



POTENTIAL OF DIFFERENT ENERGY SAVING STRATEGIES IN HEATED GREENHOUSE

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INTRODUCTION

In heated greenhouses, important amounts of energy are used to optimize climate conditions (temperature, humidity).

Basically, there are two ways to reduce energy consumption one is related to temperature control, and the other one to humidity control.

Some results obtained in Switzerland are presented here.



AIM

The aim of this trials was to compare the effects of different energy saving strategies in heated greenhouse on energy consumption and yield of a tomato culture.



MATERIAL AND METHODS

Temperature integration

- Two identical greenhouses of 90 m²,
- One greenhouse was managed in a conventional manner (control) and the other with temperature integration over 24 hours (Test)

Management of temperature loses

- 2 equal compartments of 358 m²,
- Each compartment has a thermal and an aluminised screen,
- Screen management was tested after sunrise.

Thermodynamic dehumidification

- 2 equal compartments of 358 m²,
- One compartment with a conventional dehumidification by heating-ventilation and one with a heat-pump. The objective was to keep the DX above 3 g water/kg dry air in the morning.



RESULTS

Table 1. Yield and energy consumption in the control greenhouse (Control) and in the greenhouse with temperature integration (Test). Mean of 3 years.

	Control	Test	Δ
Yield kg m ⁻²	35.5	34.5	-3%
Energy consumption kWh m ⁻²	306	222	-27%

Table 2. Yield and energy consumption with differentiated screens management (Test) and fixed management (Control). Mean of 2 years.

	Control	Test	Δ
Yield kg m ⁻²	35.7	37.3	+4%
Energy consumption kWh m ⁻²	130	95	-27%

Table 4. Yield and energy consumption with traditional dehumidification (ventilation and heating, Control) and with dehumidification by condensation (Test). Mean of 2 years.

	Control	Test	Δ
Yield kg m ⁻²	40.4	39.6	-2%
Energy consumption kWh m ⁻²	122	96	-21%



Thermal and aluminised screens.



CONCLUSION

- These energy savings were possible without important decrease in yield.
- The potential of energy savings in heated greenhouses with the three tested climate management strategies in comparison to the classical climate management varied between 21 and 27%.
- The results of these studies could be partly transferred to organic greenhouses.

