

CASCADÉ
LIGHT TECHNOLOGIES

Innovative agriculture films

Adapting sunlight to protected crops

Frederic PEILLERON
CEO

CASCADE develops **Optically Active Additives**
for sunlight wavelength shifting

They sustainably improve
yields and quality of protected crops



Company creation in 2012

Financial support from Institutional VC investor

>5 M€ 2018-2022 R&D Project supported by French Environment Agency (ADEME)

First sales in 2019 : *Berry, Melon and Vegetables (double roof) crops*

Spinoff of LPRL Research laboratory

French Research institute with 30 years of experience in light-matter interactions

Team - 7 persons

3 R&D scientists working on **Materials** (Optics, Polymer chemistry) - Nantes

2 R&D scientists working on **Agronomy** : Collaboration INRA/AGO/IRHS – Angers

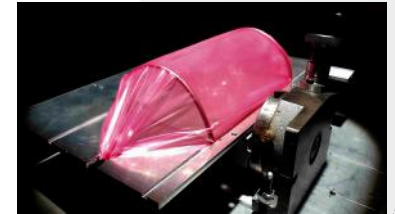
2 **Business Development & Customer Support** France/Spain/International

LIGHT CASCADES® Patented Technology

ADEME



Agence de l'Environnement
et de la Maîtrise de l'Energie



Research Centers



Materials



Algae



Film Extruders

Leading European film extruders :
France, Spain, Italy, Belgium



Experimental Farms & Growers



R&D Collaborative 2018-2022 - 5 M€

- CASCADE-AGRIPLYANE-INRA-CNRS
- New crops & durability > 2 years

ADEME



Agence de l'Environnement
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OVERALL DESCRIPTION – HOW DOES IT WORK ?

► Adapt sunlight to plant needs

« LIGHT CASCADES® » formulations associate different optical effects

Spectrum Conversion

Selective Filters

Diffusion, Lightwave guide...

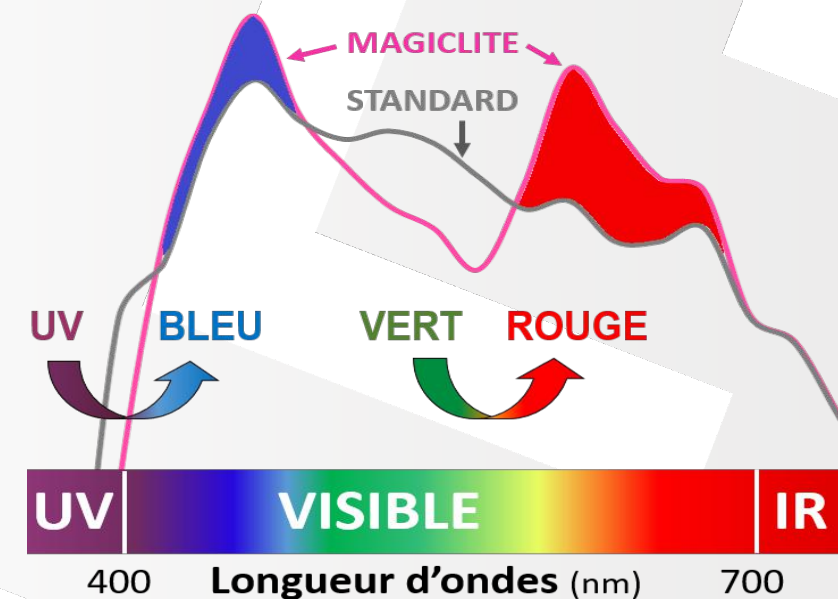
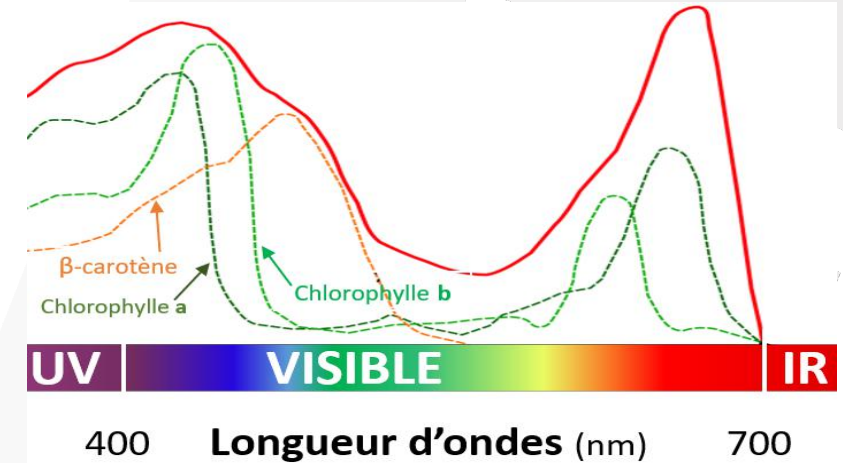
PHOTOSYNTHESIS

► Enrich wavelengths fostering photosynthesis

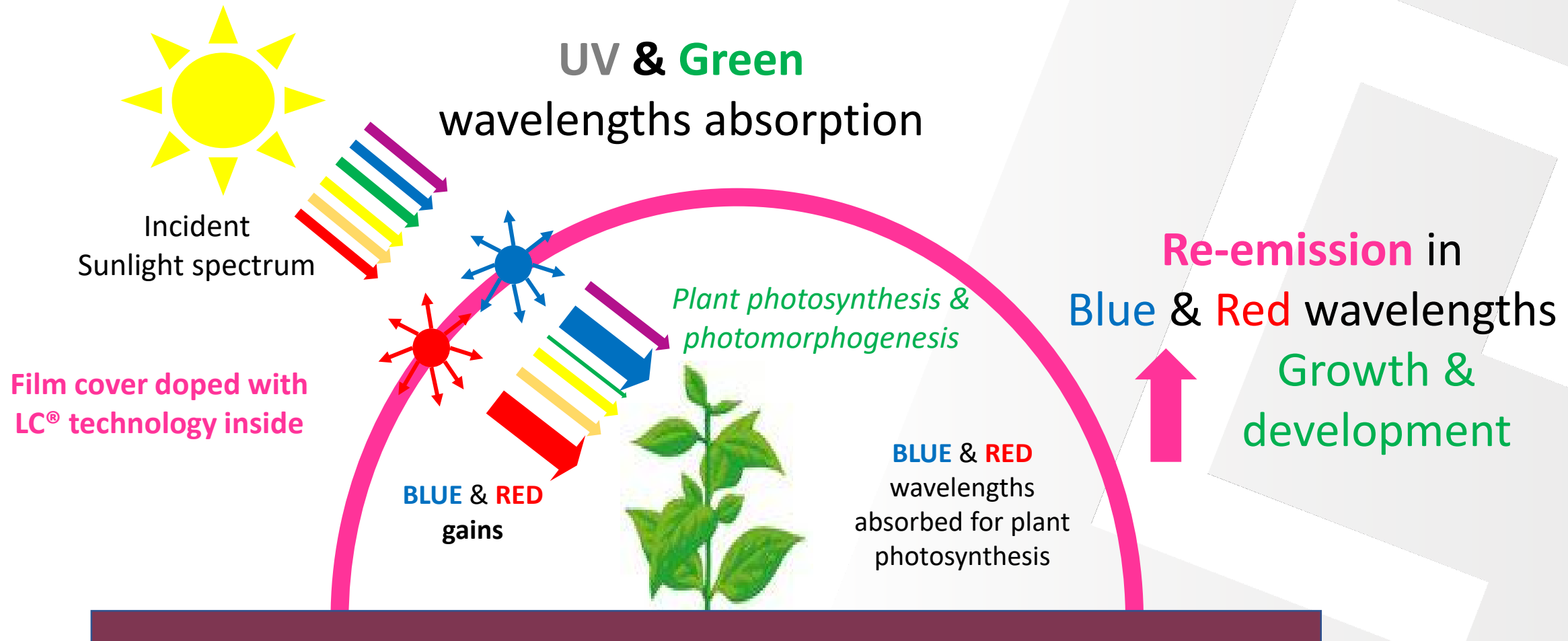
MORPHOGENESIS

► Light Spectral balance that can modulate plant growth & development

Patented Technology



➤ How does it work?



Develop optically active formulations for agriculture films

Tasks :

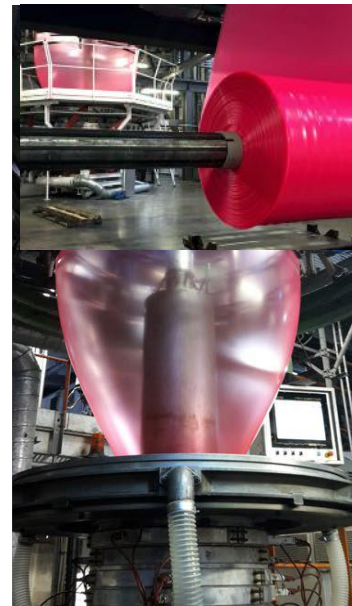
- ▶ Optically active formulations
- ▶ Adapt to existing industrial processes
- ▶ Impact on crops
- ▶ Industrial & Sales Partnerships



CASCADE Lab. (Nantes, France)

Agronomic trials since 2013

- Controlled GH crops (Angers-INRA)
- Experimental farms + growers



▶ Green technology

- Efficient use of natural sunlight
- Less input & land per produced crop
- Can reduce input fertilizers or pesticides
- Recyclable

▶ Adapted to existing farming processes

- Does not interfere with pollination



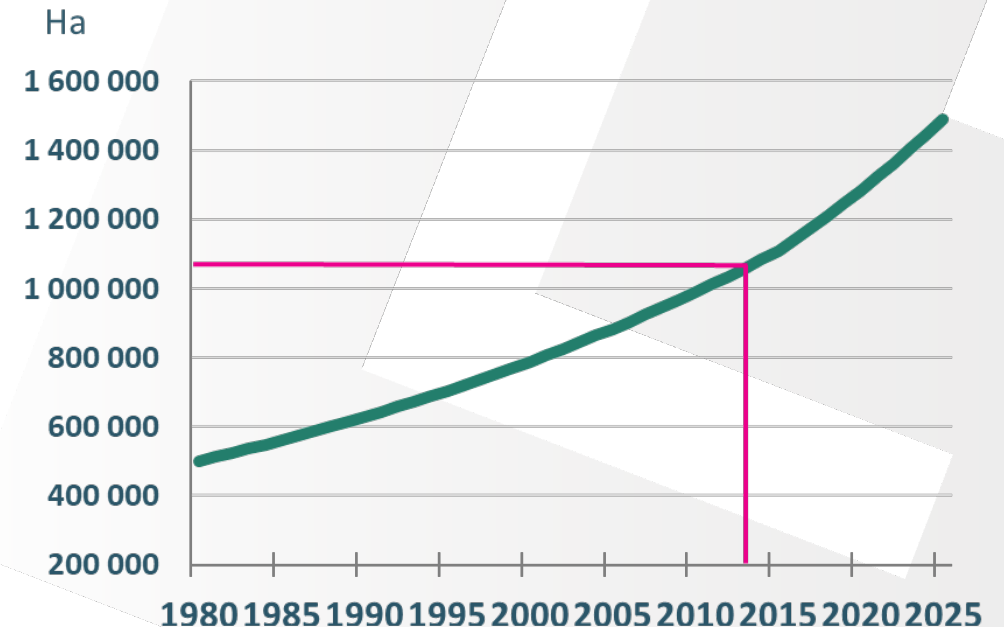
Large & growing market

- > 2 Bn € Film, > 1 Bn € MB, 5 to 8 % growth rate
- 2 segments
 - 1-year film - 20%
 - High Tunnels - 80%
- Per crop segments
 - Vegetables
 - Berries
 - Flowers



Expectations of farm growers

- Extra crop Yield & Quality (Extra value / Ha)
- More sustainable agriculture



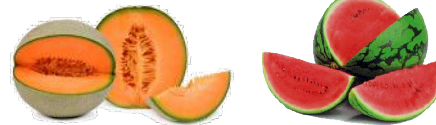
- ▶ **Ready for one–season films**
- ▶ **Formulations OK for low light conditions**
- ▶ **Proof of concept for Multi-season : Ready at lab scale**
- ▶ **New formulations to adapt to new agro segments**
 - **Tropical climates**
 - **Excess light growing crops (summer crops)**
 - ...



Per Crop/Region Segment Approach : Define use case

3 targets market for "one-year" films

- ▶ **Melons / Watermelons**



- ▶ **Berries** (*Strawberry/Raspberry/Blueberry*)

Winter Med crop - Huelva



- ▶ **Double roof** (*Cucumber/Tomato/Pepper/zucchini*)

Winter Med crop - Almeria



Business Model to Farmers for each targeted segment

- ▶ **Benefits** > 10 % of crop value
- ▶ **Cost** < 3 % of crop value

- ▶ 104 agronomic trials since 2013 with experimental farms
- ▶ 24 in Spain Murcia/Malaga, Huelva & Almeria



- ▶ Many different regions from Northern Europe to Andalucía
- ▶ Many crops tested



► Overall agronomic benefits

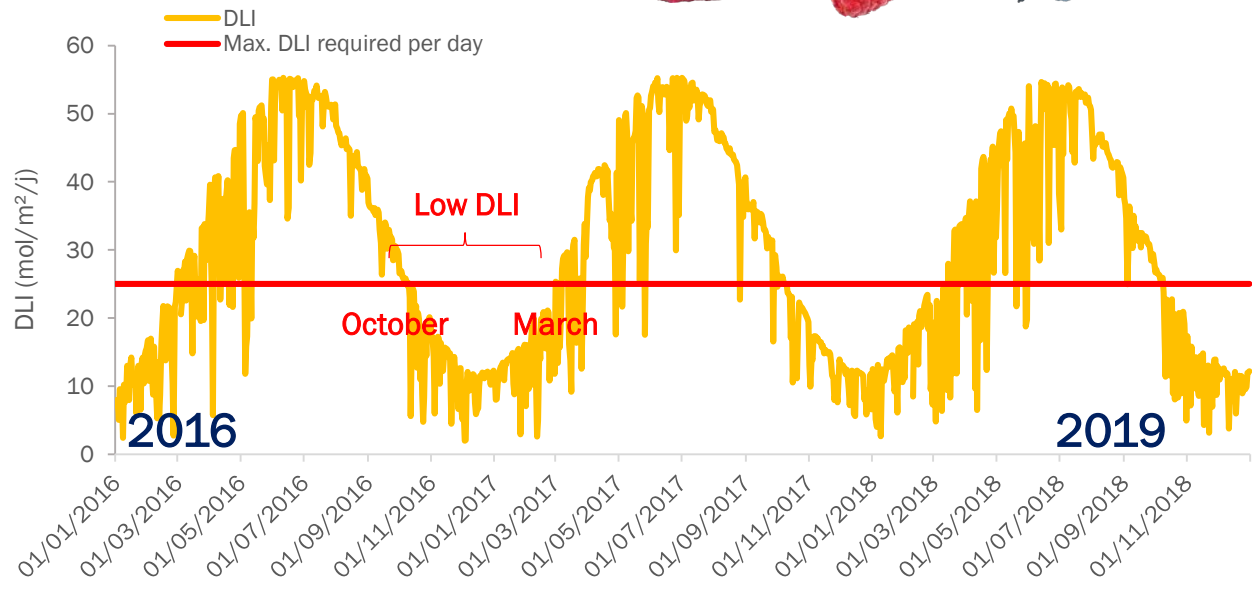
- **Increased yields** From +10% & up to > 25%
- **Improved fruit quality** Higher sugar levels, reduced wastes, improved shelf life...
- **Earlier harvests** Depending on crops
- **Benefits maximized on winter crops or under poor weather conditions**

DLI & CROP TARGET PERIODS

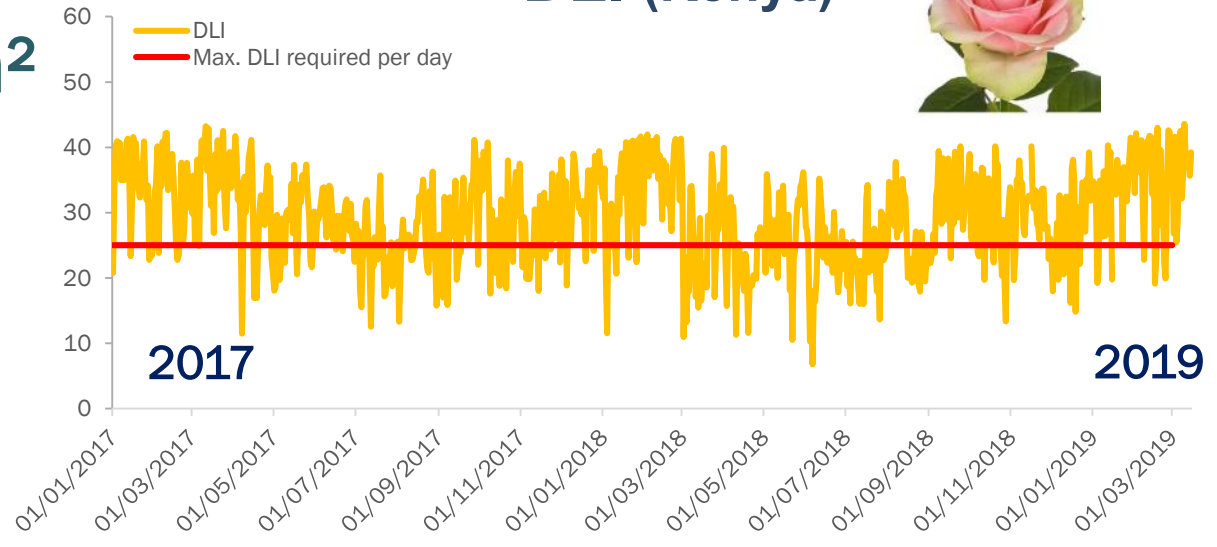
DLI (*Daylight Integral*)
= Quantity of photons per day, per m²

Priority targets :
Crops growing in low DLI periods

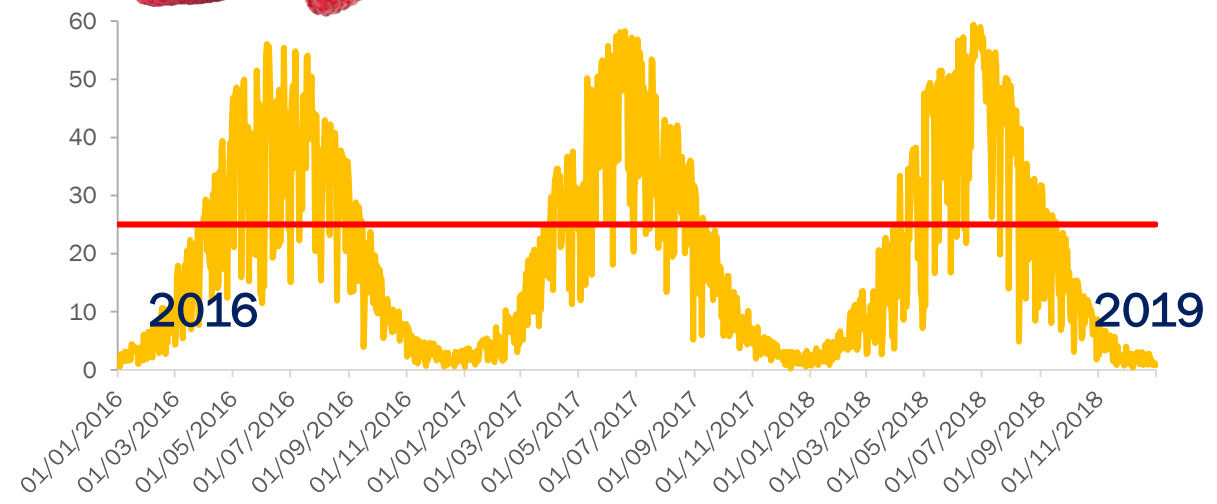
DLI (Huelva, Spain)



DLI (Kenya)



DLI (East Malling, UK)



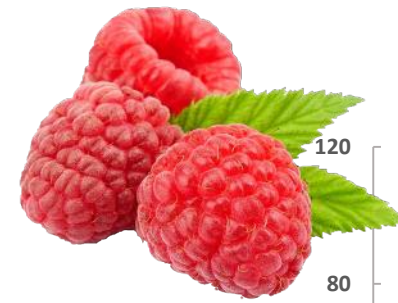
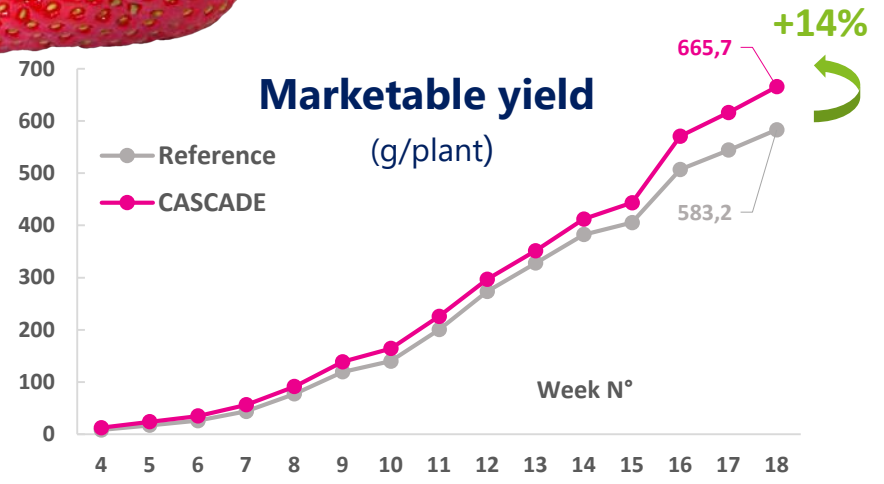


Berries Agronomic Results



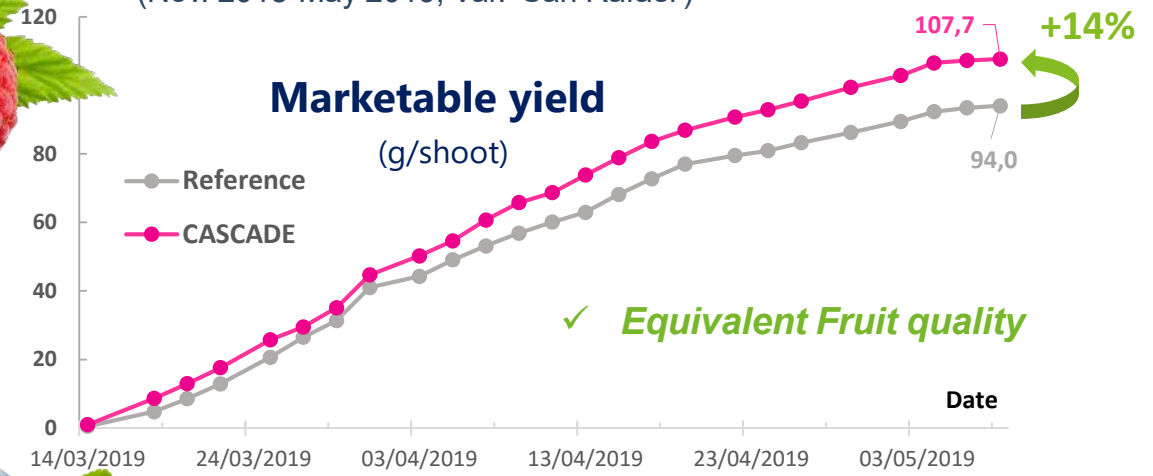
Strawberry

(Nov.2018-May.2019, Huelva)

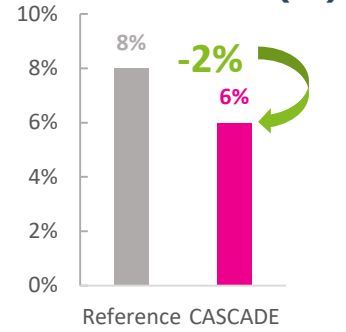


Raspberry

(Nov. 2018-May 2019, Var. 'San Rafael')

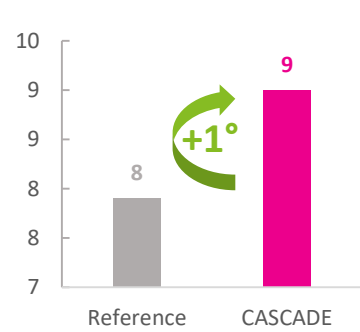


Wastes (%)



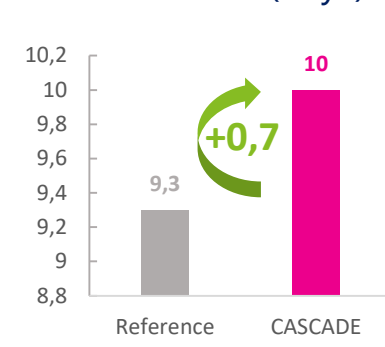
✓ Wastes reduction

°Brix



✓ + Sugar content

Shelf life (days)

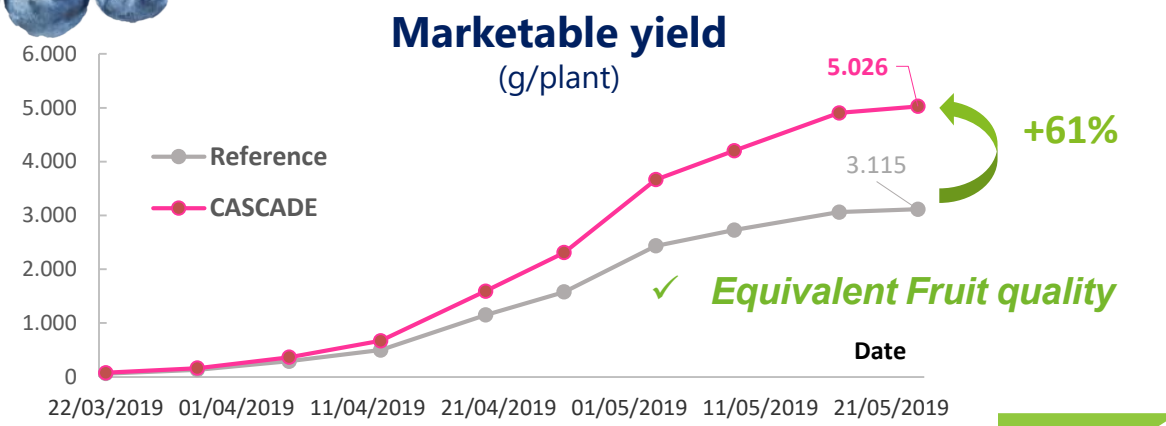


✓ Extended shell life



Blueberry

(Nov. 2018-May 2019, Var. 'Ventura')





Doble Techo Agronomic Results

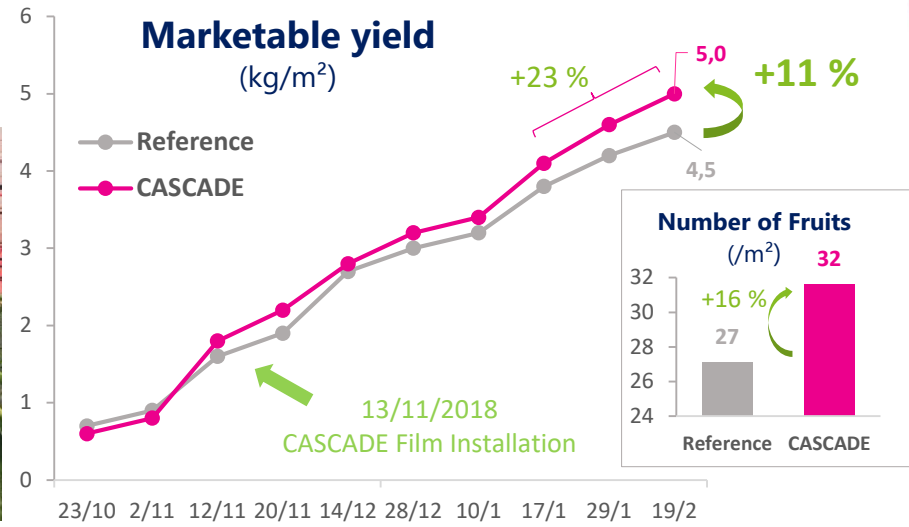
PEPPER, ZUCCHINI, TOMATO "DOBLE TECHO" TRIALS (Almeria)



Pepper



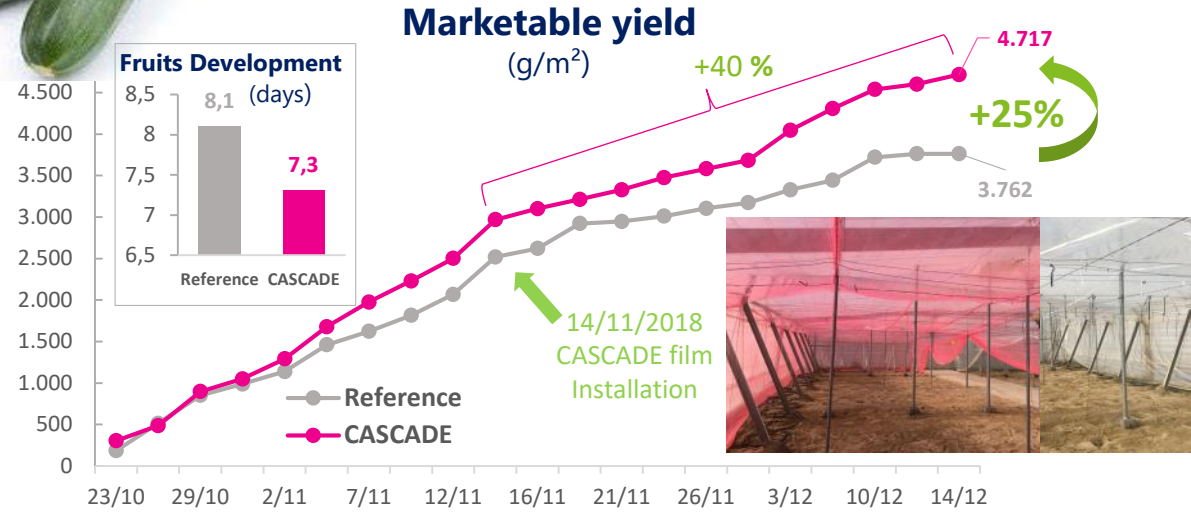
Oct 2018-Feb 2019 (Var. 'Canzion')



Zucchini



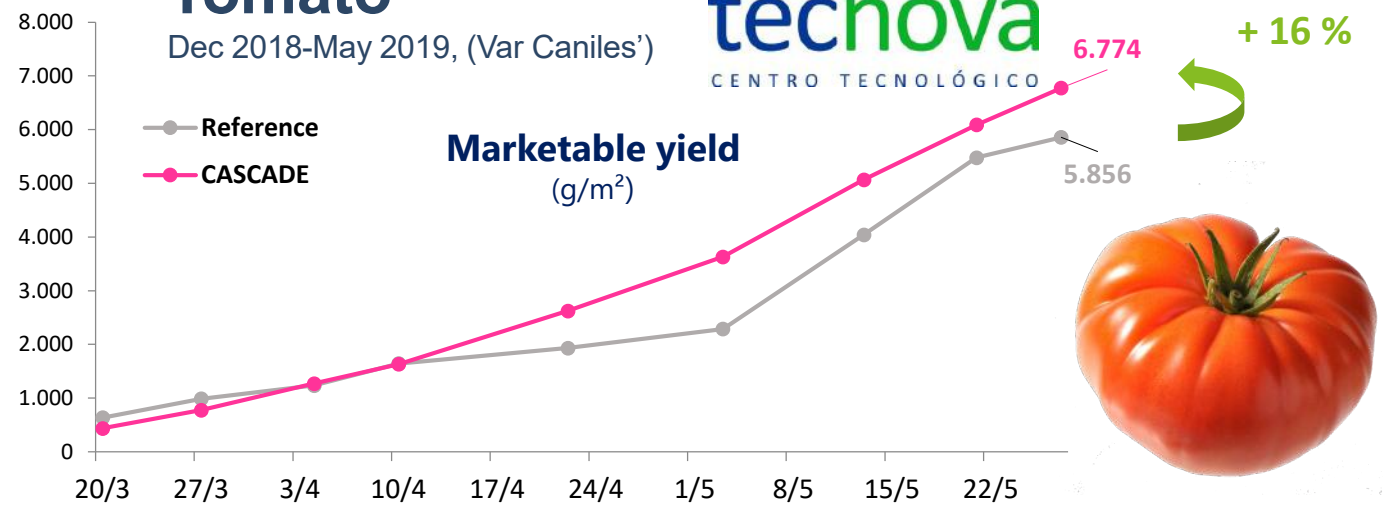
Oct 2018-Dec 2018, (Var. 'Calabonita')



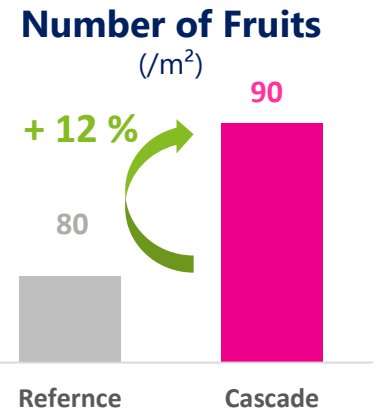
Tomato



Dec 2018-May 2019, (Var Caniles')



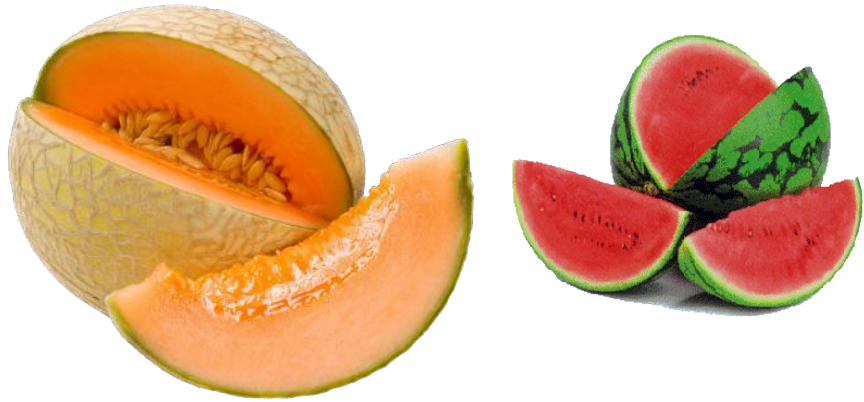
✓ **Faster fruit development**



18



Melon Agronomic Results



18 trials since 2013

- **France & Spain**
(Murcia & Malaga)
- **Local experimental farms & Producers**



Marketable Yield gain (%)	Yield Securing (%)	Fruit quality
<p>7 % to 10% average yield gain.</p> <p>Earliest Harvest regularly observed</p>	<p>Up to +25% yield gain under unfavorable weather conditions</p>	<ul style="list-style-type: none"> • Stable or improved sugar content • Reduced fruits wastes

▶ “One-season” film first sales in 2019

- > 120 Ha sold – Berries, Vegetables, Melons
- Objective > 600 Ha in 2020, > 10 000 Ha in 5 years (*market 1,5 million Ha*)

▶ 6 leading European film producers as 1st customers

- France, Spain, Italy, Belgium

▶ Regions targeted

- **Mediterranean countries priority** (winter crops)
- **Interest from Northern Europe winter greenhouse crops**
France Brittany, Belgium, UK (tomato...)
- **Interest from America** (berries, roses), **Africa** (roses)

▶ Multi-year launch highly expected by market

Company need

- Build up business development & marketing team
- Prepare Industrial scale up

Use of funds

- Finalize durability for multi-year greenhouse films and pursue agro trials
- Develop industrialization and marketing
- Speed up international deployment Europe/Africa
- Reinforce business development team

Fundraising

- € 1.0 M – 2020
- € 1.0 M – 2021 (*Global deployment*)