemical residues will delay the start of the biocontrol program

Natural enemies need time to build a population

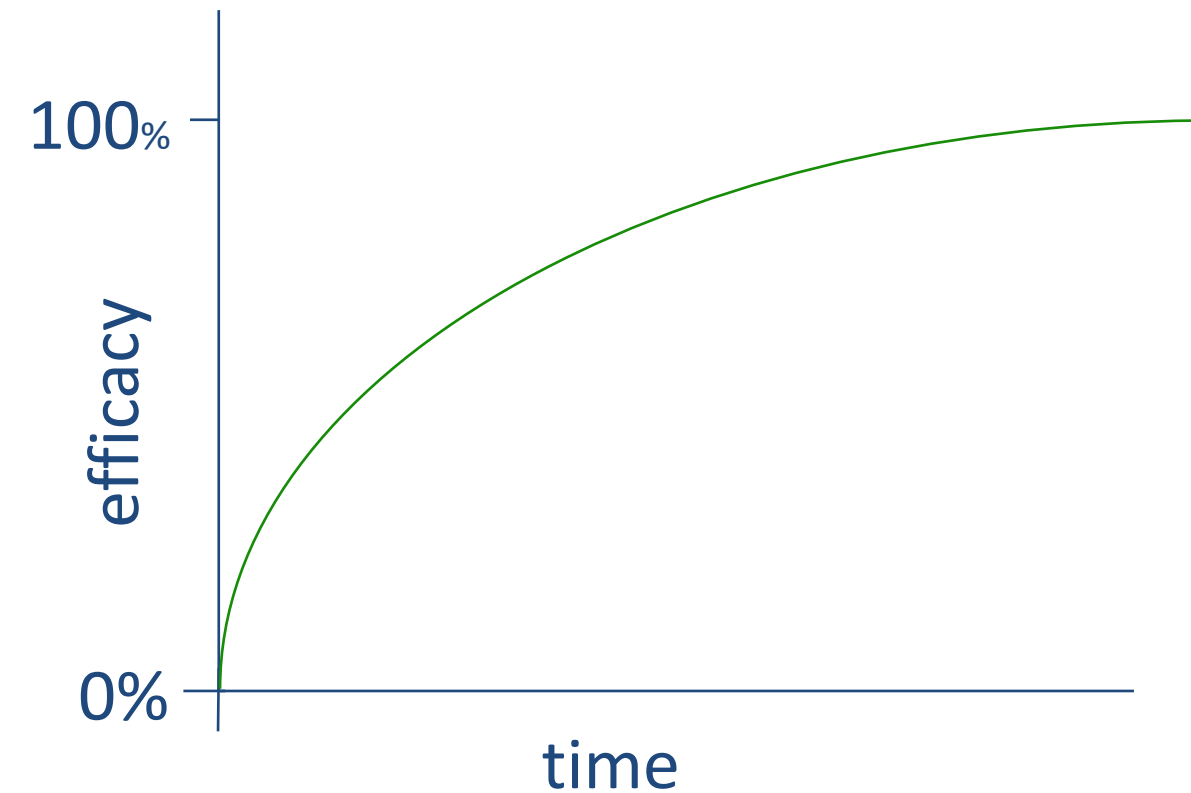


A good crop starts with clean plants

Starting material is clean from chemical residues



col
on
2
tio



A good crop starts with clean plants

Starting material is clean from chemical residues



Temperature	10°C	15°C	20°C	25°C	30°C
Generation time (days)	19.8	16.6	10.0	13.6	9.6
Doubling time (days)	8.5	5.6	2.7	3.1	3.2

In 14 days, 5x doubled | 1 becomes 32!

- Parasitoid is faster!
- If head start is too large, aphid population will surpass the damage threshold
- Start as soon as possible



A good crop starts with clean plants

Starting material is clean from chemical residues

Compatible alternatives that leave no residue include

- Some “softer” chemicals
- Temperature treatments (CATT, plant sauna, ...)
- Soaps, oils, salts, ...



A good crop starts with clean plants

Starting material is clean from pests

Starting material is clean from chemical residues

Starting material is loaded with natural enemies



A good crop starts with clean plants

Starting material is loaded with natural enemies

Start with natural enemies on the mother plants

Use natural enemies to control pest during propagation

- May require additional feed to grow and multiply
- May / may not remain on the plant during transport
- Take advantage of the dense positioning
- Could be challenge for phytosanitary inspections



A good crop starts with clean plants

Starting material is loaded with natural enemies

Example: nursery release *Nesidiocoris* for tomatoes

- Introduce 7-10 days before transplanting
- Provide high quality food

Plants are loaded with eggs!



A good crop starts with clean plants

Starting material is loaded with natural enemies

Why does it work?

- Start as soon as possible
- Activates the plant defenses

Journal of Pest Science (2022) 95:1501–1517
<https://doi.org/10.1007/s10340-022-01506-3>

REVIEW



Induction of plant defenses: the added value of zoophytophagous predators

Meritxell Pérez-Hedo¹ · Sarra Bouagga² · Nina Xiaoning Zhang³ · Rob Moerkens⁴ · Gerben Messelink^{5,6} · Josep A. Jaques⁷ · Victor Flors⁸ · George Broufas⁹ · Alberto Urbaneja¹ · Maria L. Pappas⁹ 



A good crop starts with clean plants

Starting material is clean from pests

Starting material is clean from chemical residues

Starting material is loaded with natural enemies



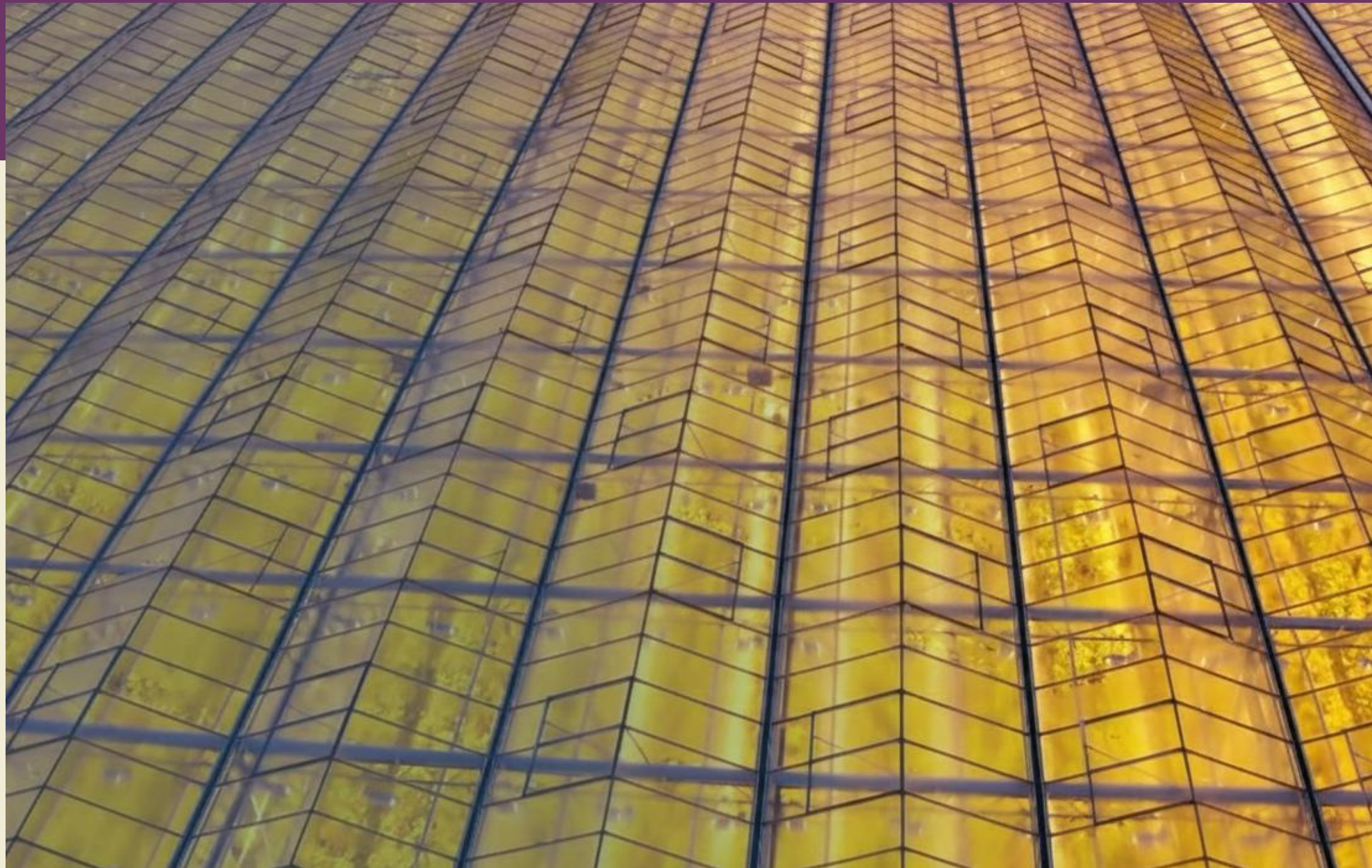
Thank you!

Tom Groot



Smart Energy management for propagators

Lukas Sigg



Hi, I'm Lukas

Founder of Nordic Energy
Consulting



The Greenhouse Business Or The Energy Business

You're in both



Reactive vs Strategic



Relying only on your
supplier is not enough



Be strategic and not reactive



Markets and regulations
are changing fast

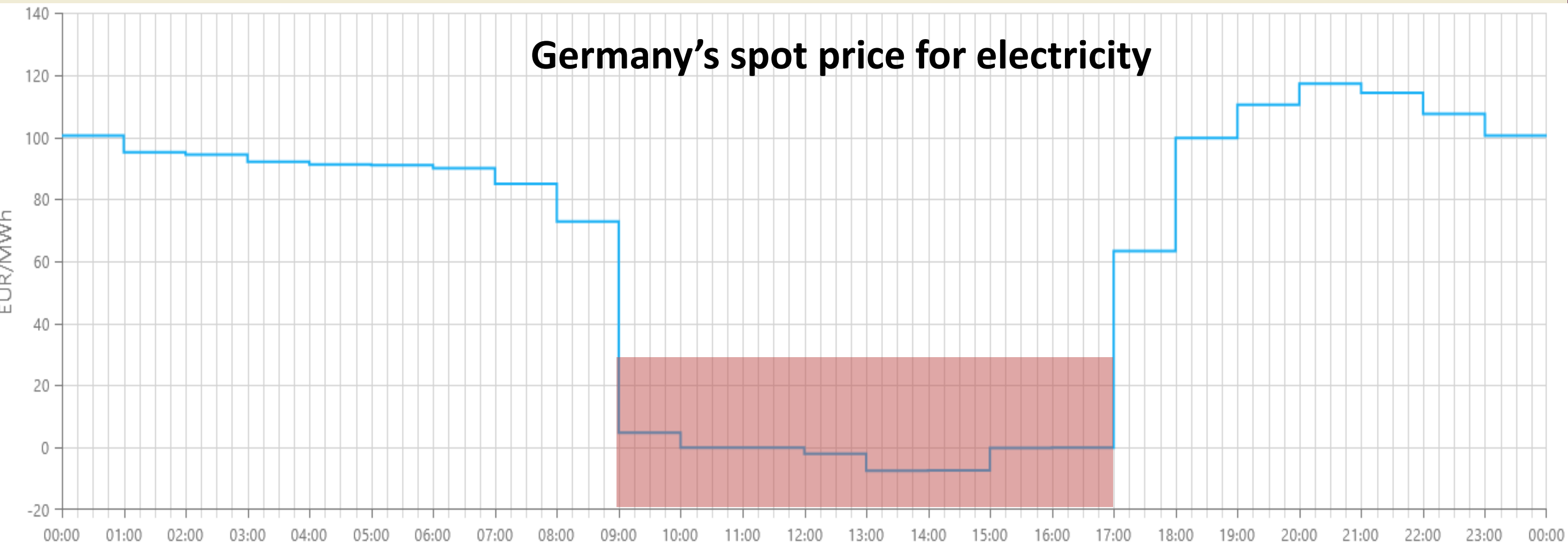


Energy is one of your
biggest costs



Know your local markets

Make sure you know the markets you are operational in and take advantage of them

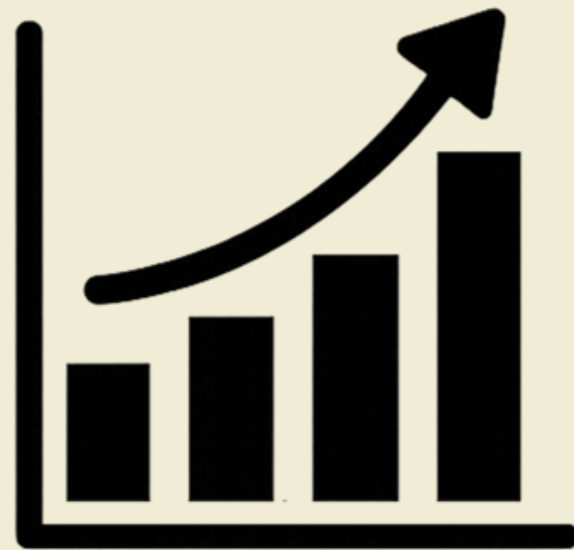


Electrifying your heating

Electrical
boiler



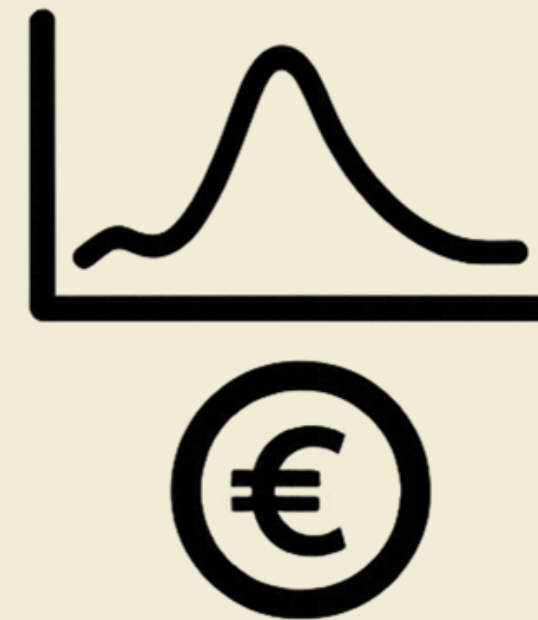
Balancing
markets



Heat
storage



Price
curves

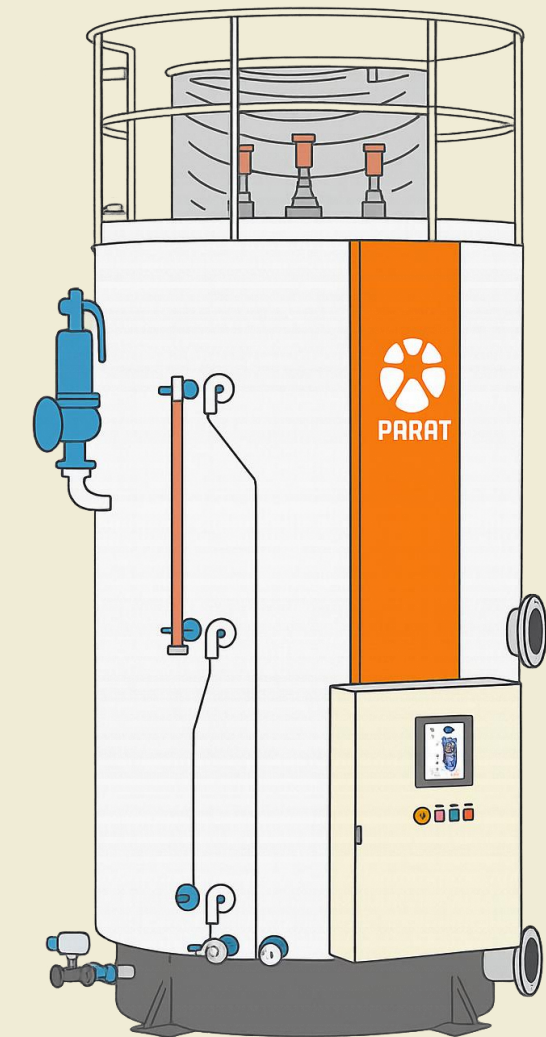


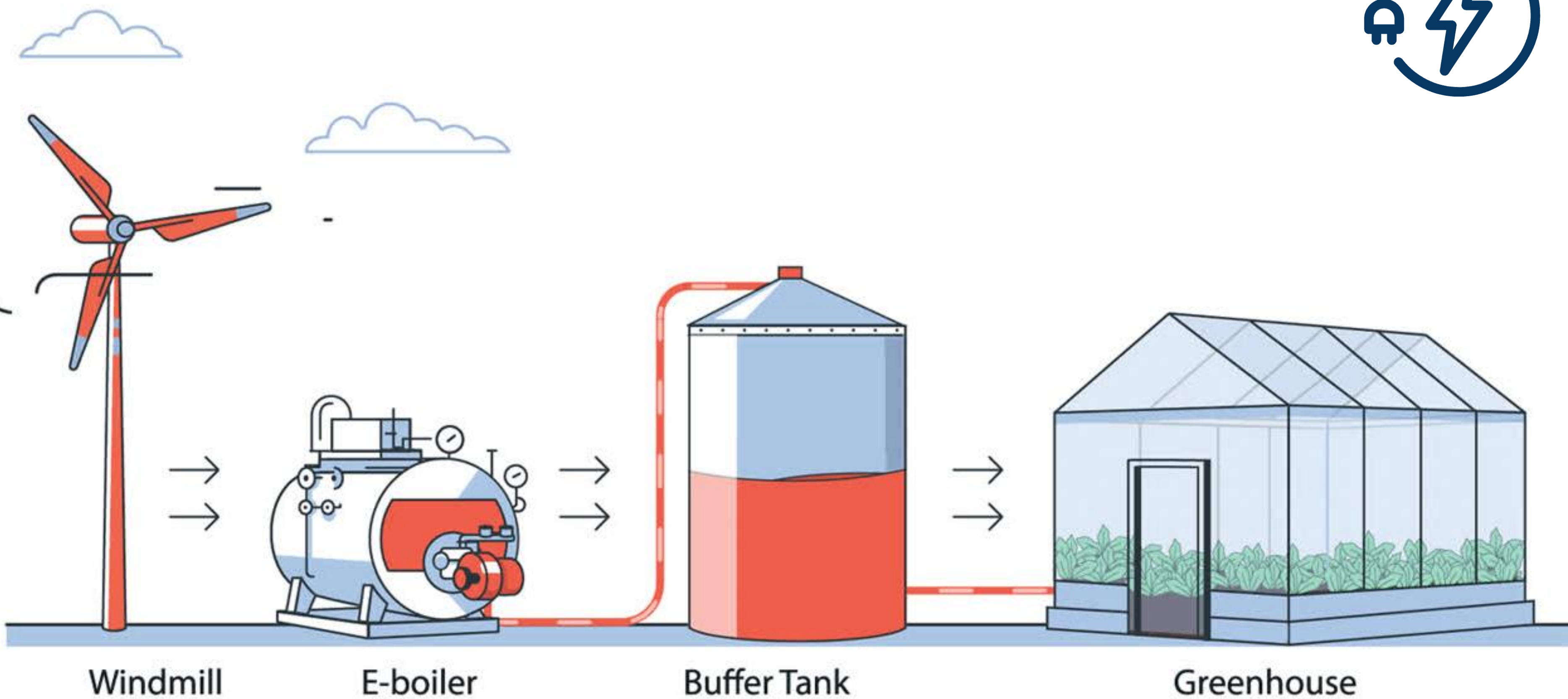
Electrical Boilers

E-boilers come in all sizes, 100 kW to 100 MW

Turn electricity into heat

Combine with heat storage



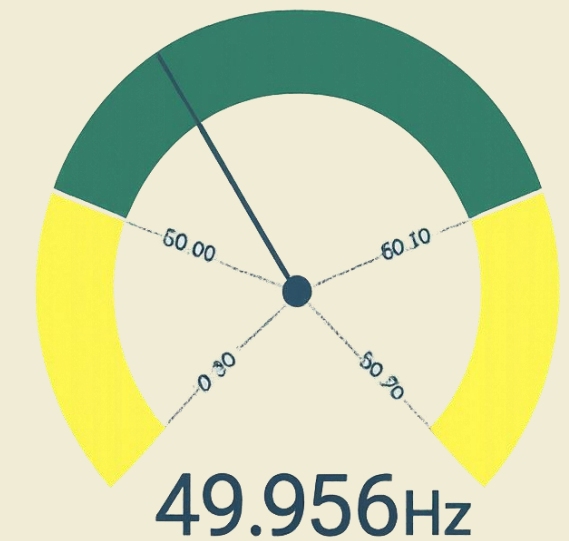
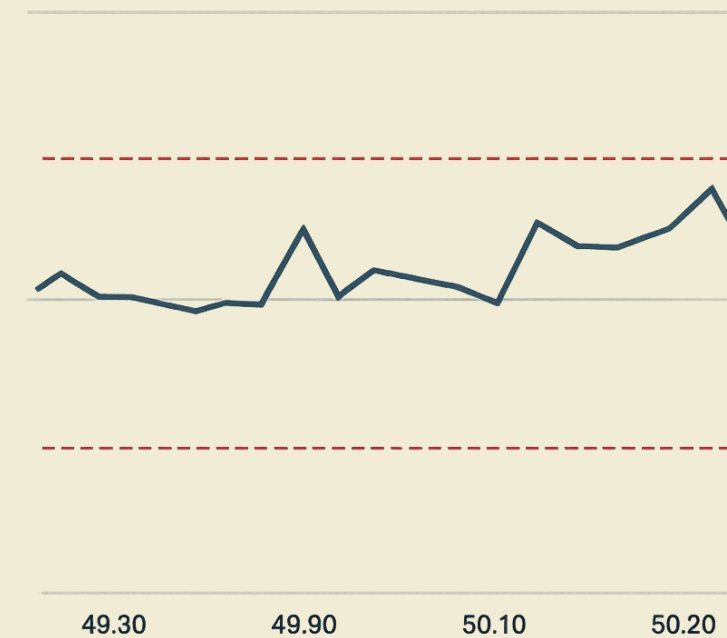


Reserve and Balancing Markets

Turn flexibility into revenue



Electric system frequency





Reserve and Balancing Markets

Turn flexibility into revenue

Why do we need reserve markets

Production and consumption
always needs to be in balance

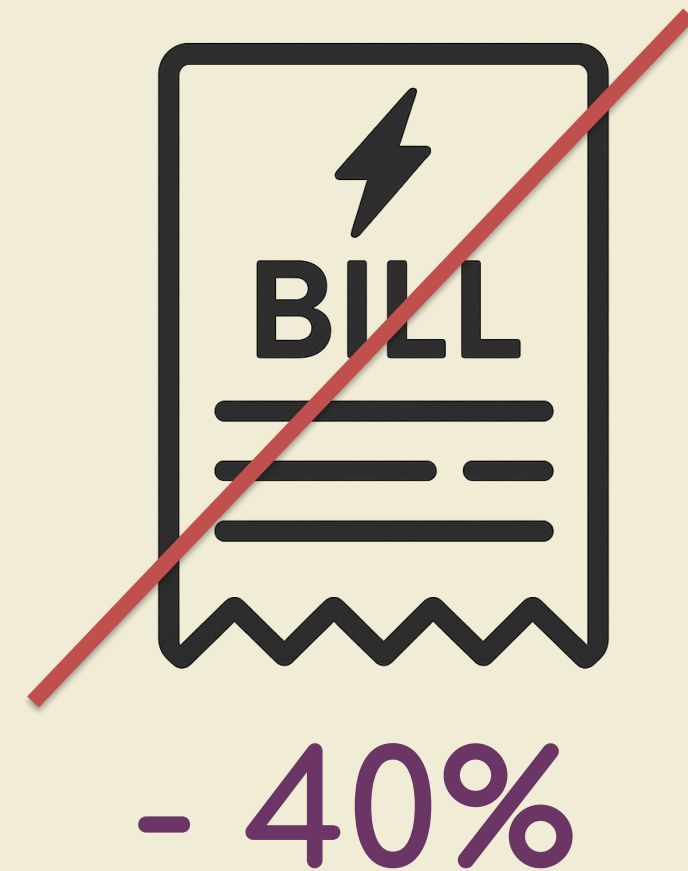
The market needs flexible assets

Perfect for flexible electrical
assets



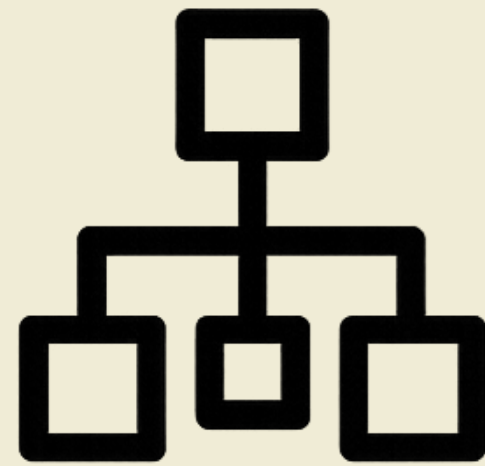
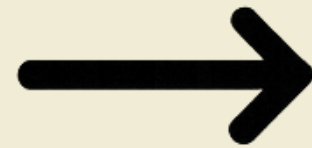
Finland as an example in 2024

"In 2024, a Finnish greenhouse covered over 40% of its electricity costs through revenues from reserve and balancing markets."

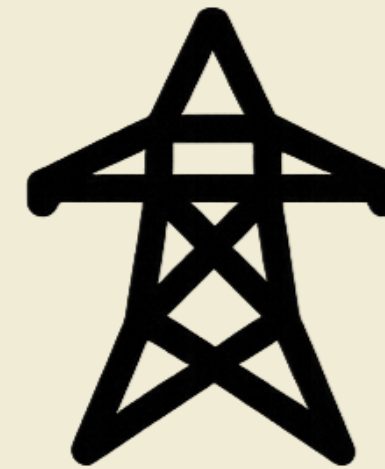




You



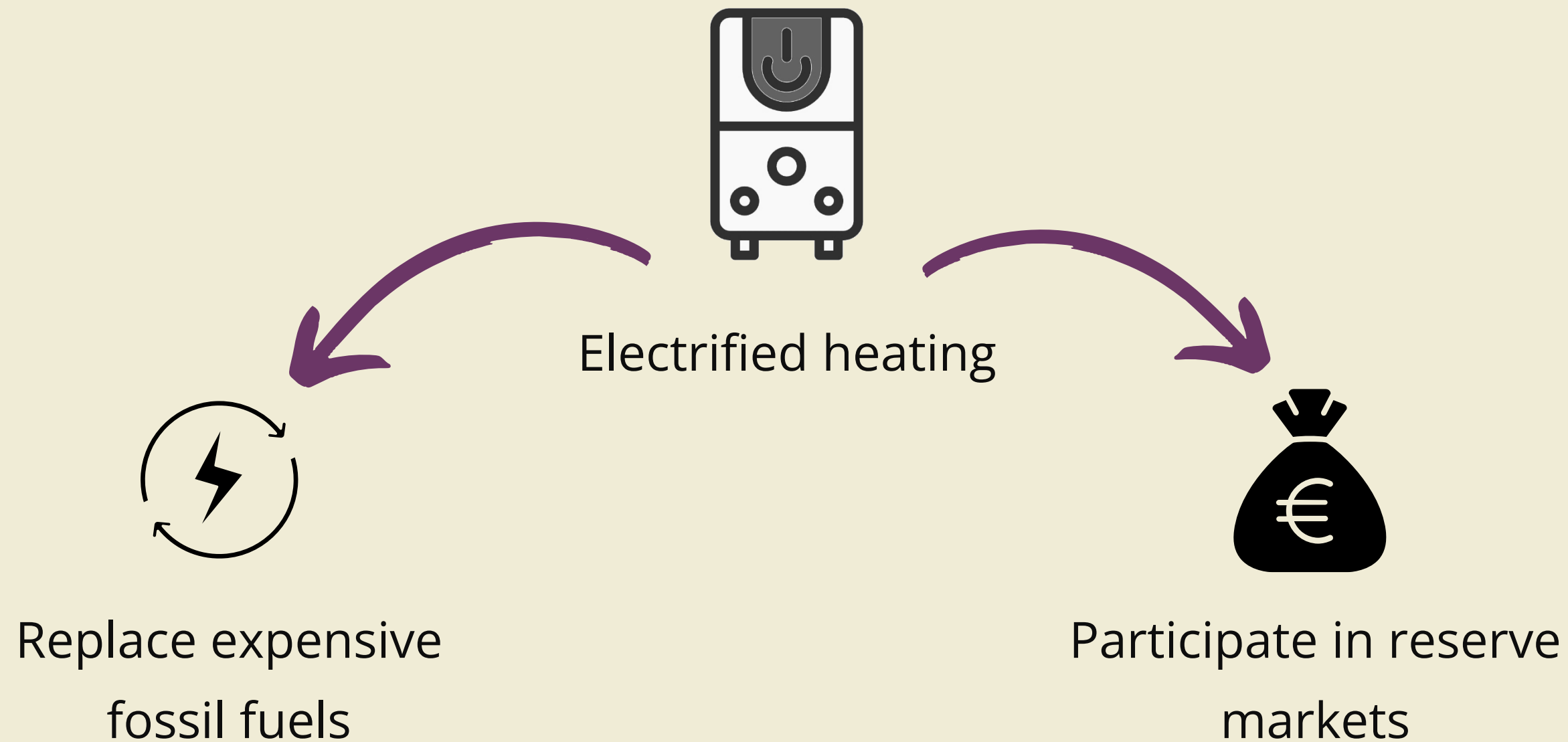
Aggregator



Grid Operator



One Asset Two Income Streams



Thank you!

Lukas Sigg



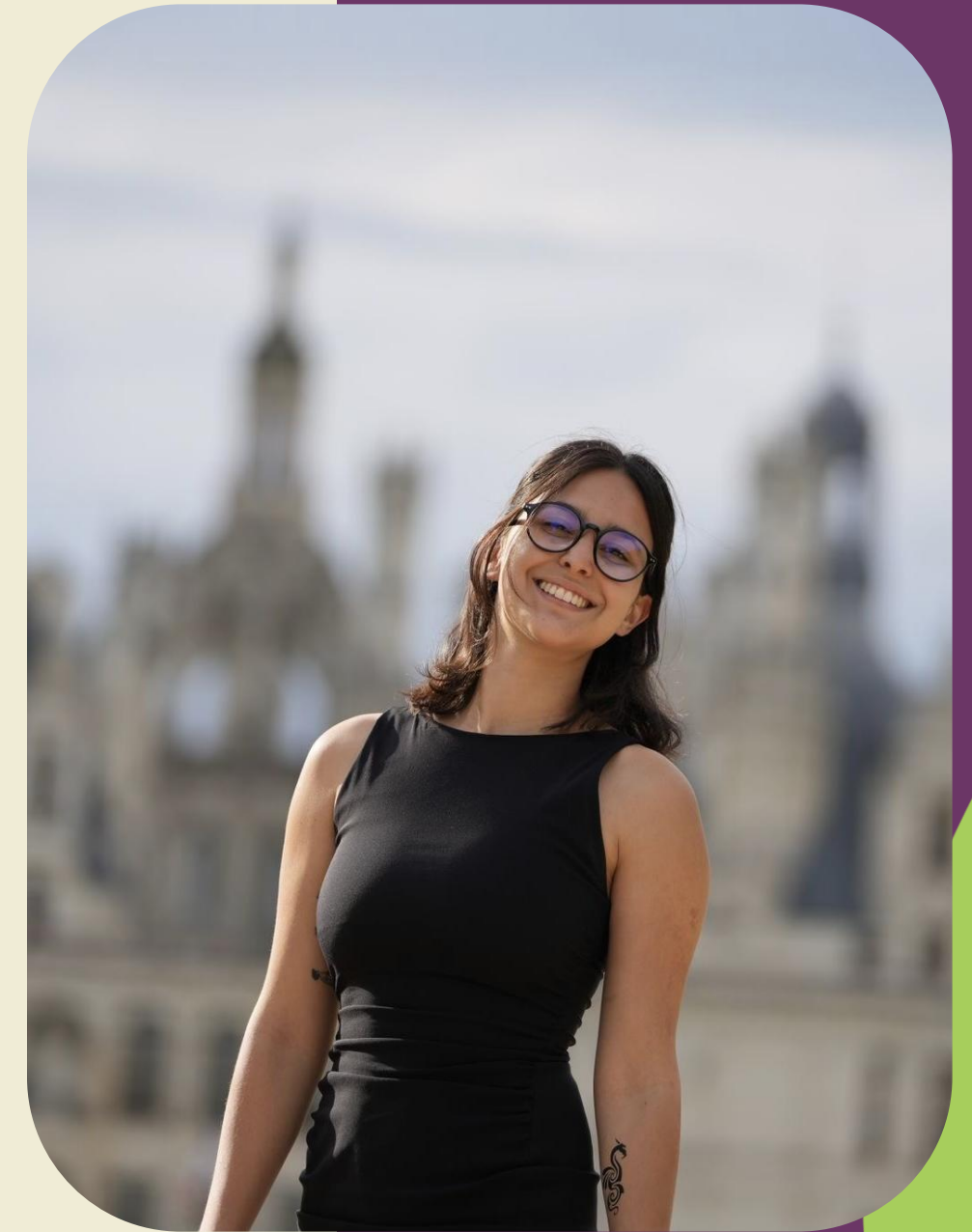
Screening as a path to achieve more efficient growing

Paula Rico



Hi, I'm Paula!

- 🌱 Horticulture and Business Management, HAS | 2026
- 🌱 Internship at Hoogendoorn + PE staff | 2025
- 🌱 High-Tech Agricultural Solutions Minor | 2024
- 🌱 Plant Empowerment Summer School | 2024
- 🌱 Internship at Nunhems & Growy | 2021
- 🌱 Plantanova



The aim



Healthier plants



Energy saving



Lower costs > Higher profit



The struggles



Edema



Prinzenberg, A.E. (2021)



Fungal diseases



Chang et al. (2025)



Lack of Ca



Yara, 2018



The struggles



Lack of Ca



Yara, 2018

With Calcium, there is no point of return

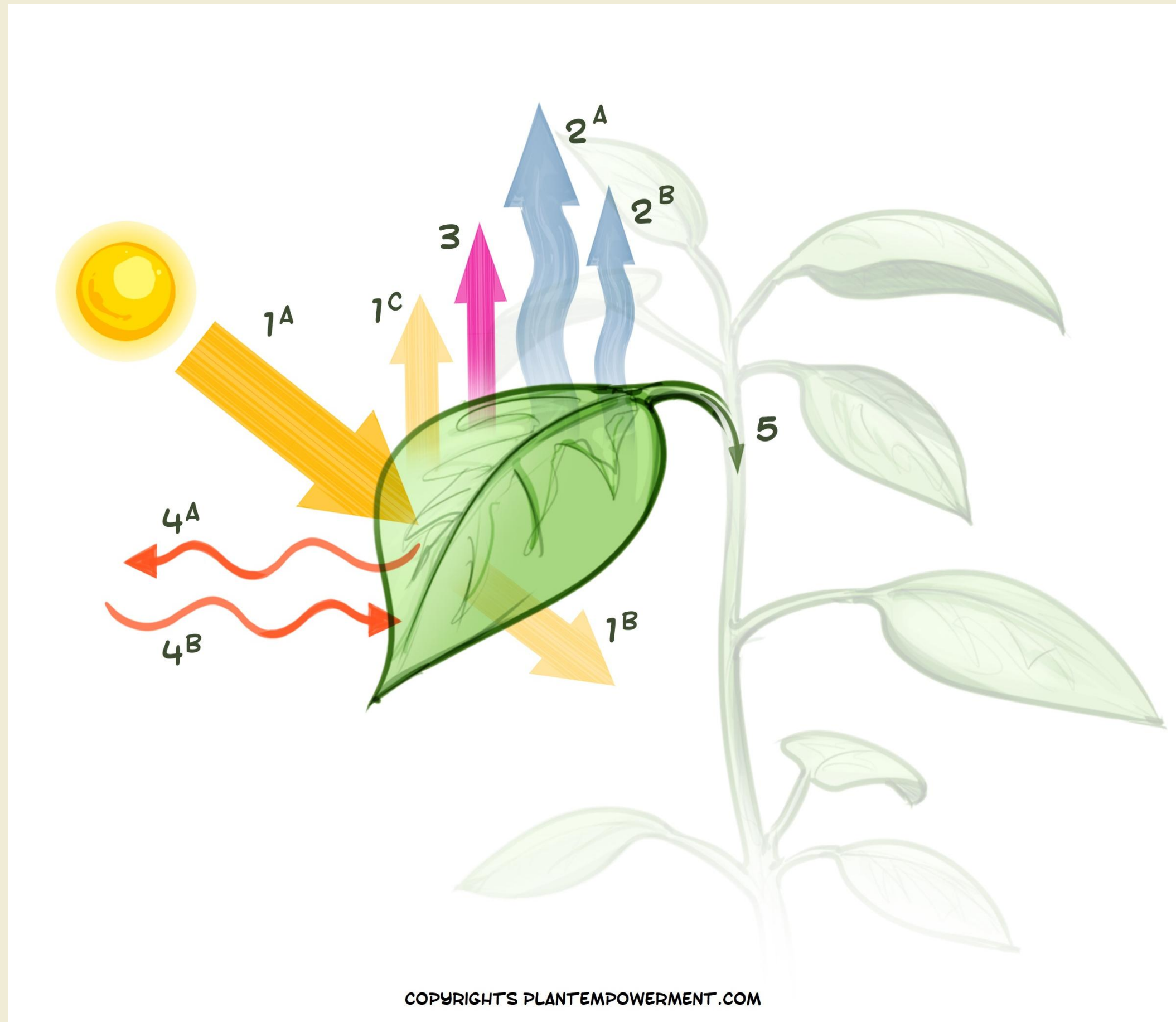


We all want this...



Source: Plant Empowerment





Source: Plant Empowerment



Let's talk about screens

- Reduction of light pollution
- Lower levels of sunlight
- Diffuse light
- Lower influence from outdoor conditions
- Decreased energy consumption
- Prevention of cold heads

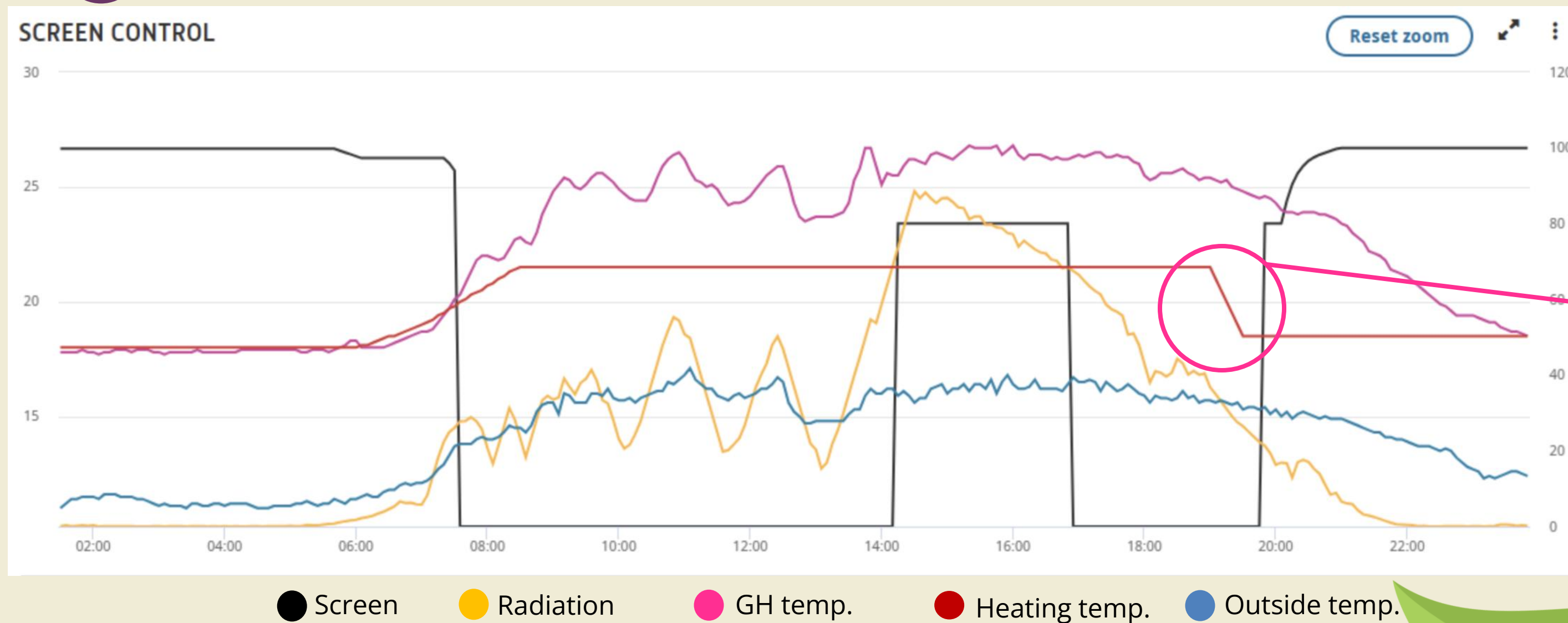


Source: Ludvig Svensson, 2019

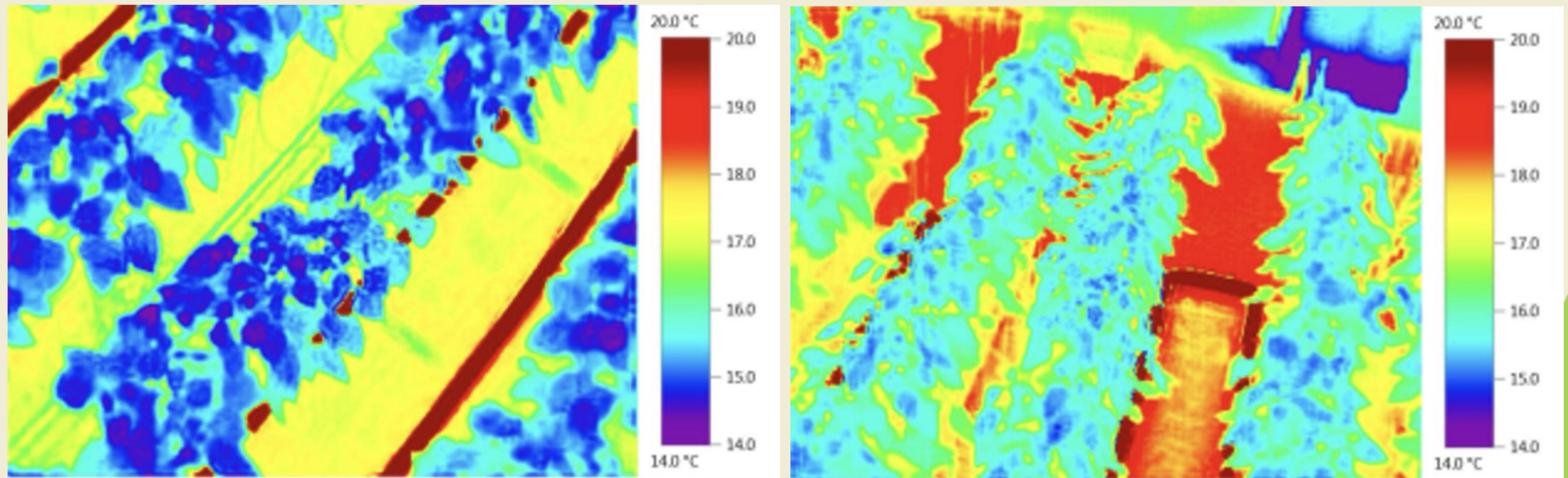


Guidelines

1 Screen against condensation, mainly at sunrise & sunset



- 2 Always assume that there is *heat emission* -> more on clear than cloudy nights



Source: Feije de Zwart, 2016 ; Young peppers

Change 1.5°C without any heating costs!

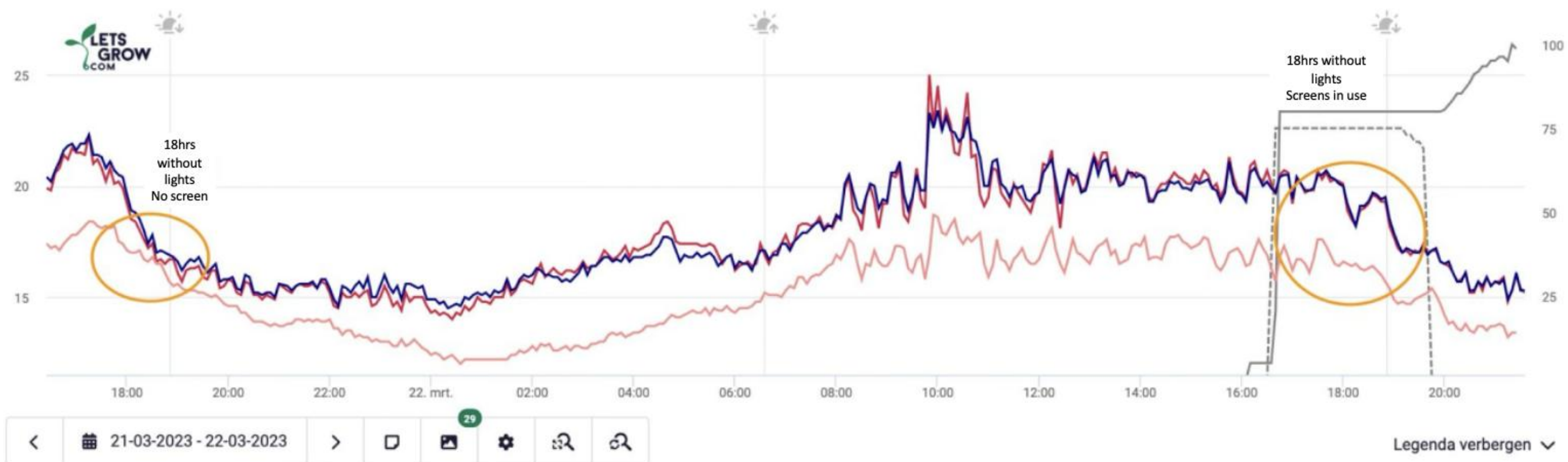




Peter Ninhuys • 2nd
Teeltmanager bij Van Gog Kwekerijen C.V.
2yr • 🌱

⋮ Crop dew point

? Support



● Dew point ● Crop temperature ● Head temperature ● Screens



More Ca in the sap



Luuk van Duijn; Source: Kas Als Energiebron

Key Insights:

Started closing the screen at the end of the day by 80% until night temperature was reached. This increased evaporation at the top of the plant.

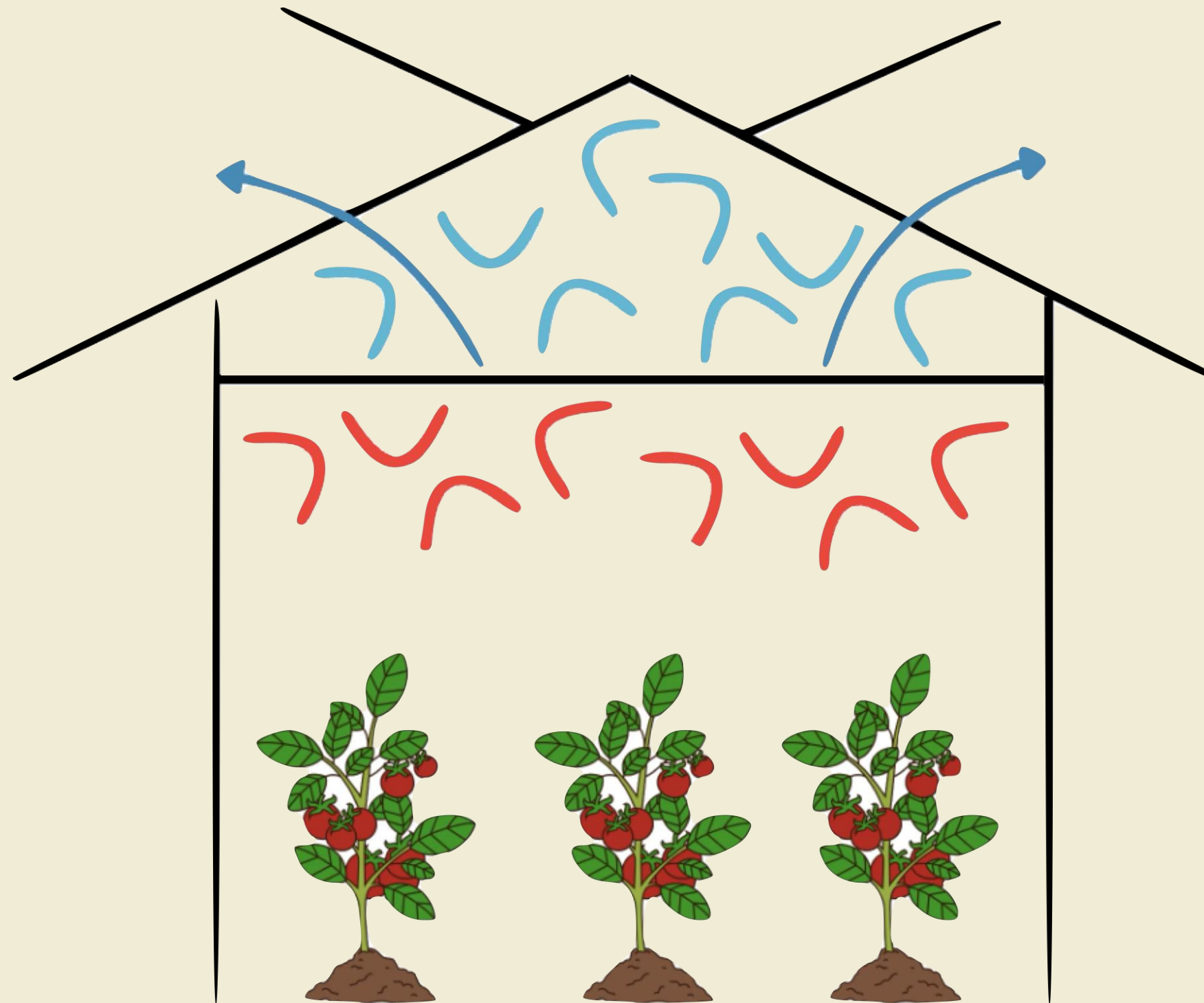
They analyzed leaves every 2 weeks..

Found higher Ca levels in the sap of the young leaves

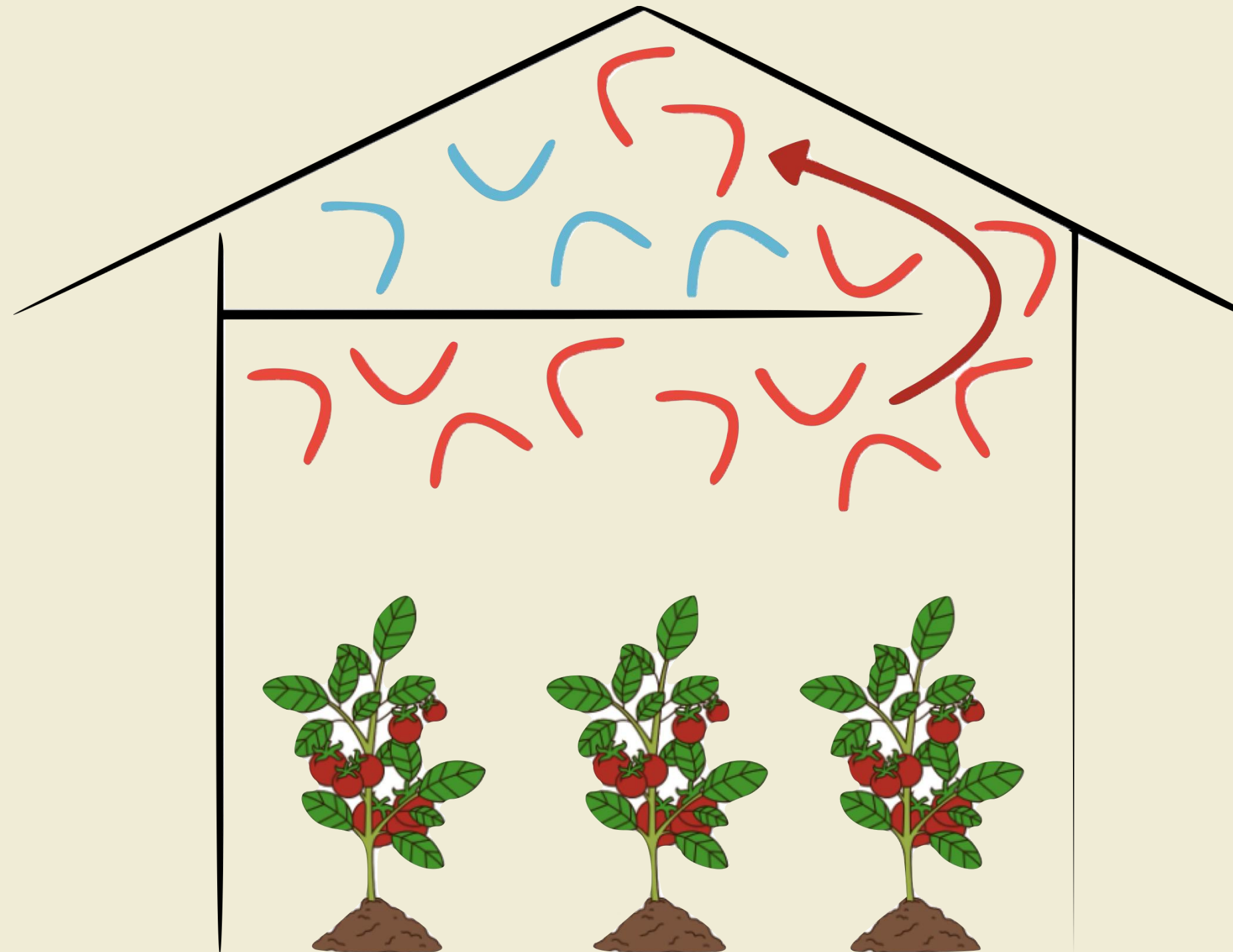
They also used 0.5 m³/m² less gas vs. last year



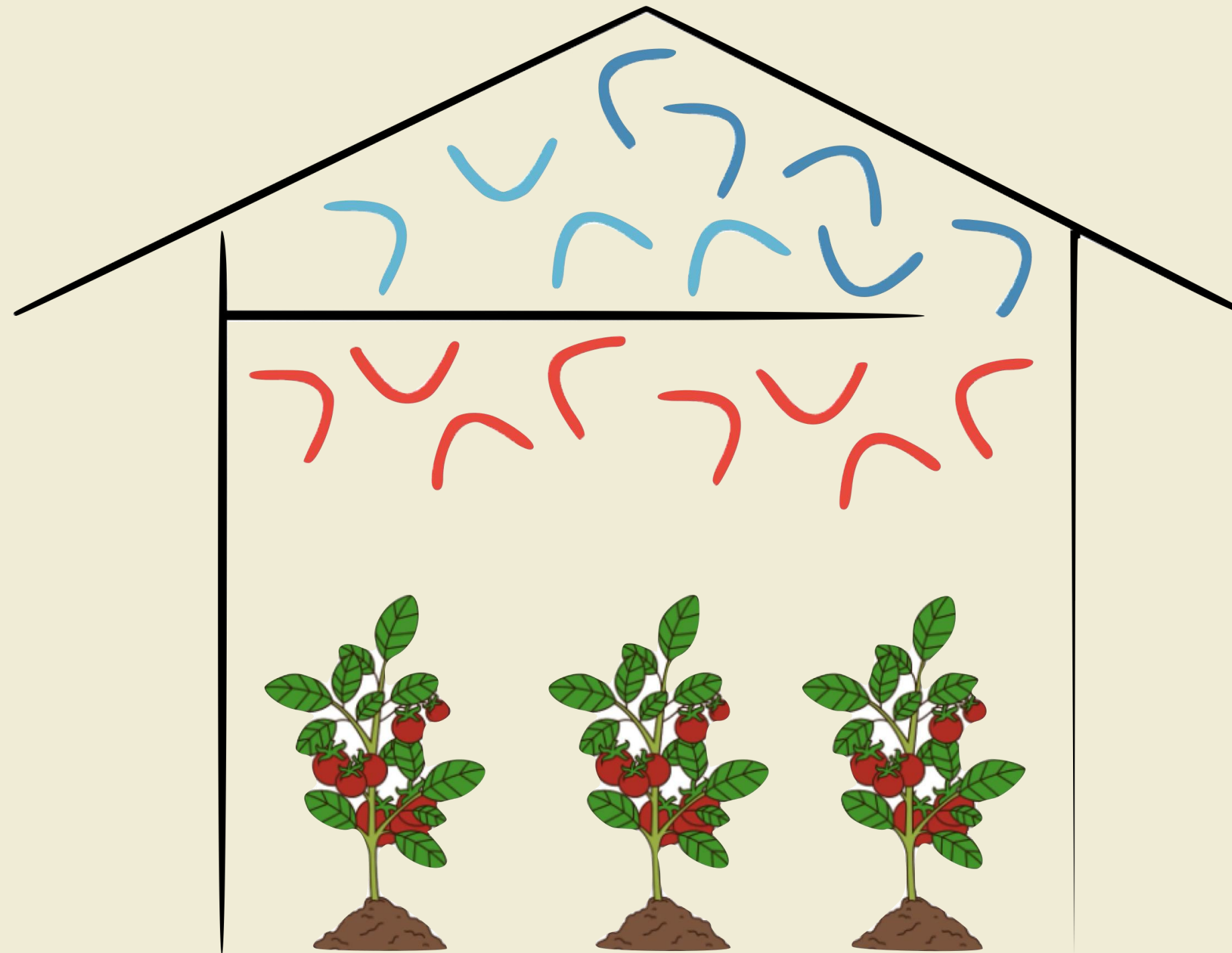
- 3 Close the screens as much as possible to avoid cold drops



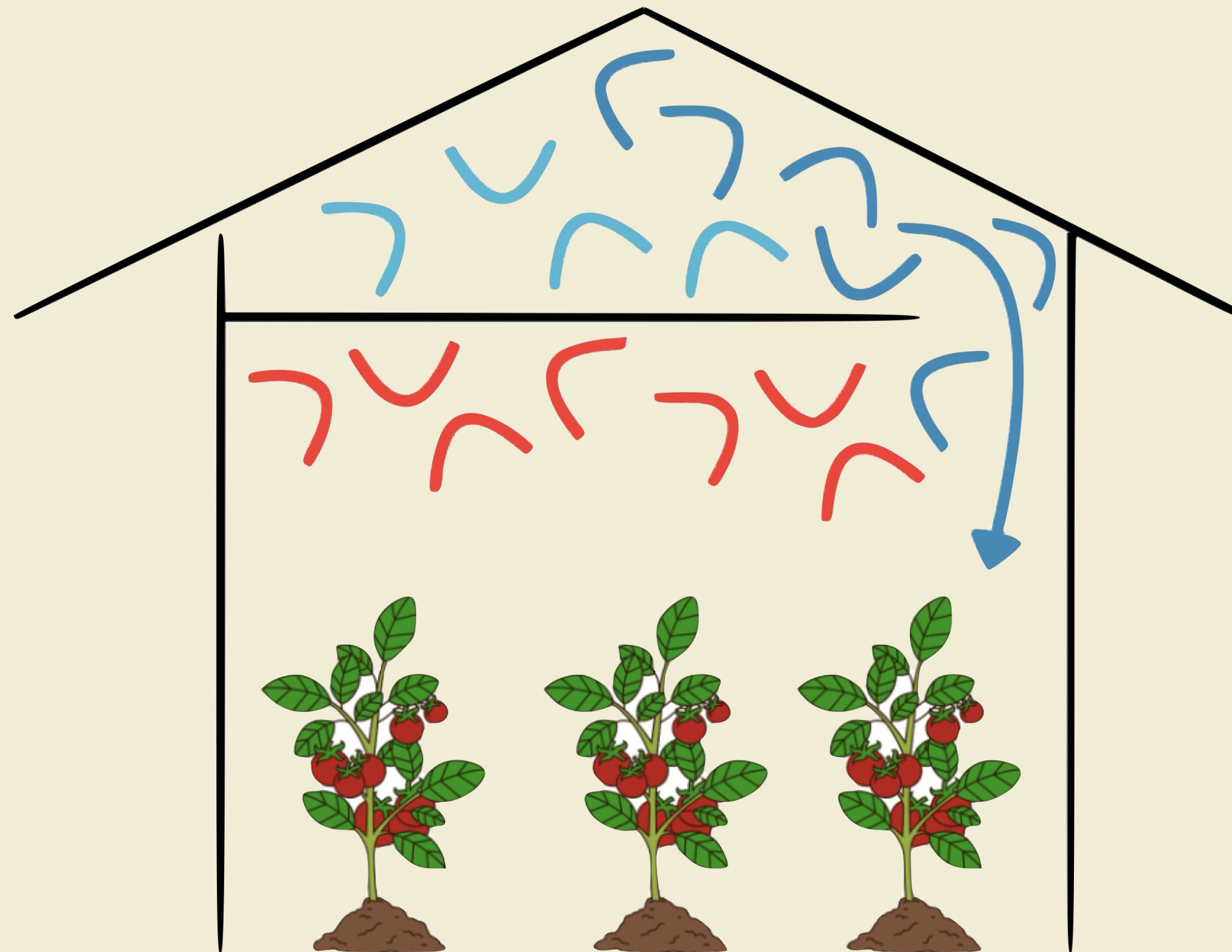
- 3 Close the screens as much as possible to avoid cold drops



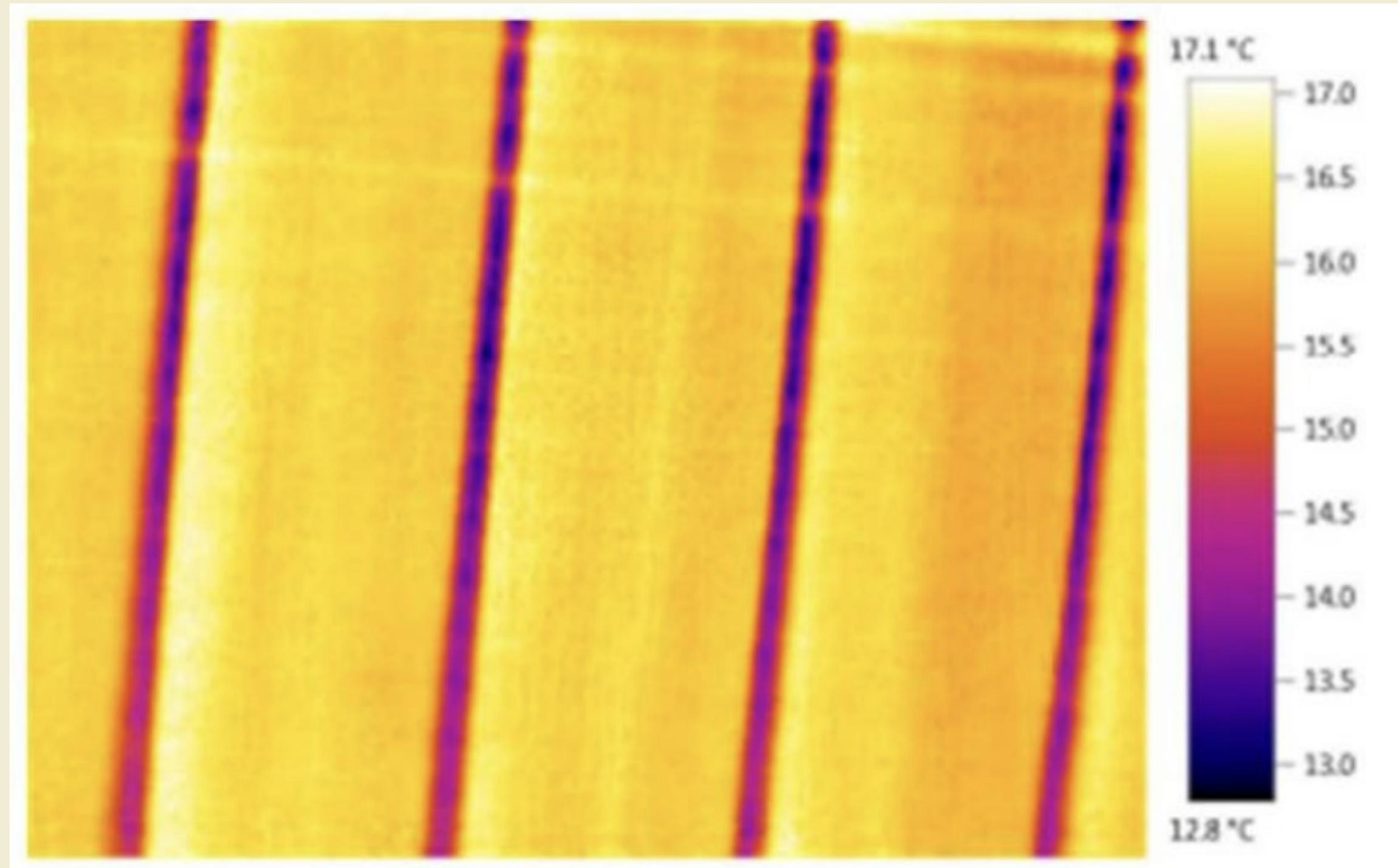
- 3 Close the screens as much as possible to avoid cold drops



- 3 Close the screens as much as possible to avoid cold drops



Gaps between the screens



Source: Feije de Zwart, 2016 ; screen XLS SL95 W/W



Sunrise screening strategy

Cold season

Prevent fall of vertical cold air



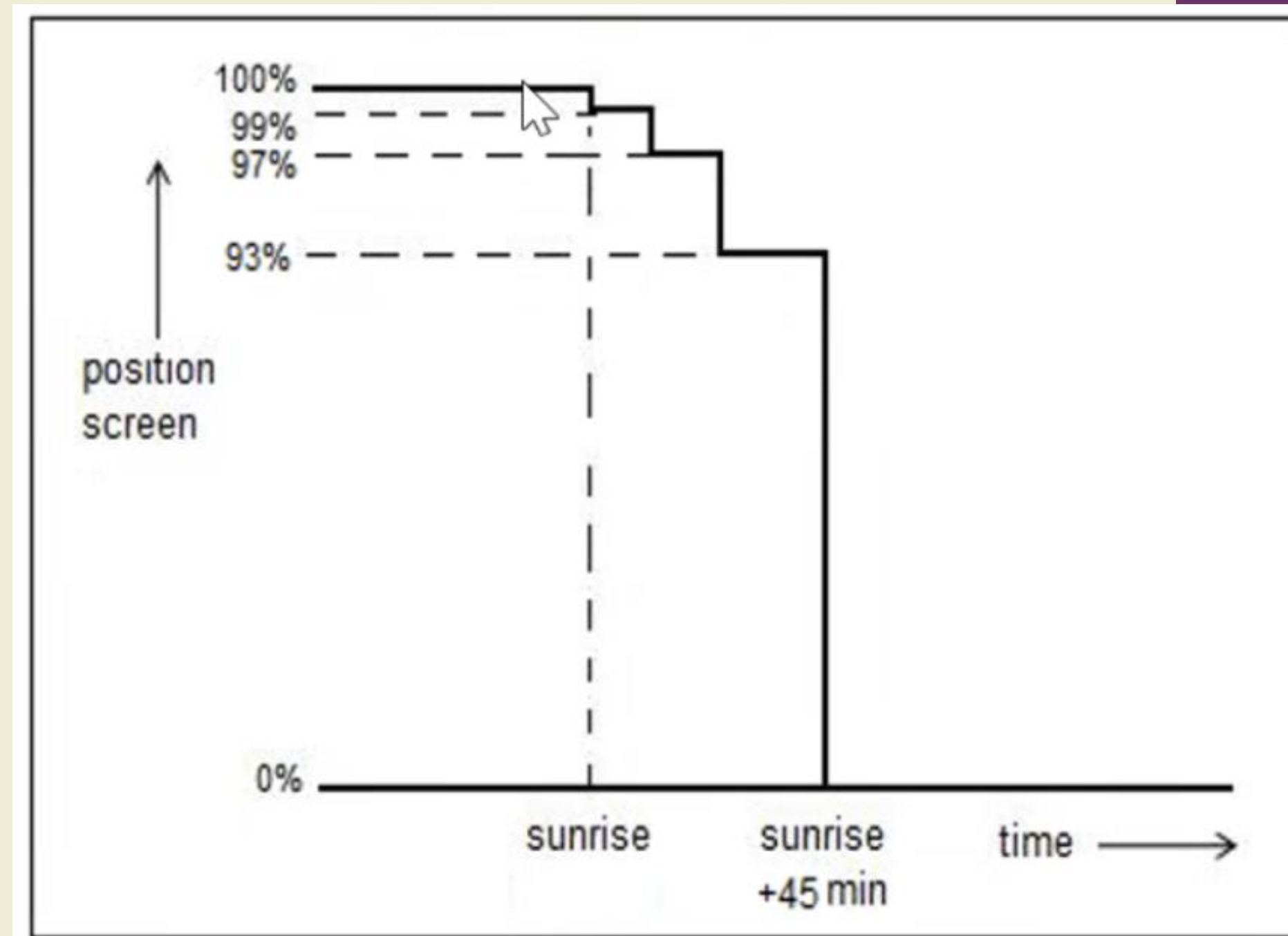
Avoid cold plants



Avoid condensation



Avoid fungi, low Ca, edema...



Source: Paul Arkensteijn,
Svensson

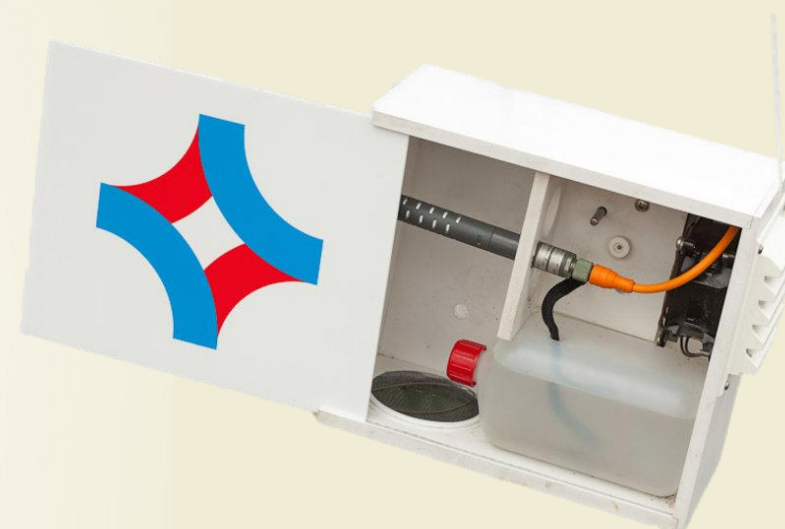
Screening strategy

- Screen against heat emission, mainly at sunset & sunrise
- Close the screens as long as possible for an even climate and to avoid cold drops
- Initiate the day smoothly -> the colder, the more steps!





Use the tools available!



Thank you!

Paula Rico



Paula Rico

Future Data Driven Growing Specialist



Tiny Titans

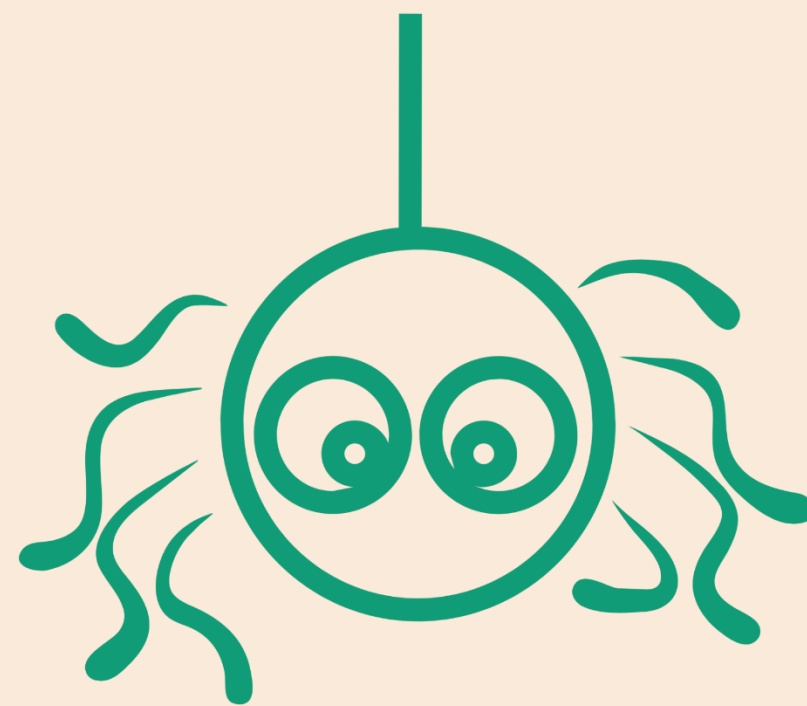
Fleur Bruinen



Hi, I'm Fleur!

Co-owner of Little Spider
B.V.





LITTLE
SPIDER BV



kick-off question

Who is already working with biological control agents in their greenhouse?



Little Spider in Action

LITTLE SPIDER CATCHES AN APHID

 LITTLE
SPIDER BV



What will you do when
spraying is no longer an
option?



A man with grey hair, wearing a dark blue polo shirt with a small logo, is standing in a large greenhouse. He is surrounded by rows of orchids, with a large cluster of purple orchids in the foreground on the left. He is holding a thin vertical wire with his right hand. The greenhouse has a complex metal structure with many hanging pots and plants in the background.

WOS

the ladies who are going to harvest in the morning who were bothered

Breeding the Spiders



What do they do?



The Spider's web



Hunting behavior



Releasing the Spiders



Little Spider Control



Chemical Pest Control



Key Facts



The spider is native and found throughout Europe



They love humidity and warmth, but cold doesn't kill them.



The spiders are monogamous, they stay with one partner for life.



With Little Spider, the
Future Starts Today



Thank you!

Fleur Bruinen



Propagation
at the other
side of the
world





plantanova

Propagation at the other side of world





Suagro
S.R.L

The strategy of scent

Pheromone-powered pest control in Propagation



Expert in natural solutions

Together towards green and sustainable
cultivation methods for your crop



Hi, I'm Jürgen!

Commercial Manager at
HortiPro



HortiPro.com

Plant

Soil &
substrate

Plant
Protection
Products

Water &
fertilizers

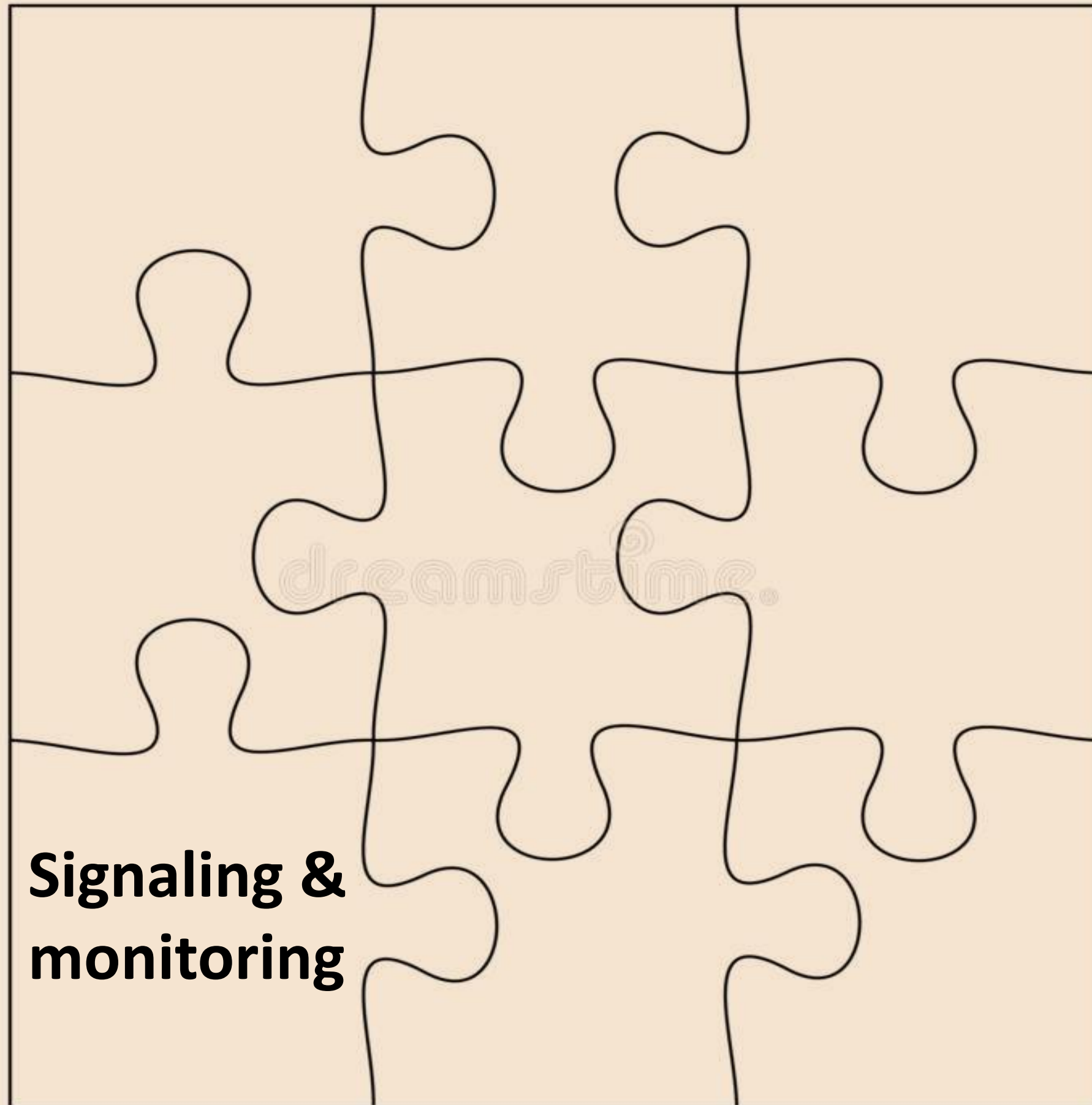


HortiPro.com

Trends in crop protection:

- Social and political concerns.
- Decreasing approved active ingredients. (chemicals)
- More stringent registration requirements.
- Decreasing number of applications on labels.
- The toolbox emptier → lack of curative measures.
- Growing role for green, less environmentally harmful solutions.
- Requires different mindset (IPM → ICM)





Growing puzzle remains the same size but becomes more complex



We need more puzzle pieces to complete the cultivation puzzle.



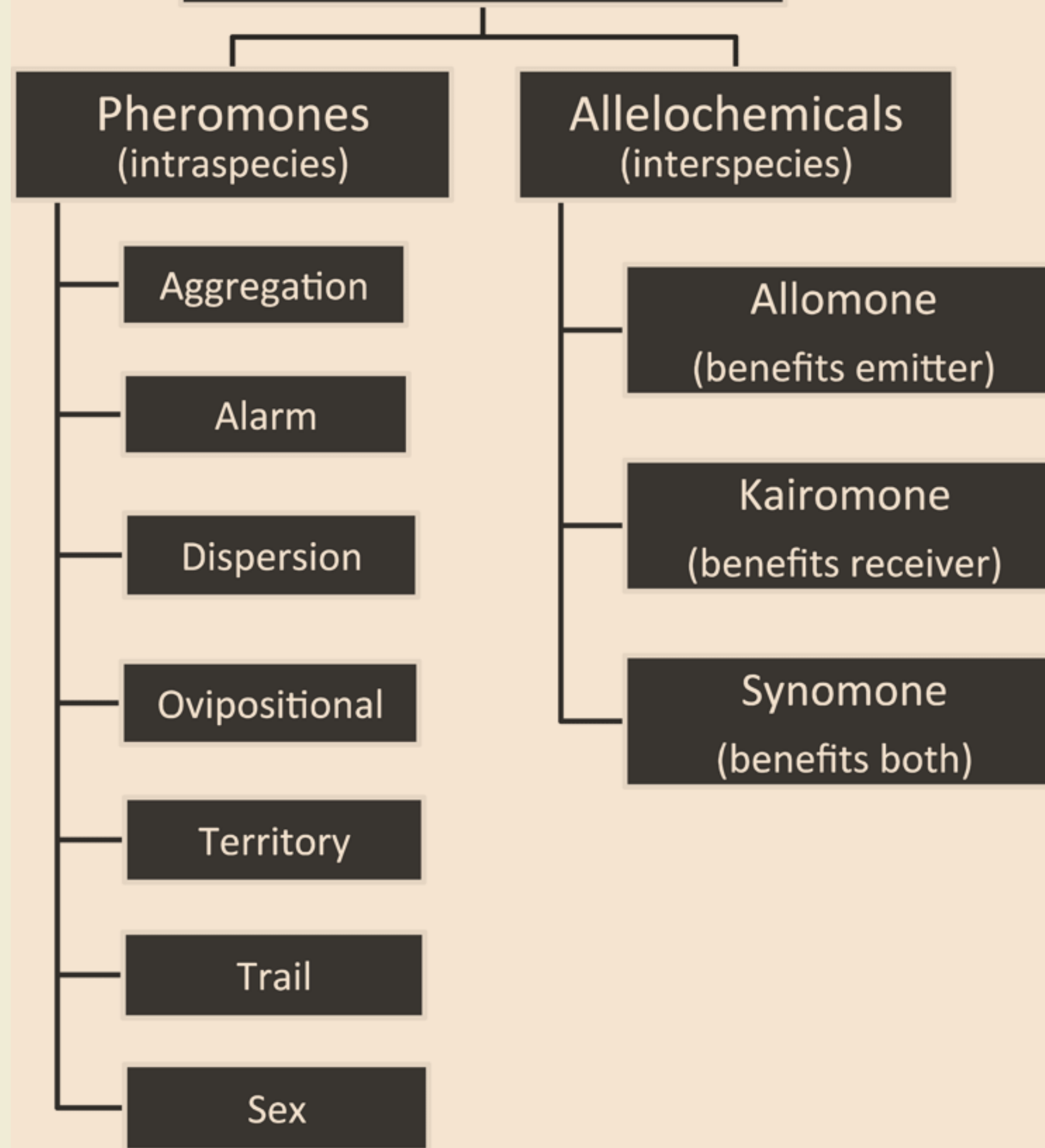
Systems approach (ICM)



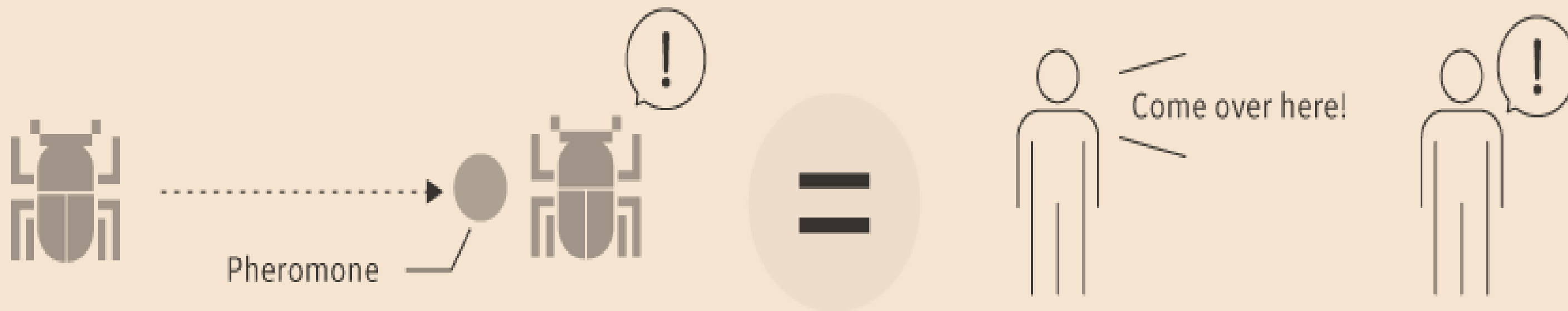
HortiPro.com

Semiochemicals (Infochemicals)

Source: John J. Beck/ USA



HortiPro.com



insect communication using pheromones is the same as Human communication by language

Source: Fuij Flavor Co., LTD Japan



HortiPro.com

What can we do with pheromones?

Mating disruption: Isonet-T®; tomato leaf miner (*Tuta absoluta*)
Crop protection registration required.



Signaling & monitoring:
Crop protection registration not needed



Signaling and monitoring



Present situation: delta trap in combination with glue bottom or sticky plate with or without pheromone.

Disadvantages:

- Attracts only male insects.
- Short acting pheromones.
- Do not touch with hands.



New SemeonPro Line

New type of pheromones for different insects.

Advantages:

- Duo pheromones; attracts male and female insects.
- Longer acting pheromones
- Do touch with hands.
- 3-7 days earlier detection
- 35-40% more insects attracted



HortiPro.com

SemeonPro™ feromonen

- 10 pheromone dispensers.
- Dispensers are packed airtight.
- Resealable aluminum packaging.
- Store in the refrigerator or freezer.
- Shelf life up to 24 months.
- Operating time 6 - 8 weeks.



feromoon - pheromone - Pheromon - phéromone - feromona - feromônio - feromone
 феромон - feromon - فيرومون - فرمون - feromón - פרומון - φερομόνη - ფერომონი




♀♂

PheroThrip 2.0 10x Trips / Thrips

 + 4C°
 - 18C°
 07/2024

8 718564 162998

SemeonPro
 PHEROMONES

HortiPro BV www.hortipro.com

feromoon - pheromone - Pheromon - phéromone - feromona - feromônio - feromone
 феромон - feromon - فيرومون - فرمون - feromón - פרומון - φερομόνη - ფერომონი




♀♂

PheroBem™ 10x Bemisia tabaci

 + 4C°
 - 18C°
 07/2024

8 718564 163124

SemeonPro
 PHEROMONES

HortiPro BV www.hortipro.com

feromoon - pheromone - Pheromon - phéromone - feromona - feromônio - feromone
 феромон - feromon - فيرومون - فرمون - feromón - פרומון - φερομόνη - ფერომონი




♀♂

PheroDes™ 10x Trialeurodes vaporariorum kas wittevlief

 + 4C°
 - 18C°
 09/2024

8 718564 163117

SemeonPro
 PHEROMONES

HortiPro BV www.hortipro.com

feromoon - pheromone - Pheromon - phéromone - feromona - feromônio - feromone
 феромон - feromon - فيرومون - فرمون - feromón - פרומון - φερομόνη - ფერომონი




♀♂

PheroSuf™ 10x Sufetula diminutalis

 + 4C°
 - 18C°
 06/2024

8 718564 163179

SemeonPro
 PHEROMONES

HortiPro BV www.hortipro.com

feromoon - pheromone - Pheromon - phéromone - feromona - feromônio - feromone
 феромон - feromon - فيرومون - فرمون - feromón - פרומון - φερομόνη - ფერომონი




♀♂

PheroDup™ 10x Duponchelia fovealis

 + 4C°
 - 18C°
 09/2024

8 718564 163162

SemeonPro
 PHEROMONES

HortiPro BV www.hortipro.com

feromoon - pheromone - Pheromon - phéromone - feromona - feromônio - feromone
 феромон - feromon - فيرومون - فرمون - feromón - פרומון - φερομόνη - ფერომონი




♀♂

PheroCica™ 10x Empoasca vitis (druivencicade)

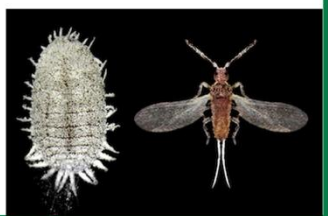
 + 4C°
 - 18C°
 09/2024

8 718564 163346

SemeonPro
 PHEROMONES

HortiPro BV www.hortipro.com

feromoon - pheromone - Pheromon - phéromone - feromona - feromônio - feromone
 феромон - feromon - فيرومون - فرمون - feromón - פרומון - φερομόνη - ფერომონი

♀♂

PheroCitri™ 10x Planococcus citri citruswolluis

 + 4C°
 - 18C°
 10/2025

8 718564 163292

SemeonPro
 PHEROMONES

HortiPro BV www.hortipro.com

feromoon - pheromone - Pheromon - phéromone - feromona - feromônio - feromone
 феромон - feromon - فيرومون - فرمون - feromón - פרומון - φερομόνη - ფერომონი




♀♂

PheroDeixis™ 10x Chrysodeixis chalcites (Turkse mot)

 + 4C°
 - 18C°
 09/2024

8 718564 163155

SemeonPro
 PHEROMONES

HortiPro BV www.hortipro.com

feromoon - pheromone - Pheromon - phéromone - feromona - feromônio - feromone
 феромон - feromon - فيرومون - فرمون - feromón - פרומון - φερομόνη - ფერომონი




♀♂

PheroTuta™ 10x Tuta absoluta tomatenmineermot

 + 4C°
 - 18C°
 06/2024

8 718564 163308

SemeonPro
 PHEROMONES

HortiPro BV www.hortipro.com

feromoon - pheromone - Pheromon - phéromone - feromona - feromônio - feromone
 феромон - feromon - فيرومون - فرمون - feromón - פרומון - φερομόνη - ფერომონი




♀♂

PheroRadicum™ 10x Delia radicum (koolvlieg)

 + 4C°
 - 18C°
 05/2024

8 718564 163186

SemeonPro
 PHEROMONES

HortiPro BV www.hortipro.com

feromoon - pheromone - Pheromon - phéromone - feromona - feromônio - feromone
 феромон - feromon - فيرومون - فرمون - feromón - פרומון - φερομόνη - ფერომონი




♀♂

PheroNesi™ 10x Nesidiocorus tenuis

 + 4C°
 - 18C°
 07/2024

8 718564 163254

SemeonPro
 PHEROMONES

HortiPro BV www.hortipro.com



HortiPro.com





Together towards green
and sustainable cultivation
methods for your crop



Thank you!

HortiPro



HortiPro.com

Propagate Academy



Natural Enemies

Biological solutions to greenhouse pests



Hi, we are
Tom & Imri
Koppert



Believe in biologicals

- Jan Koppert started 1967 because allergic reaction on chemicals and poor result
- Spidex is used for over 50 years
- Enstrip more than 40 years
- Western –Europe : almost every vegetable grower is using IPM
- We have a lot of experience and expertise



Today's Program

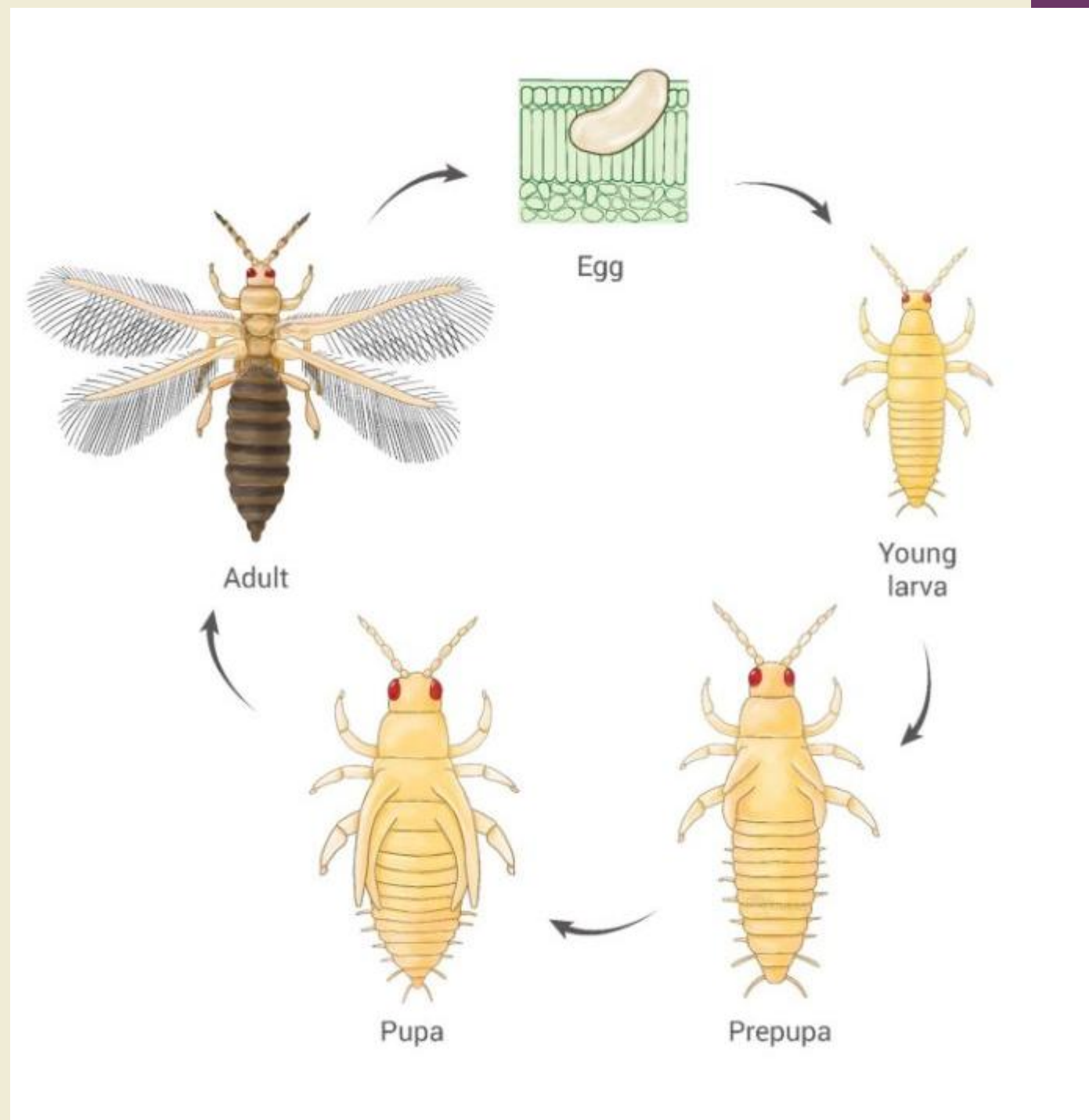


Thrips

- Order Thysanoptera – fringed wings
- Smallest winged insects (0.5-14 mm)
- polyphagous pest : many crops
- Virus!



Thrips life cycle



Thrips Damage





Koppert

Predatory mites

- Creates a “standing army”
- Can feed on pollen
- Can control multiple pests





Thrips & whitefly control



Predatory mites

Orius

- What's on the menu: Trips, Spider Mites and Aphids
- Can feed on pollen as well.

- Orius
- Development from 11 ºC:
- +/- 60 days bij 15ºC
- +/- 30 days bij 20ºC
- +/- 15 days bij 25ºC

Trips

- Development from 11,5 ºC
- +/- 40 days bij 15ºC
- +/- 20 days bij 20ºC
- +/- 15 days bij 25ºC



BIOLOGICAL CONTROL OF THRIPS



Take aways

- Monitor using sticky traps
- Create a standing army of predatory mites
- Orius is also an option in plant propagation



Today's Program

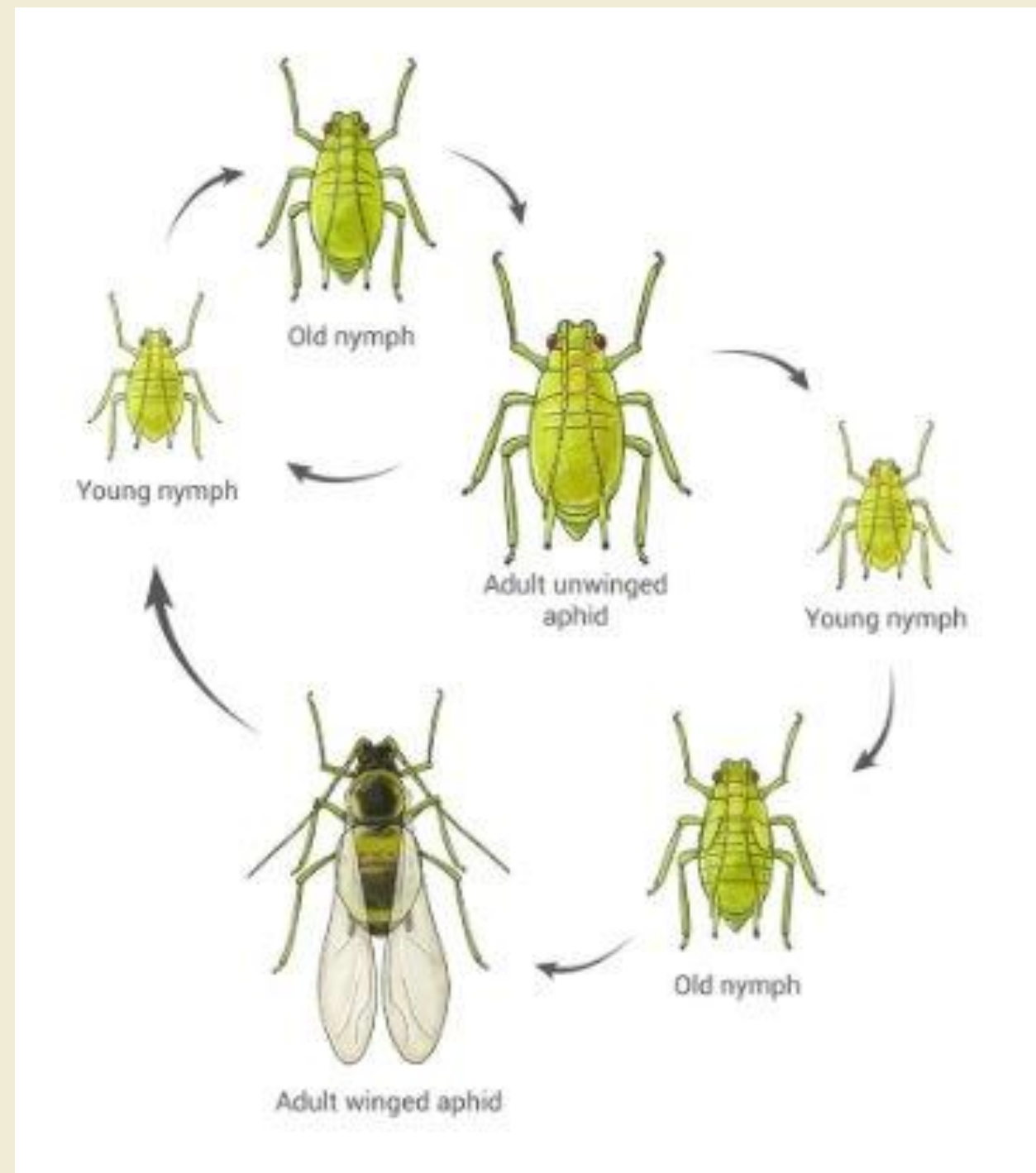


Aphids

- Quick development
- Only females
- polyphagous pest : many crops
- Virus!



Aphid life cycle



Aphid Damage



Aphid Solutions

- Preventative
 - Parasitoids
 - Gall Midges
- Curative
 - Propylea
 - Chrysopa



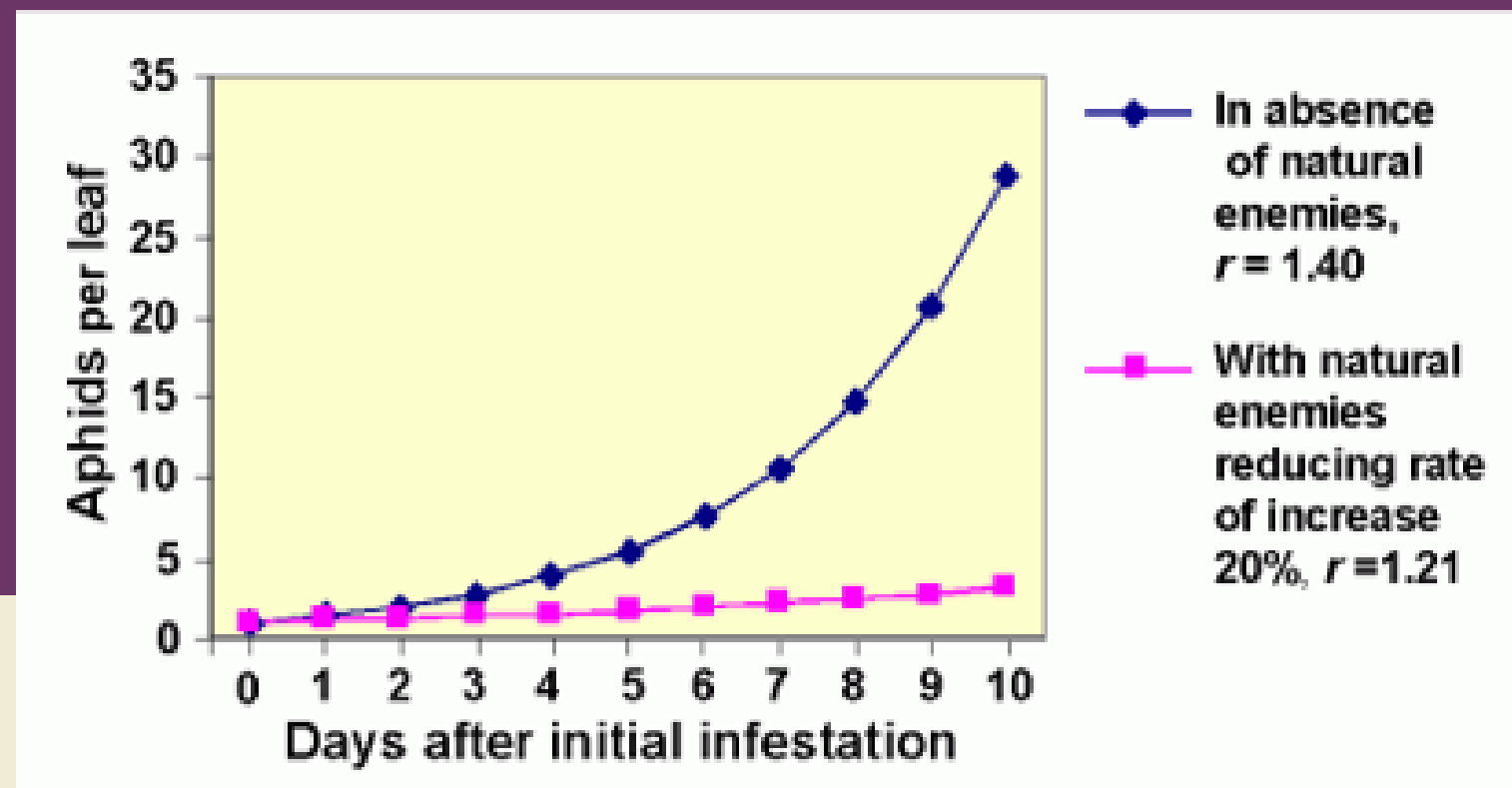
Parasitoids



Gall Midges (Aphidoletes)



Take aways



- Work preventively
- Quick action is a must in aphid control!
- Even good scouting is often too late!



Today's Program



Spider Mites



- *Tetranychus urticae*

Red spidermite

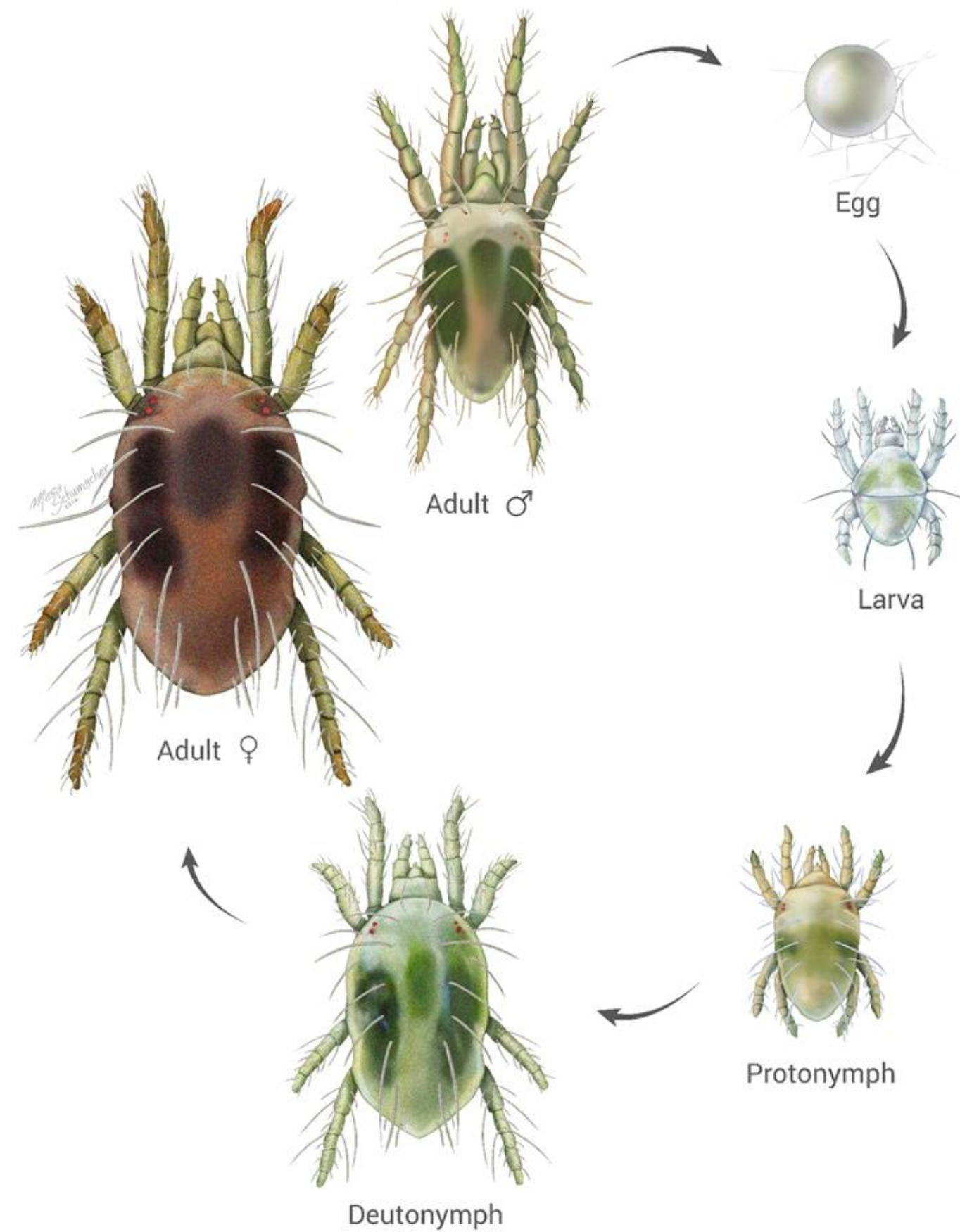
Glasshouse spidermite

Two spotted spider mite

- Eight-legged arthropods with two large spots on both sides of the body
- Extremely rapid population growth



Spider-mite Life cycle



Population growth

- After 15 days, 120 eggs are laid
- 75% females; that means that 90 eggs are females
- 90 females lay 120 eggs per female
- After 30 days there are $90 \times 120 = 10800$ individuals

- 10 days at 25°C
- 6-8 eggs a day
- 100 eggs a female
- Development depends on
 - Temperature
 - Relative humidity
 - Host plant
 - Crop quality
 - Differences between strains
- Diapause

Spider-mite Damage



Spider-mite Solutions

- Predatory mites
 - Phytoseiulus
 - Californicus



Phytoseiulus persimilis (SPIDEX)



THE SPRINTER Quick at clean ups

- Predatory mite only survives on *Tetranychus* spp.
- Adult mites are red in color with long legs.
- Very *active* predator
- Lots of protective hair (*Which allows to hunt in heavily webbed areas*)



Phytoseiulus persimilis (SPIDEX)



THE LONG-DISTANCE RUNNER Steady sustainable control

- Less active than *Phytoseiulus persimilis*
- Eats *T. Urticae*, *Panonychus spp.*, other mites and pollen
- Longer survival without food than *Phytoseiulus persimilis*
- Medium qty protective hair so prefers to hunt small spots with little webbing
- Moves into highly webbed areas after *P.persimilis* has mostly cleaned up

Gall Midges (Feltiella)



Adult



Egg



Puppa



Larva

Take aways

- Scouting
- Quick action is very important
- Identify problem locations
- Combine preventative and curative measures



Thank you!

Imri Verrijp & Tom Groot



iverrijp@koppert.nl



Biological control: a day-to-day basis

Nathalie Zwinkels



Hi, I'm Nathalie

Crop Protection
Specialist



Growing cucumber

Using biology

All Green reasons passed

MAIN REASON:

→ The resources are no longer working sufficiently



Delivering clean plants !

Customer demand for a clean start
0-tolerance
MRL



Guided pest control

Decision made on scout and crop monitoring



Calender Spraying X



Know what's going on!

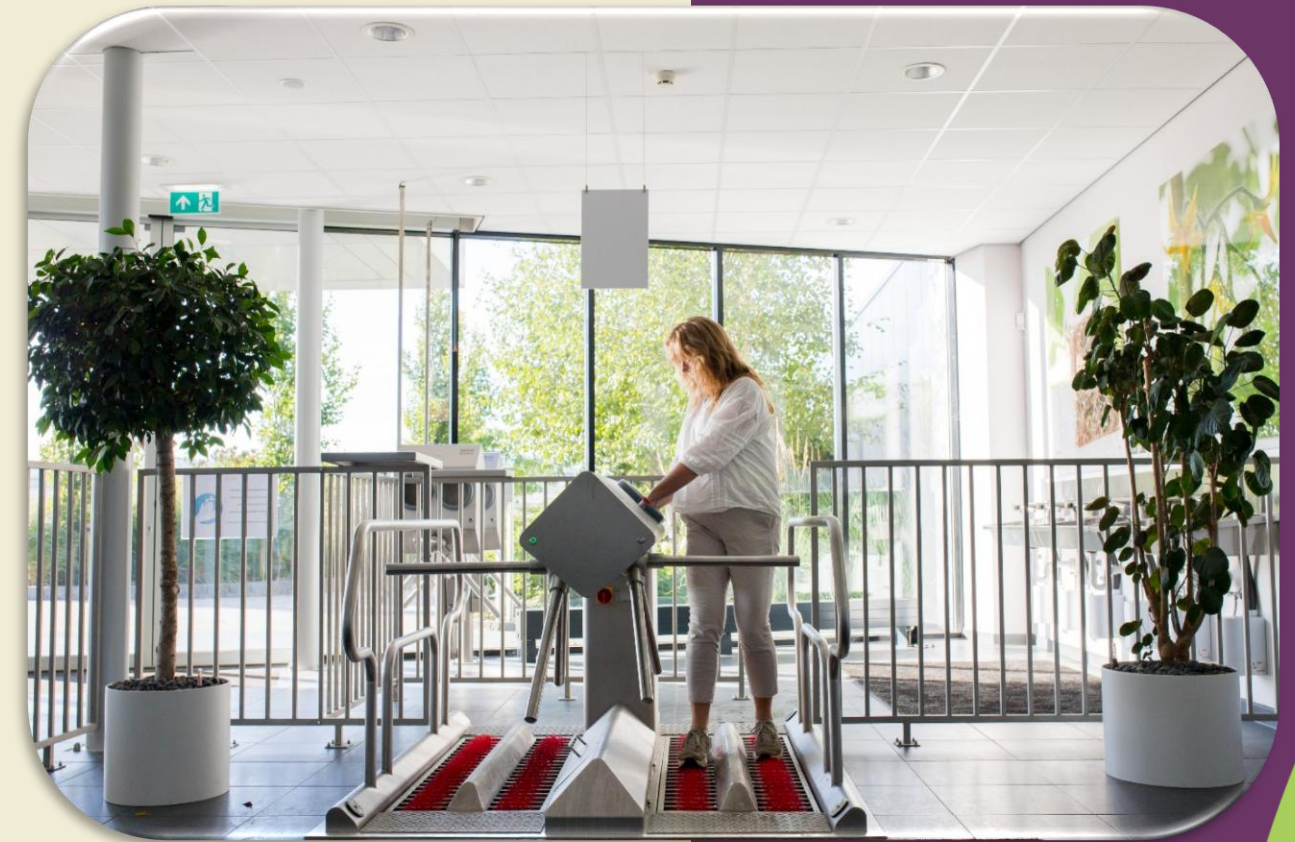


Learning from your own data



Hygiene is the start

Everything we keep out we
don't have to control



Know your harmful pests

And how it behaves



Bron foto: Koppert



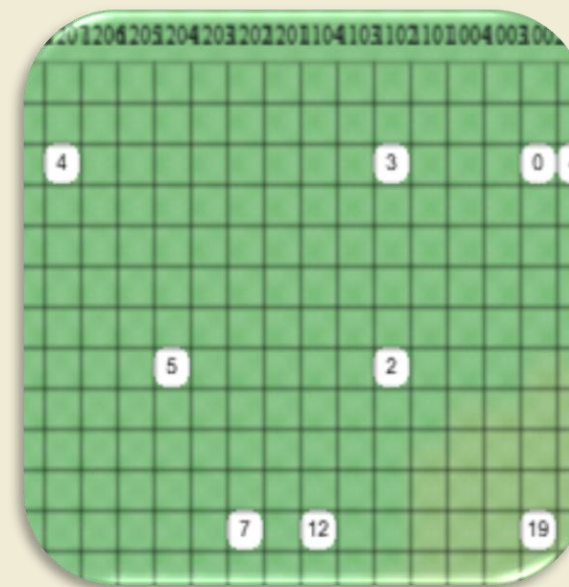
Decision



Counts Sticky Trap



Crop monitoring



Dashboard



Crop / season



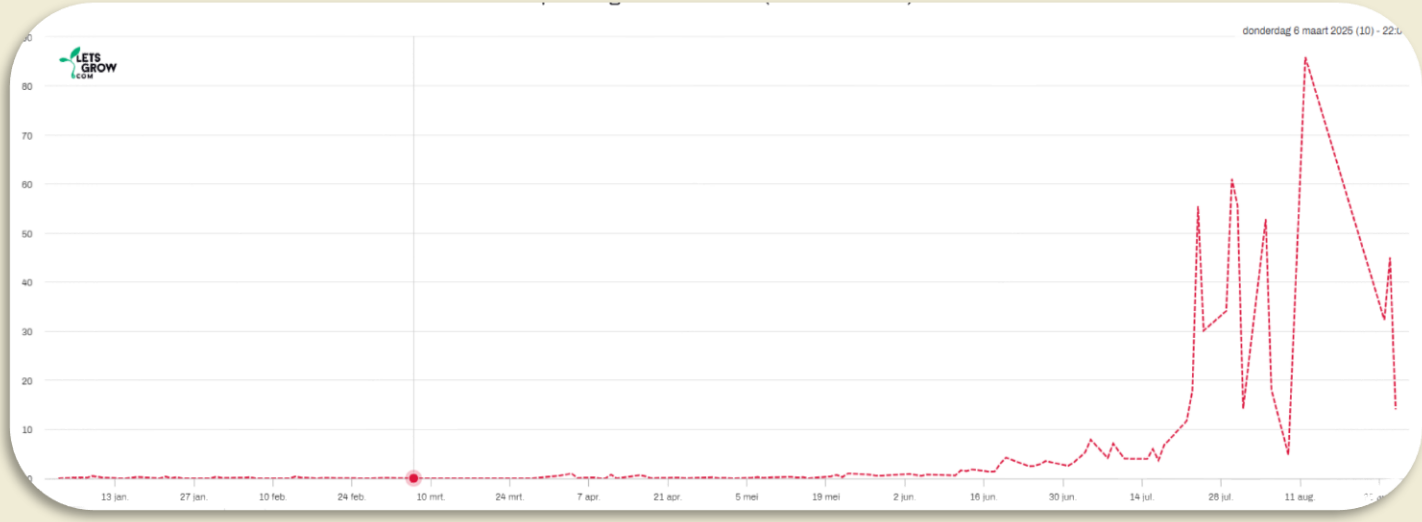
Good observations

scout and crop monitoring

- On weekly basis
- Crop observation route
- Supporting tools, e.g. pheromone traps



Countings



Supporting tools



Various species of thrips

Frankliniella
occidentalis



Frankliniella
occidentalis larvae



Echinotrips

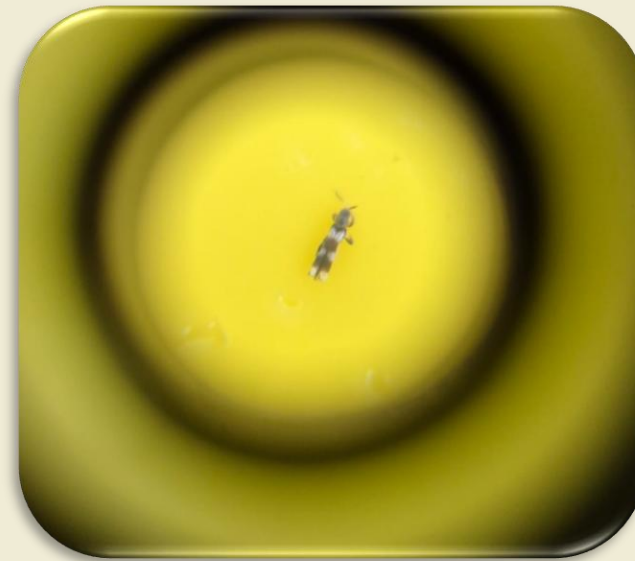


Bron: Koppert



Various species of thrips

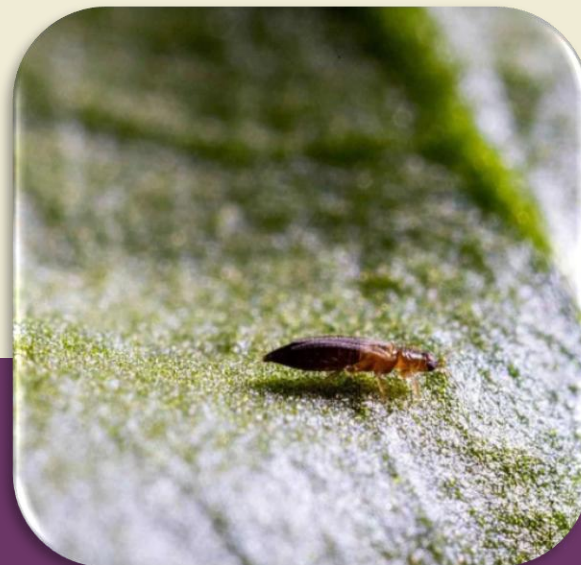
Parthenothrips
dracaenae



Thrips tabaci



Thrips parvispinus



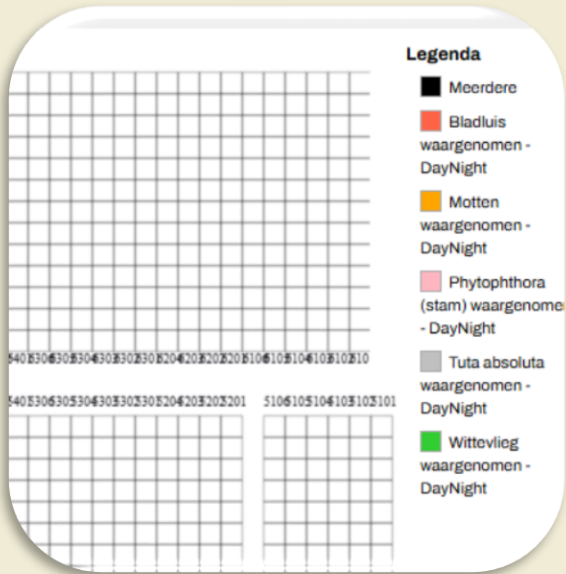
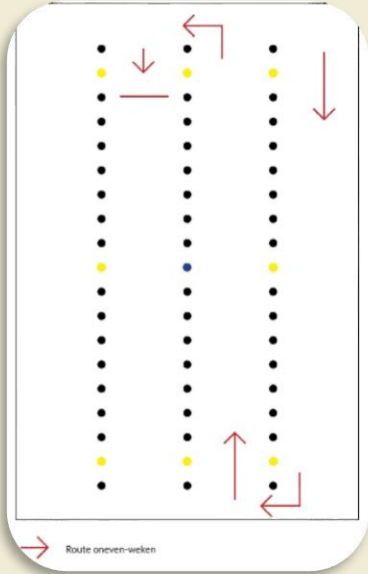
Common
Thrips
Grass edges



Bron: Koppert



Crop observations



But also!



IPM

Predatory mite Swirskii



Swirskii Mite
Bron foto: Knoppert



Aerobug



Nutrition Mite
Carpoglyphus lactis



Swirskii on the job
Bron foto: Koppert



Crop damage Thrips



Cleaner plant delivered!

Plants with an army of biological control agents
Low MRL gives room for correction
Resources remain more effective



All customers convinced

Doubts removed



Thank you!
Nathalie Zwinkels

