Energy Efficient Climate Control for Cut Flower *Alstroemeria*

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Outline

- Introduction
- Energy saving concept
- Results
- Conclusions
- Questions and discussion

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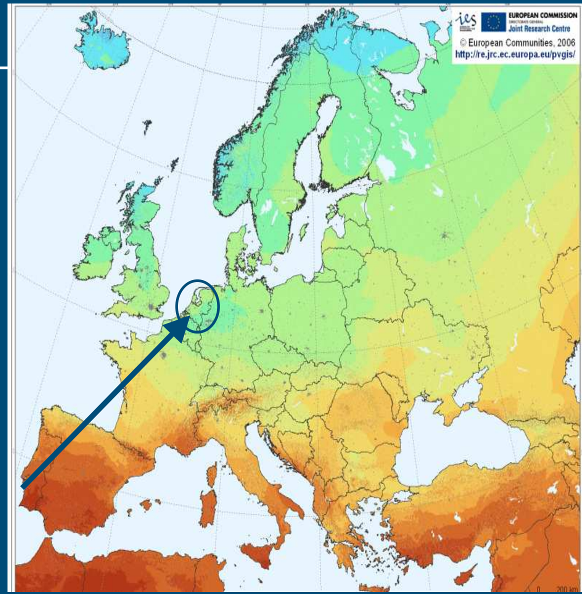
Introduction: Dutch horticulture



- 10.500 hectare glasshouses
- 5800 growers
- € 5,5 billion
- 80% export

- 2008 PP Agreement "Clean and Efficient Agriculture"

Introduction: aim

- 40% reduction in energy consumption for heating and dehumidification
- Equal or better production and quality
- For cut flowers grown at relatively low temperatures

→ development of an energy saving concept
→ one year experiment
  - greenhouse according to energy saving concept
  - greenhouse according to common practice as reference

Introduction: cut flower *Alstroemeria*

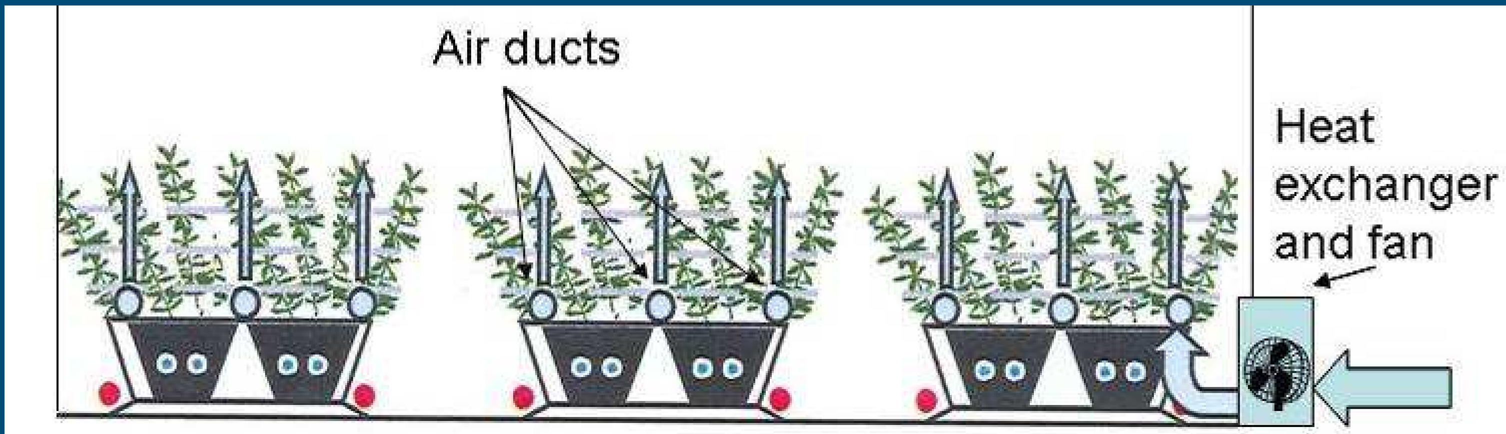
- 70 hectare, € 32 million
- Average temperature of about 15°C
- Soil cooling (15°C)
- Additional lighting
- Energy use in common practice: 17 m^3 gas m^{-2}

Energy saving concept: methods

- A) Temperature integration
  - Heating set point lowered to 12°C instead of 14°C, compensated by postponed ventilation for same average temperature.
- B) Additional insulation with second thermal screen
- C) Dehumidification with an energy efficient humidity control system instead of common practice.

Energy saving concept: humidity control system

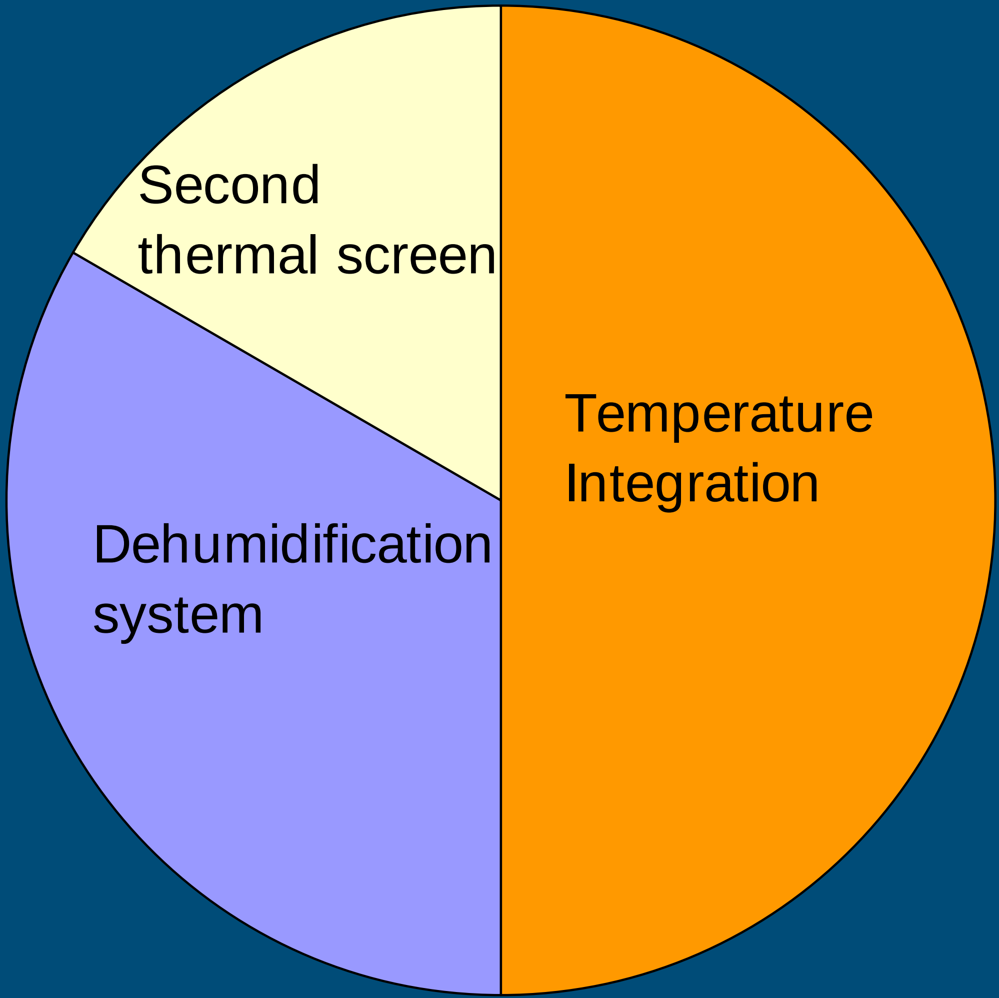
- Air distribution under the canopy with heated outside air
  - 3 ducts per 1.6 m (ø100 mm)
  - Capacity ±7 m^3 air m^{-2} hr^{-1}
- Humidity control within the crop
- More homogeneous temperature
- Humidity threshold can be set at higher humidity levels because of effective control → less ventilation needed, which saves energy



Energy saving concept: humidity control system

Results

- Saving of 37% on heating energy
- Largest energy saving with temperature integration (simulation)
- Largest energy saving in autumn and spring



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Results

- Capacity of ±7 m^3 air exchange m^{-2} hr^{-1} enough for humidity control, excepts for some nights when outside absolute humidity is almost equal to inside absolute humidity
- Equal yield in number of stems and total fresh weight
- ‘Primadonna’ and ‘Nadya’ less necrotic leaf tips in December and January resulting in better quality

Results: less necrotic leaf tips

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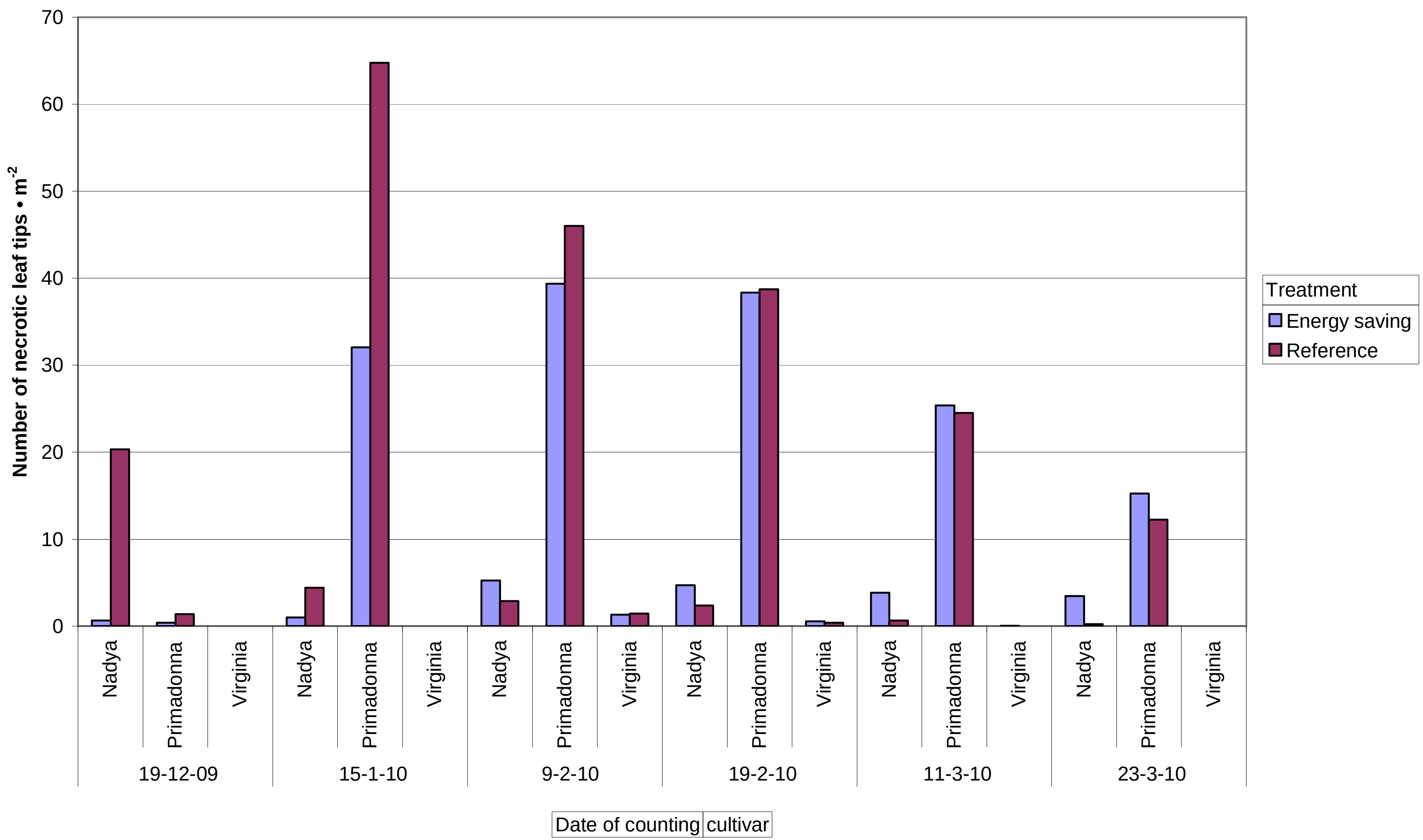
Results: less necrotic leaf tips



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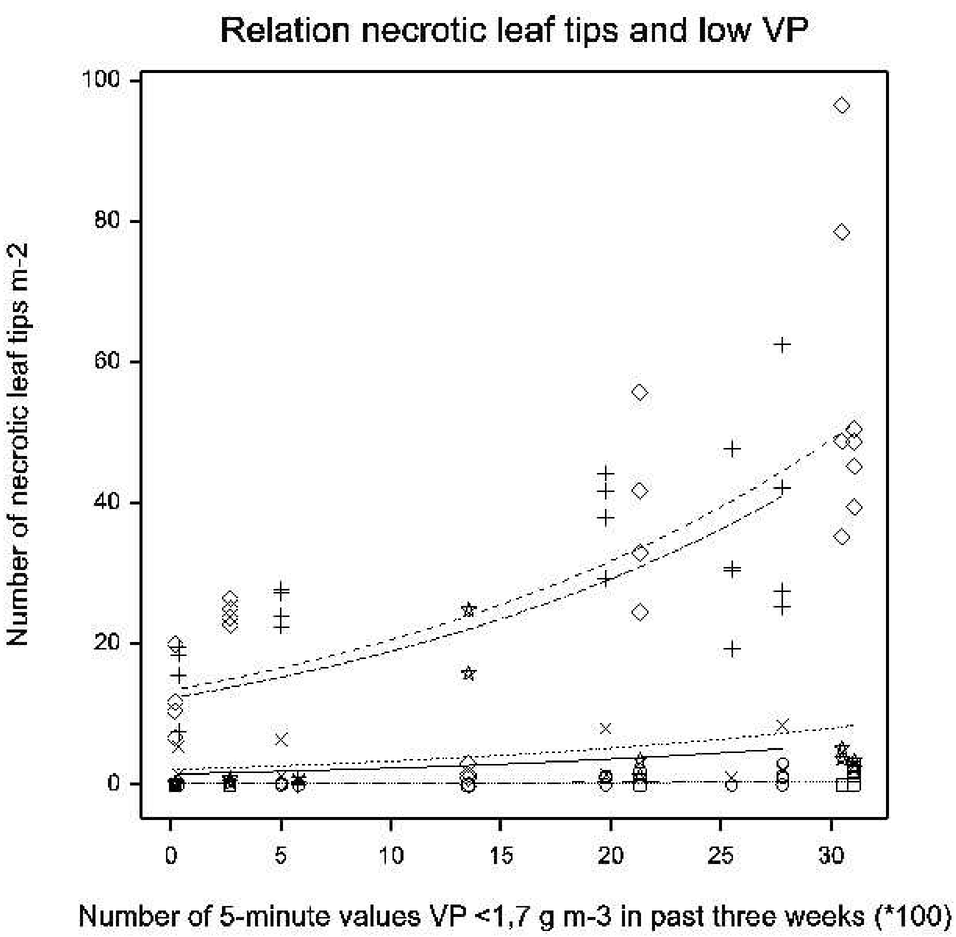
Results: exponential relation

$y=a+b*r^x$

$r=1{,}35$



Conclusions

- Saving of 37% on heating energy through;
  - Temperature integration
  - Double thermal screens
  - Humidity control with outside air distribution system
- Humidity control system effectively controls vapour deficit within the crop
- No negative effects of this energy saving on yield
- Some cultivars positive effect on quality;
  - Less necrotic leaf tips through humidity control

Questions and Discussion

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