Adaptive greenhouse design: what is best for growing tomato in Northern Africa?

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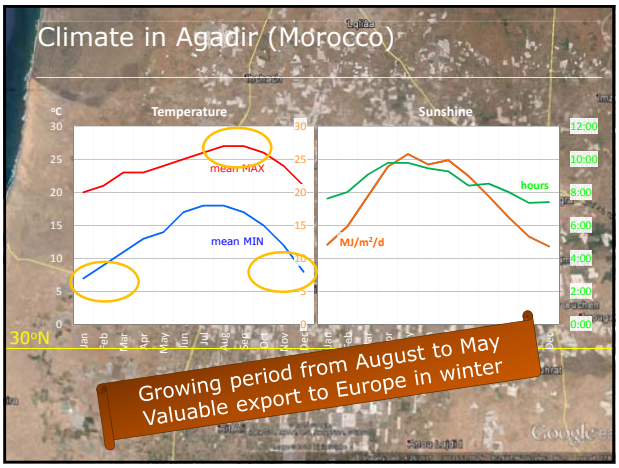
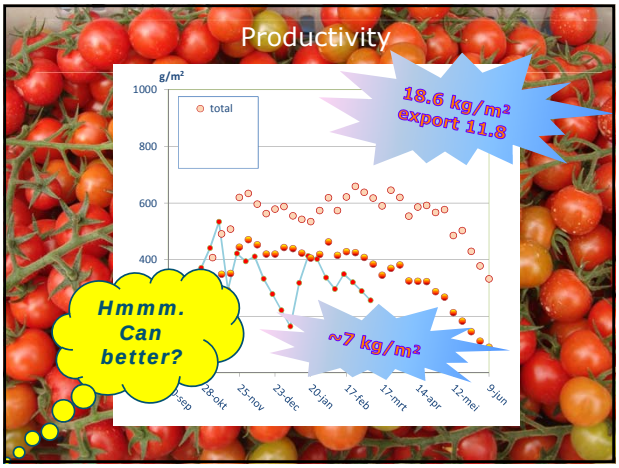
GreenSys 2015

Climate in Agadir (Morocco)

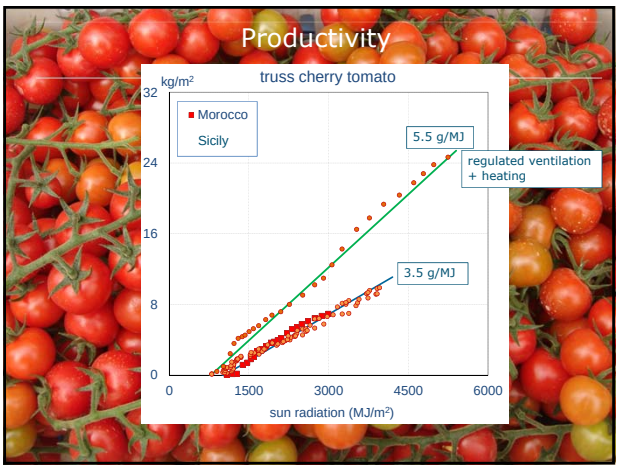


The greenhouses

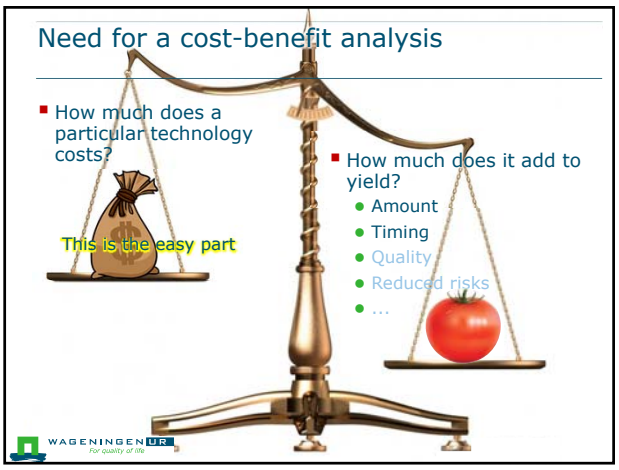
Productivity



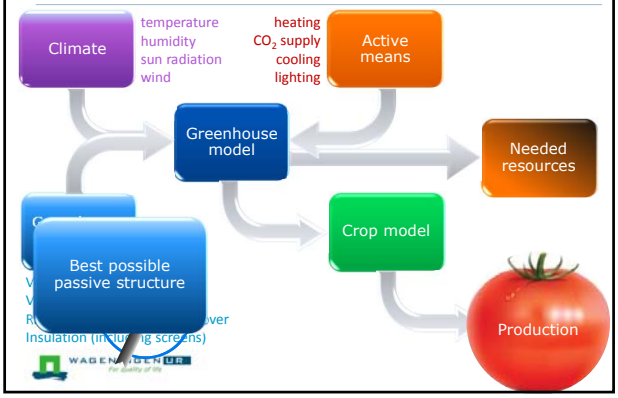
Productivity



Need for a cost-benefit analysis



Our approach:



The best possible passive structure

	Yield (kg / m²)	Winter Yield (kg / m²)
Real case	18.6	7.6
Reference (standard management; no pathologies)	23.8	7.3
Improved ventilation	34.2	8.5
No application of whitewash	36.5	8.5
Energy screen at night	37.1	9.3

Need for a cost-benefit analysis

- How much does a particular technology costs?

120 kC/Ha

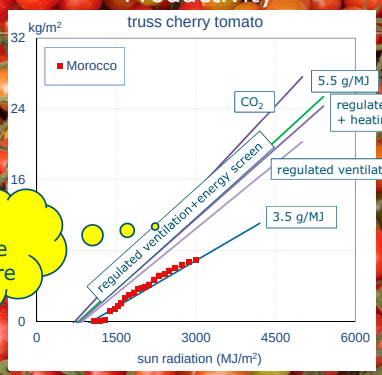
- How much does it add to yield?
  - Amount +14.3 kg 0.25 €
  - Timing of which 2 winter 0.50 €
  - Quality
  - Reduced risks
  - …

+40 kC/Ha.y

Worth of active climate management

	Yield (kg / m²)	Winter Yield (kg / m²)	Resources needed
Best possible passive greenhouse	37.1	9.3	0
Heating	37.3	9.5	506 MJ/m²
CO_2 (capacity 60 kg/Ha·h)	44.2	12.2	24.2 kg/m²
Artificial light (150 µmol/m²s)	39.5	10.7	106 kWh/m²
Artificial light on top of CO_2	51.0	13.8	106 kWh/m² + 24.2 kg/m²

Productivity



Best passive structure

Conclusions

- The best "passive" greenhouse for the conditions of Morocco has at least 40% ventilation area with insect nets…
- …and a good energy screen…
- …and a promising financial outlook
- Among "active" climate management, carbon fertilisation should be considered much earlier than heating