Presentation TomatoesNZ

Auckland
december 5th 2023
Frank Florus
Lycopersicon

Introduction

- Frank Florus, crop consultant for tomatoes on substrate.
- Founding member of Lycopersicon – advisor group.
- Lycopersicon is a tomato consultancy agency, covering all types of tomatoes.

Introduction

- Advising growers in Belgium, the Netherlands, France, Switzerland and Poland.
- Besides tomatoes expertise in high wire cucumbers and pointed capsicum.

Introduction

- Third time adressing the tomato industry in New Zealand (1999; 2012 and 2023).

Program

- Overview of developments in greenhouse horticulture in (north)west Europe.
- Climate change.
- Energy crisis / cultivation / CO_2.
- Summer climate.

Program

- Viruses : PepMV, ToBRFV and ToCV.
- Pest management : white fly.

Developments in northwest Europe

- From 2010 to 2020 the industry grew.
- The replacement rate was at a normal level of 5 %.
- On top of that more new glass was build.

Developments in northwest Europe

- Almost all of these new glasshouses were intended for lit crops !
- Diffuse glass (low Haze) and AR-coatings became common.

Developments in northwest Europe

- The area of lit crops increased till :

  > the Netherlands 850 ha on 1950 ha in total;

  > Belgium 230 ha on 640 ha in total.

Developments in northwest Europe

- The installed capacity in light went up from 180 µmol HPS to 230 – 300 µmol LED !
- Around 2020 the first glasshouses with LED were installed, first as hybrid, now since the energy crisis with full LED.

Developments in northwest Europe

- From 2010 till 2020 energy cost was low.
- Good returns out of cogeneration.
- Since the energy crisis a second energy screen became a reality.

Climate change

- It is happening !!!
- Climate conference in Dubai.
- Global warming : over 1° C
- Less clouds.
- More sunlight.
- Higher CO_2 levels outdoor.

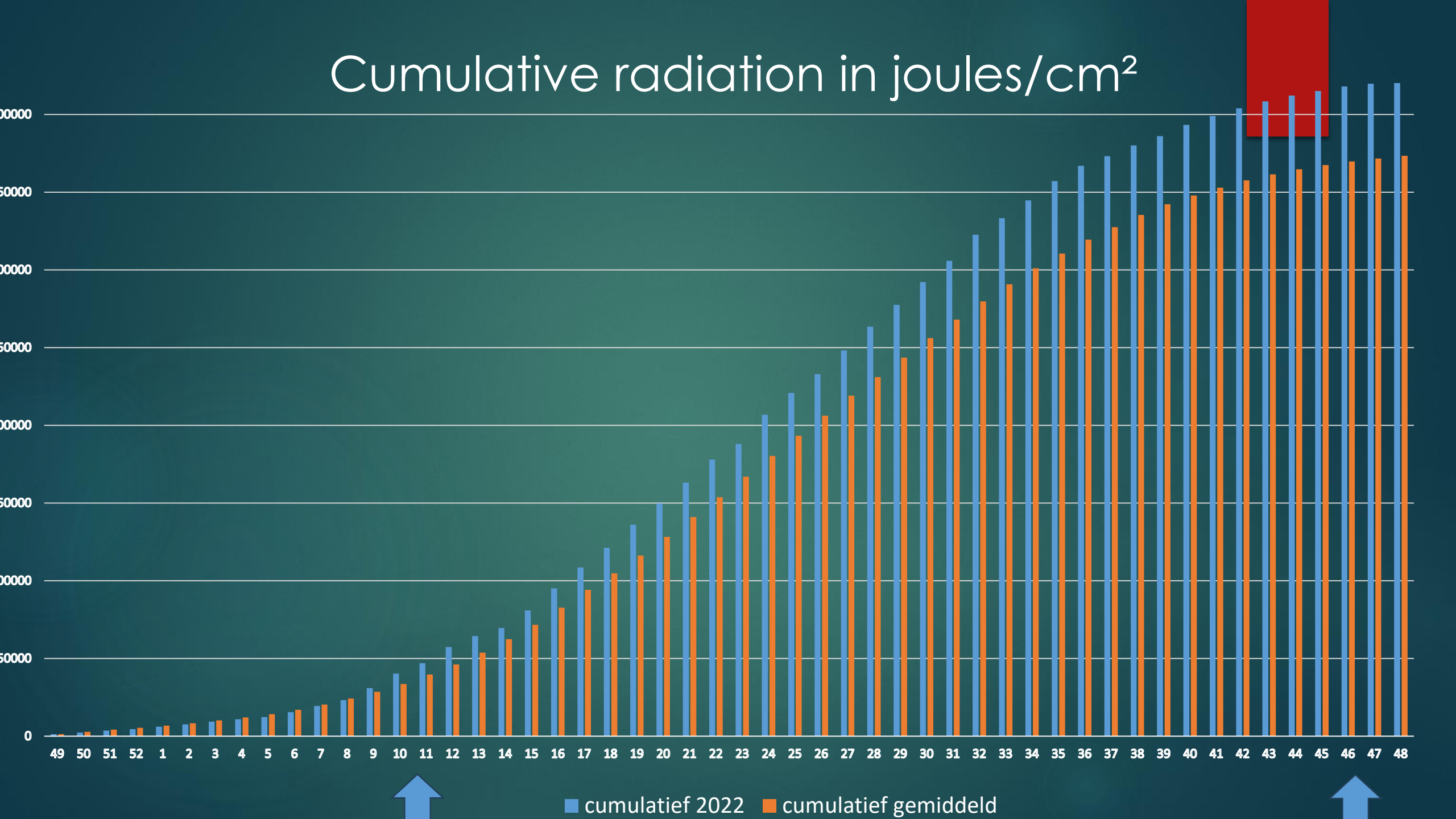
=> Extremer weather conditions !

Climate change

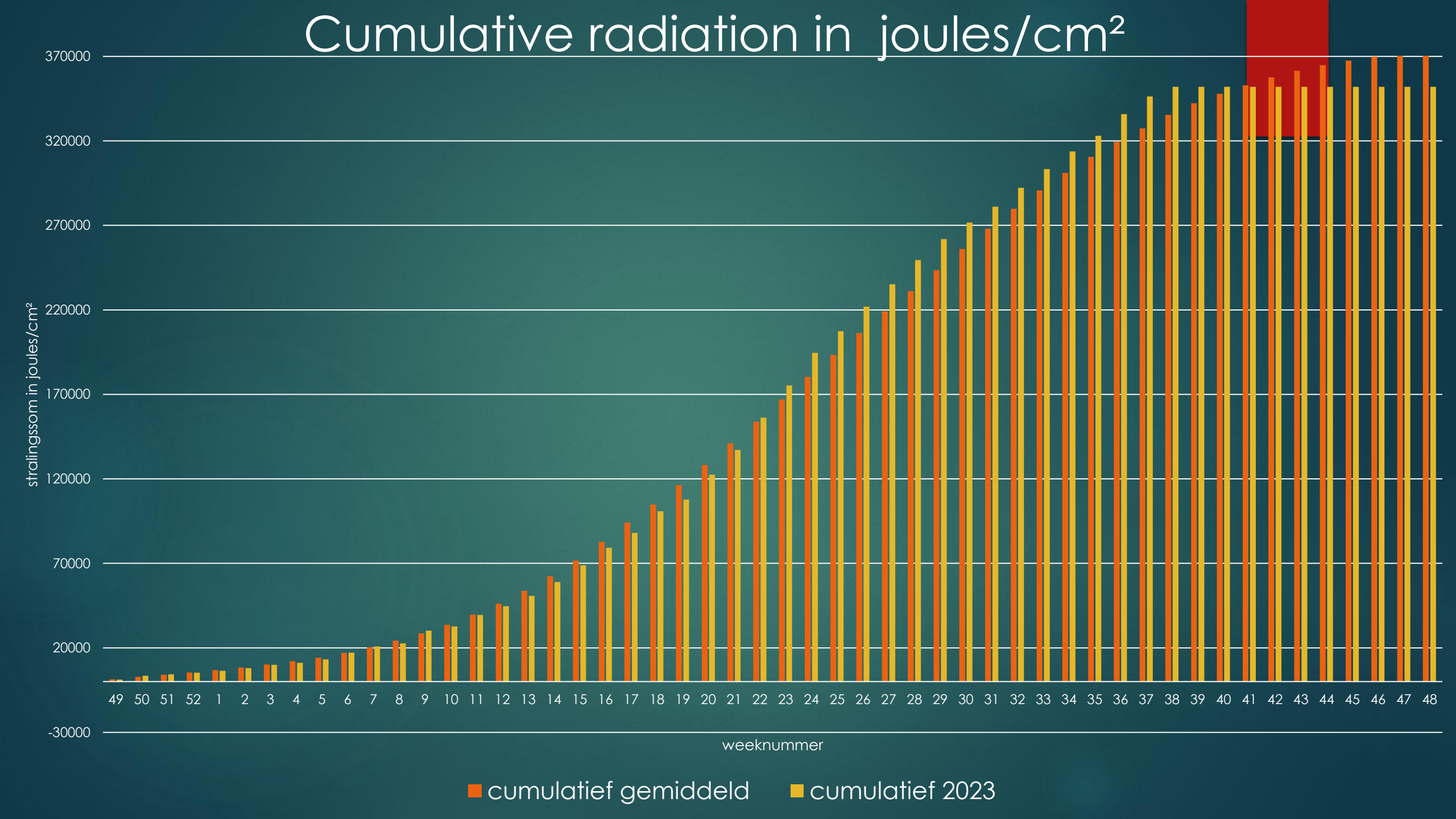
- In West Europe 2022 was the brightest year ever.
- Multi-year average : 373389 J/cm²
- 2022 : 421089 J/cm²

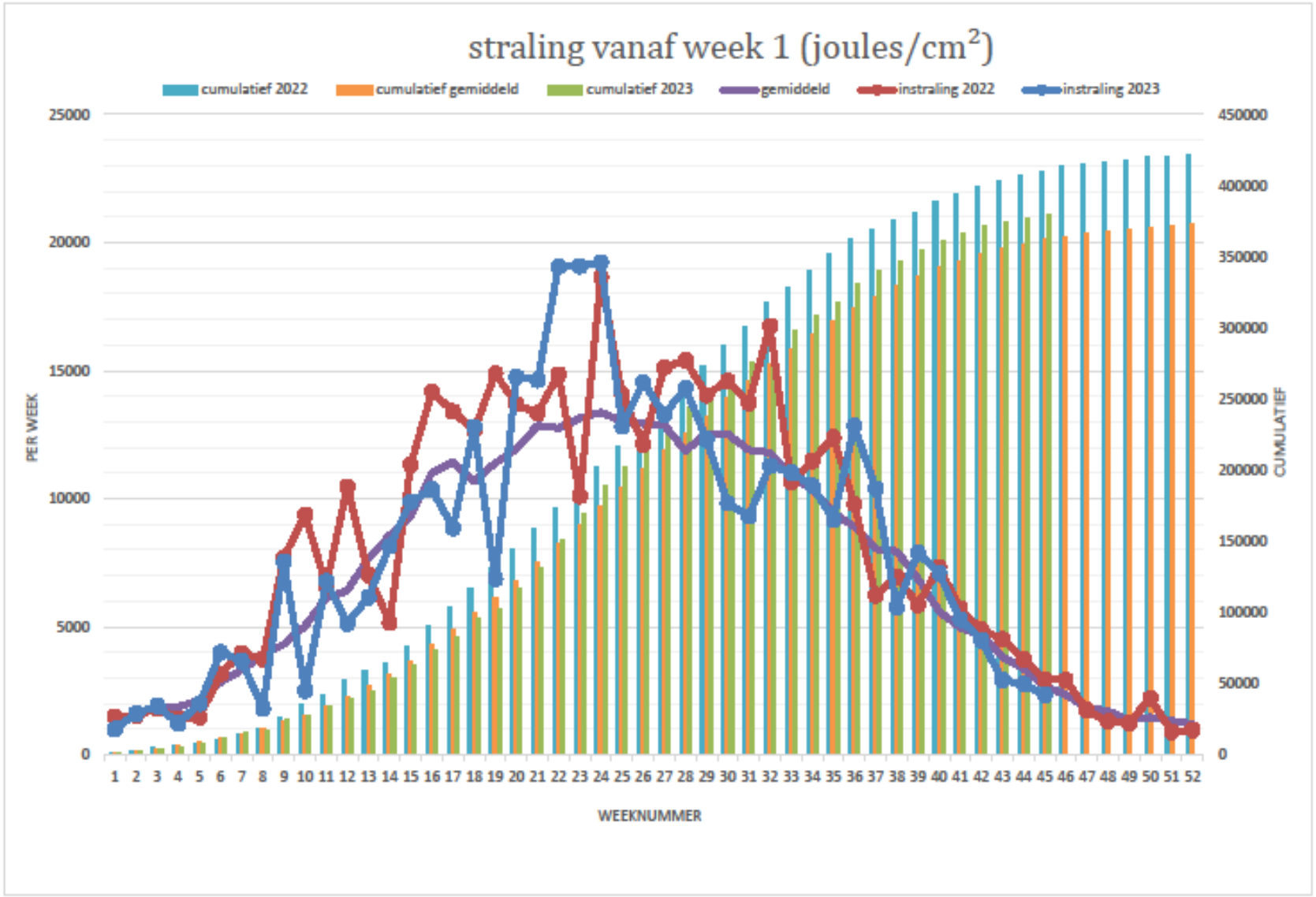
=> 12,8 % more radiation than average !

Cumulative radiation in joules/cm²



Cumulative radiation in joules/cm²




straling vanaf week 1 (joules/cm²)
cumulatief 2022
cumulatief gemiddeld
cumulatief 2023
gemiddeld
instraling 2022
instraling 2023
PER WEEK
CUMULATIEF
WEEKNUMMER
0
5000
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15000
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52

Climate change

- Over the last years all sorts of weather records are broken.
- For example Septembre 2023 was the warmest month ever :

  2023 : 18,8° C

  2022 : 15° C

  average : 16,2° C

Climate change

- Water temperature of North Sea much higher.
- Very high amount of percipitation in novembre in North of France and West Flanders.
- Hugh floods.

Climate change

- CO_2 level in outdoor air went up over the last 30 years from 340 to 400 ppm !

Energy crisis

- In the july and august of 2021the market of gas and electricity became volatile.
- From september on prices went up crescendo !

Energy crisis

- The highest gasprice was € 300,-/MW ! … Coming from € 15,-.
- The peak of elecrticity was at € 800,-/MW !

Energy crisis

- In all of Europe the situation was the same.
- Cause : war in Ukraine.
- Very big differences in energy costs between nurseries (+ € 20,- till - € 40,- per m² !), all depending on the deals that the grower made.

Energy crisis

- It was impossible to use the assimilation lamps in a proper way.
- So there was as good as no winter production.
- Prices were high and stayed high whole season.

Energy crisis

- Lot of nuresies had to deal with ToBRFV and suffered serious production losses.
- In South Europe (Spain – Italy) also a lot of virus pressure.

Energy crisis

- Morocco : no import in Europe – King Mohammed VI wanted cheap food for his people.

=> highest average price / kg ever !

Energy crisis

- We had to lower our energy input.
- Growers /companies were not prepared.
- There was a lack of strategy.

- **How to deal with an energy crisis ?**

Cultivation

- Make a good an realistic cultivation plan before you start.
- Less energy easely results in lower production or in lower revenu !
- If you want to save energy, your focus in the crop should change from temperature to humidity.

Cultivation

- Make a good variety choice and a smart combination with the rootstock.
- Consider a wider plant spacing.
- And / or increase plant density later towards spring / summer (week 40 to 46 !).

Cultivation

- Reduce your maximum pipe (45° C instead of 55 or 60° C).
- Use the energy screen more and wiser.
- A pyrgeometer or radiation meter can be / is very useful.

Cultivation

- You can make more screening hours if you vent above the closed screen.
- Replace old screens in time !
- Use fans under a closed screen.
- Avoid moisture deficiency under 1,8 during the night.

Cultivation

- Open screens gradually in the morning.
- Give less water with a higher EC value.
- Use ‘generative’ nutritional compositions (less NO_3, more SO_4 and Cl)

CO_2

- Cogeneration supplies :
  1. Heat
  2. Electricity
  3. CO_2

CO_2

- CO_2 together with evaporation is the basis for growth and production.
- **$6\ CO_2 + 6\ H_2O \Rightarrow C_6H_{12}O_6 + 6\ O_6$**
  light and temperature
- The influence of CO_2 on production shouldn't be underestimated !

CO_2

- Findings from practice :
  1. When we started with cogen, production went up with 5 kg/m² (+ 10 %) => from 60 to 65 kg/m²
  2. Dosing nothing at all : decline in production of 10 kg/m² (- 20 %) compared to the first situation

     => 65 down to 52 kg/m²

CO_2

3. Dosing from cogen only in morning and late afternoon hours (when electricity prices are high) : production at 60 – 62,5 kg/m²

CO_2

- The differences with or without CO_2 are mainly in **stronger trusses**, better fruit set and thicker **fruits** !
- The greatest influence of CO_2 lies in spring (October - November) and autumn (April – Mai).

Summer Climate

- Start thinking for your greenhouse climate in :

Absolute Humidity

Summer Climate

- It's all about controlling temperature.
- Warm up the greenhouse and the plant towards sunrise and first hours in the morning with pipe 45° C.
- Open the energy screen early and not to slow. While opening the screen, windows are closed.

Summer Climate

- The vents must open quickly.
- The heating pipes run out due to radiation.
- Start watering 2 h after sunrise with longer cycles (= >4 % of the substrate volume).
- Realize drainage 3 h after starting.

Summer Climate

- Give enough water till 2 hours after the highest position of the sun.
- No more than 5 irrigation cycles per hour because of O_2 in the slab.
- Afterwards only give water on radiation (100 J/cm² and 250 W/m²) till 3 hours before sunset. Reduce drainage.

Summer Climate

- Reduce the EC levels from
  3,2 to 2,5 mS/cm between
  200 to 1000 W/m².
- Work with more vegetative feed recipes (more NO_3 – less SO_4 and Cl)
- Try to avoid high Na-levels.

Summer Climate

- If available, dose 10 hours CO_2 during the lightest hours of the day (8 am till 6 pm).
- **But :** if light intensity goes over 800 W/m² it is beter to reduce or stop dosing CO_2.

Summer Climate

- After a bright, sunny day with poor humidity it is wise to squeeze the vents in the late afternoon to keep more humidity inside.
- The temperature in the glasshouse must not rise during this action.

Summer Climate

- Start when light intensity goes under 400 W/m² (between 6 and 7 pm).
- Wind side : 0 – 5 %.
- Lee side : 20 – 40 %.

Summer Climate

- Do not open the vents before late at night.
- The higher the glasshouse, the better it works.

Summer Climate

- If you grow a very generative variety, or a variety which is sensitve to BER or the weather forecast predicts a serious heat wave, you could / should consider to put a coating on the greenhouse roof (or use fogging equipment for cucumbers).

Summer Climate

- The goal is to shield sun light and to gain in temperature.
- All sorts available. Redufuse IR is special.

Summer Climate

- Next level is summer screens.
- You have tot deal with humidity under the screen when it is closed otherwise your crop will end up to vegetative.

  => vents wide open, the screen ajar and the fans running.

Summer Climate : BER

- Sensitive tomato types : elongated types like plum tomatoes, San Marzano – and Coeur de Boeuf, …
- BER appears under summer conditions with high radiation and especially 24-hour temperatures over 23° C, with nights over 21° C.

Summer Climate : BER

- How to avoid ?
  - Remove NH_4 from the nutritional composition of the crop.
  - Change to a lower K/Ca-ratio.
  - Try to lower Na in the fertilization.
  - Keep the temperature of the irrigation water under control.

Summer Climate : BER

- Focus on a strong balance in the plant by deleaving correctly.
- To much leaves on the plants ensures to much Ca transport to the evaporating parts of the plant (=leaves) and not enough to the fruits.

Summer Climate : BER

- Around the longest day it is always smart to prune 2 or 3 brunches harder !

Viruses : PepMV

- Pepino Mosaic Virus
- Belongs to the group of the Potex-viruses.
- Since 1998 in the Netherlands.
- A short time later it spread over all of Europe and the rest of the world.

Viruses : PepMV

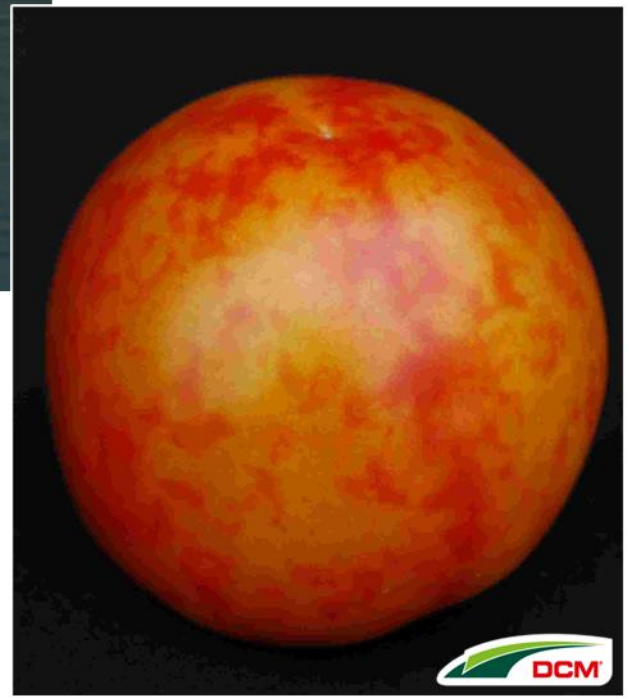
- 4 PepMV-strains
  - European : EU
  - Peruvian : LP
  - Chilean-2 : CH2
  - American : US1 (CH1)

Viruses : PepMV

- First 3 are widely spread in Europe.
- All strains have mild and aggresive variants.

- Source : slides provided by DCM.

PepMV Symptoms



PepMV Symptoms

PepMV Symptoms

PepMV Symptoms

PepMV Symptoms

PepMV Symptoms

Yellowing mutant

PepMV Symptoms

Necrotic mutant

Viruses : PepMV

- PepMV is a very unstable virus : lots of different variants and isolates.
- So lots of different symptoms.
- Every grower has his own story.
- Fact is that the virus is very infectious via mechanical transmission.

Viruses : PepMV

- After 25 years no resistent varieties available.
- Production loss estimated up to 10 % in case of mild variants.
- Much higher in case of aggresive variants.

Viruses : PepMV

- It is impossible to keep the virus in one spot of the greenhouse.
- In 3 – 4 weeks time it will spread over the whole area.
- When the crop weakens, probably the virus reappears.
- It is unlikely that plants die, they suffer.

Viruses : PepMV

- The best way to deal with it, is to vaccinate the young plant shortly after planting with a mild virus strain.
- The vaccination works according to the principle of **Cross Protection**.

Viruses : PepMV

- Cross protection : the plant is colonized by the mild strain of PepMV so that there is no place for another aggressive strain.

Viruses : PepMV

- 2 vaccines are developed and receveived recognition :
    1. PMV-01by DCM – spraying.
    2. VC / VX / V10 by Valto – pinching.

Viruses : PepMV

- It takes 3 to 4 weeks before the plants are protected.
- During that time it is crucial that you work hygienic, so that no aggreesive PepMV can infect the plants.

Viruses : PepMV

- It is possible, even likely, that between the time of vaccination and the moment that your plants are protected you will see virus symptoms on (some of) your plants.

Viruses : ToBRFV

- Tomato Brown Rugose Fruit Virus.
- Also named Jordan virus.
- Belongs to the group of the Tobamo-viruses.
- The Tobamo-group contains the most dangerous plant viruses : ToMV, TMV, CGMMV, …

Viruses : ToBRFV

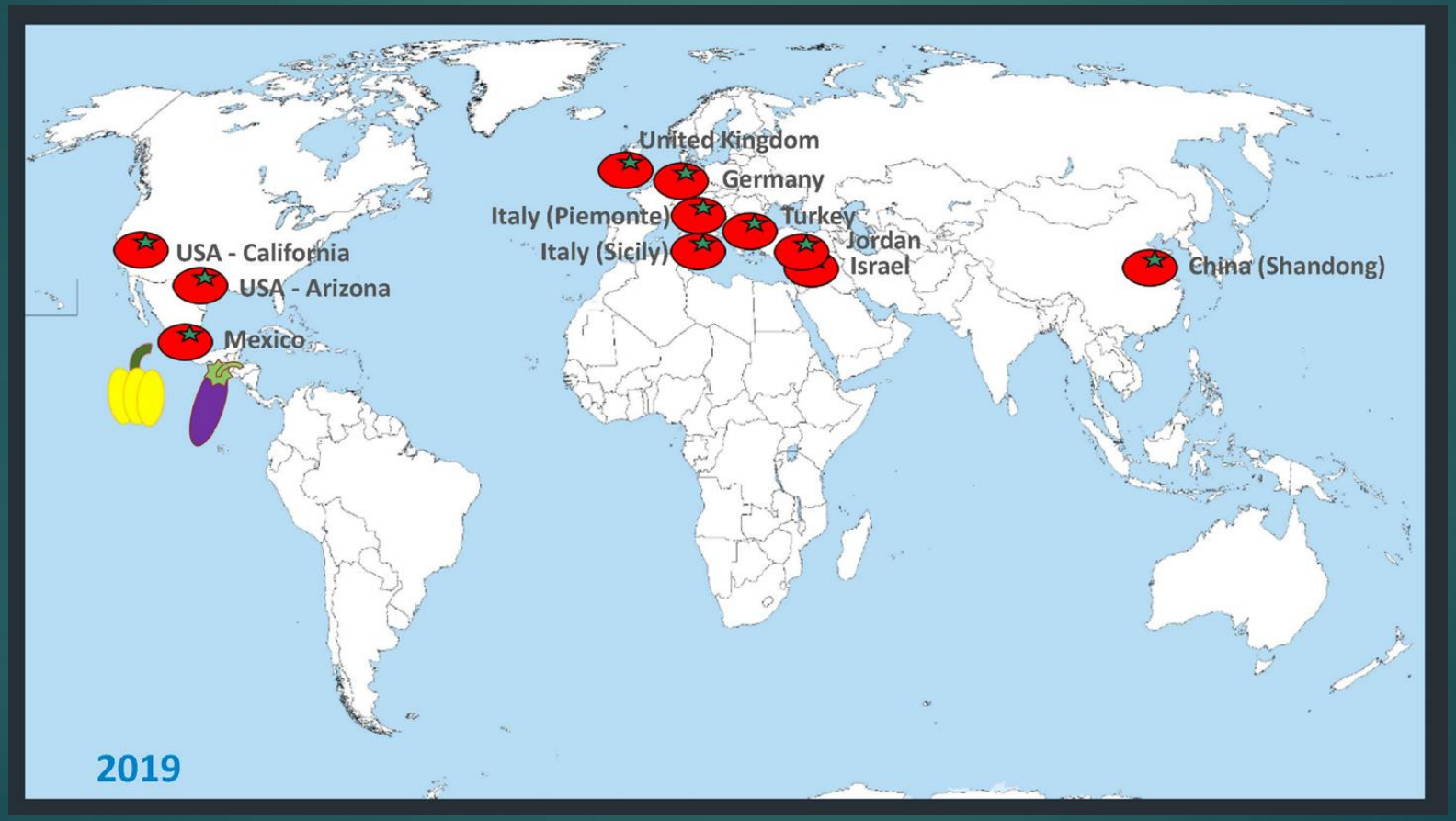
- First appeared in 2014 in Israel.
- Spread quickly from then on all over the world.

Viruses : ToBRFV

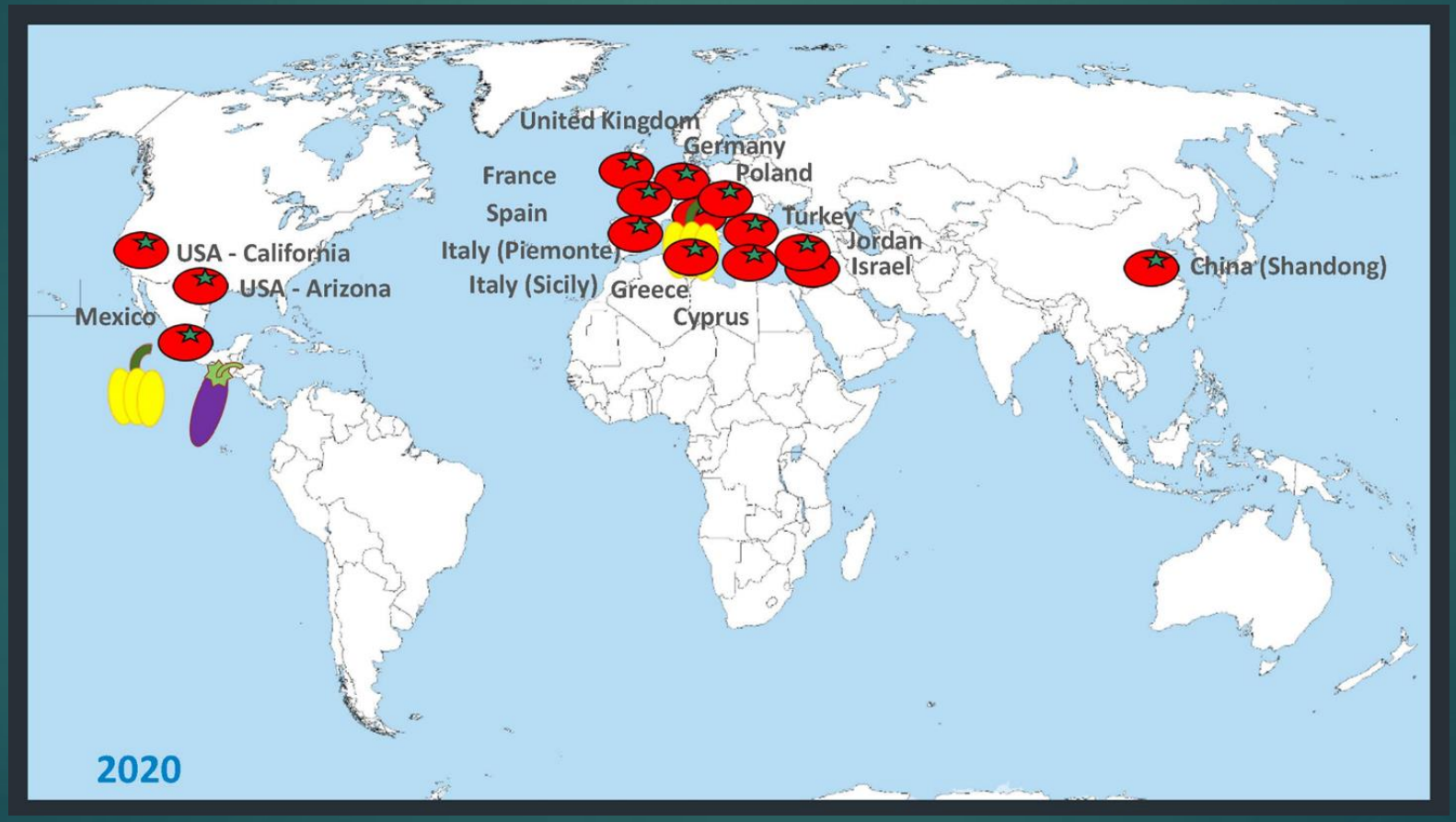
Viruses : ToBRFV

Viruses : ToBRFV

Viruses : ToBRFV



Viruses : ToBRFV



Viruses : ToBRFV

- Capsicum and eggplants are susceptible for ToBRFV, but modern varieties with resistance to TMV1 and TMV2 are not !

Viruses : ToBRFV

- Highly infecious via mechanical contact.
- Once infected, plants cannot be cured.
- The key word is prevention !

Viruses : ToBRFV

- Contamination via :
  1. People (employees, consultants, representatives, **mechanics**, …).
  2. Tools (knives, scissors, trolleys, spraying equipment, …).
  3. Crates, reusable boxes / packing stations.

Viruses : ToBRFV

4. Bumbelbees during pollination in highly infected crop.
5. Birds.
6. Rodents (mice, rats, rabits).

Viruses : ToBRFV

- No transmission via properly disinfected seed. Virus only found on the seed coat, not in the seed. Can safely be disinfected with chlorine.
- No transmission via irrigation water.

Viruses : ToBRFV

- Prevention starts with strict hygiene measures.
- Staff : working clothes remains at the nursery. Should be replaced daily. No cell phones allowed in the glasshouse !

Viruses : ToBRFV

- Visitors : overalls, overshoes, hairnets and gloves. Work by appointment.
- Good hygiene measures minimise spread and limit impact should an outbreak occur.
- Try to compartmentalize in the crop : change gloves every row.

Viruses : ToBRFV

- Try to find the first infected plant and remove the whole row and the one left and right.
- Start with strict scouting !

- Remember : there is life before ToBRFV and there is life with ToBRFV !

Viruses : ToBRFV

- The protocol for ToBRFV is similar to Clavibacter or PSTV, but stricter.
- If you act right, you can keep the affected area limited and on site.

Viruses : ToBRFV

- After a crop with ToBRFV plan a long and heavy crop rotation.
- Chlorine and Virkon are the base.

Viruses : ToBRFV

- ToBRFV is a very stable and persistent virus.
- So difficult to get rid of.
- This virus is not eliminated with temperature of 65° C, like PepMV.
- In the crop rotation first clean up all organic matter.

Viruses : ToBRFV

- Then several runs of desinfection.
- **Remark : optical clean is not microbiological clean !**

TOBRFV fruit symptoms

Yellow fruits

Marbling

TOBRFV fruit symptoms

Marbling

TOBRFV FRUIT SYMPTOMS

Abnormal coloration, brown coloration

TOBRFV FRUIT SYMPTOMS

Brown rugose

TOBRFV FRUIT SYMPTOMS

No fruit symptoms

Leaf SYMPToMS

Mosaic coloration, deformation and narrowing

LEAF SYMPTOMS

Mosaic coloration

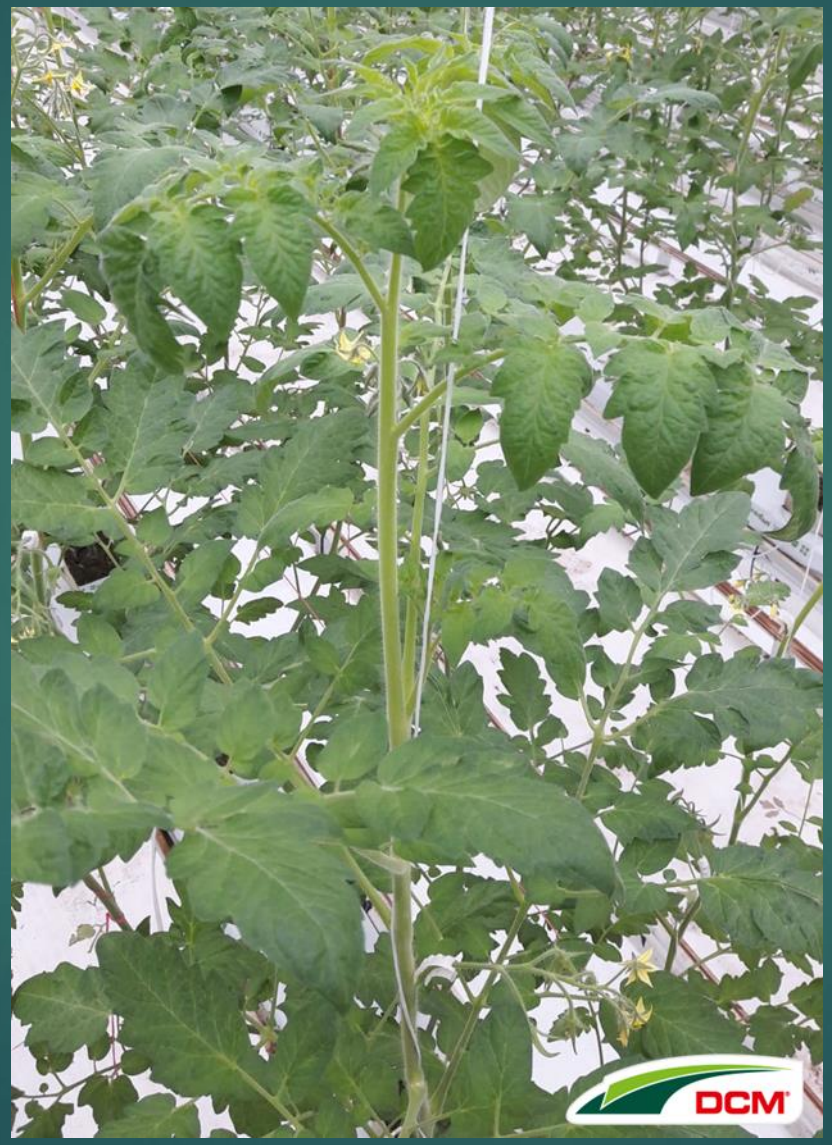
LEAF SYMPTOMS

Leaf blisters and needle-like tips

LEAF SYMPTOMS

Inoculation with ToBRFV, leaf symptoms

LEAF SYMPTOMS



No symptoms

Viruses : ToBRFV

- Good news : resistent varieties are available.
- A lot of discussions about highly resistant and intermediate resistent between researchers and seed companies, but also between themselves.

Viruses : ToBRFV

- In the season of 2023 we had the first crops with resistent varieties :
  - Loose : Tobinaro and Ustica (Enza)
  - Truss : Ustica, Perimos and Martinique (Enza)
  - Cocktail : Lucioso, Amelioso and Valerioso (Rijk Zwaan).

Viruses : ToBRFV

- For next season a lot more varieties in different types of tomatoes appear and wil be cultivated, even we do not know much about them.
- So the proof op the pudding …

Viruses : ToCV

Viruses : ToCV

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Viruses : ToCV

Viruses : ToCV

- Tomato Chlorosis Virus.
- Belongs to the genus Crinivirus.
- Symptoms : interveinal yellowing and thickening of lower leaves, later advancing towards upper part of the plant.

=> Decline in vigour and reduction in fruit yield.

Viruses : ToCV

- Vectors : Bemisia tabaci and Trialeurodes vaporariorum !

PM : white fly

- In Northwest Europe white fly is not the biggest issue. We have Macrolophus, Encarsia and Eretmocerus as biological predators.
- He have more problems with Tuta, Nesidiocorus, tomato russet mite and red spider.

PM : white fly

- If you only have Encarsia, introduce enough Encarsia per m^2 and continue long enough.
- Leave more leaves on the plants.
- If you have to adjust, do it on time and locally.

PM : white fly

- Eretmocerus for us works good in summer, when temperature is high enough.
- Introduce a lot weeks in a row.

PM : white fly

- Chemical crop protection products become rare.
- Think about and try organic and biological agents (Neemazal, Limoncide).
- Yellow sticky roll traps.
- Meshed air vents.


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