Energy Saving Research 2010

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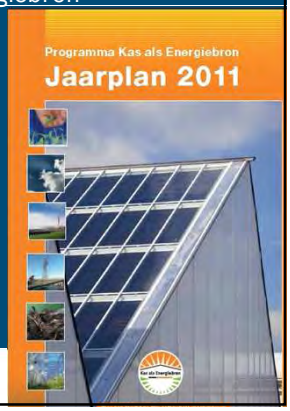
Outline of the presentation

- The program "Kas als Energiebron"
- Some projects from 2010 done in this program
- Futuristic images posed in the program

Ambition of "Kas als energiebron"

Goals for 2020

- Climate neutral, economically feasible (newly build) greenhouses
- Greenhouse sector as supplier of sustainable heat and energy
- Reduce of fossil fuel consumption



Transition paths

- Energy saving
  Crop management Light
- Sustainable energy resources
  Solar energy Geothermal heat Biofuel
- Efficient application of fossil fuel
  Sustainable electricity
- Remaining
  Sustainable carbon dioxide

Projects in the program in 2010

- In total more than 50 projects
- Total budget 7 MEURO
- Financed by ministry of Economic Affairs, Agriculture and Innovation and the Dutch Product board

Ministry of Economic Affairs, Agriculture and Innovation

Uw sector investeert in dit onderzoek via het Productschap Tuinbouw

Next generation of growing

7 steps to 50% energy saving

1. Controlled dehumidification
2. More use of ther
3. Temperature inte
4. Co
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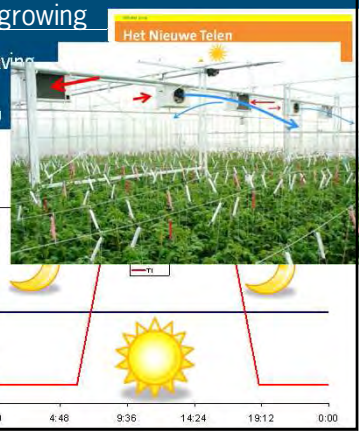
6. Ac
7. Se



The next generation of growing

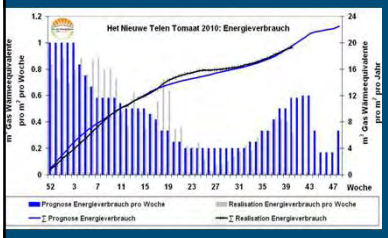
50 kg tomato with 27 m^3 gas

- Starting point: optimal insulation (triple cover/ 2 screens)
- 1°C lower heating temperature, increased ventilation setpoint
- 1th screen closed until 250 W/m^2
- 2nd screen closed when $T_{outside}$< 8°C
- Humidity setpoint ventilation > 85%

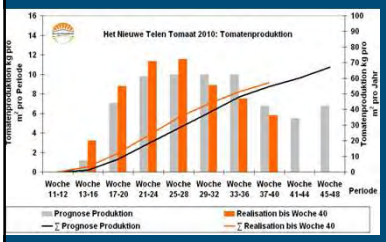
Step 1, 2 and 3 are used

De Gelder, 2009

The next generation of growing



The next generation of growing

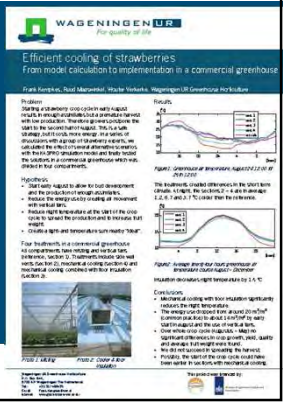


Effect LED compared to SON-T

- LED lighting results in 3-5% less production compared to SON-T
- LED treatment uses more energy since the heat has to be removed from the lamps and the greenhouse temperature has to be slightly higher

Efficient cooling of stawberries

- Floor insulation reduces night temperature
- Early start of crop cycle reduces energy use in combination with more air movement
- By control temperature in relation to light production is not effected

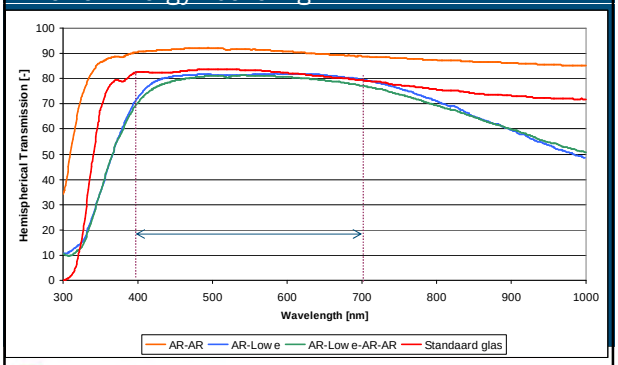


Innovation and Demonstration Centre

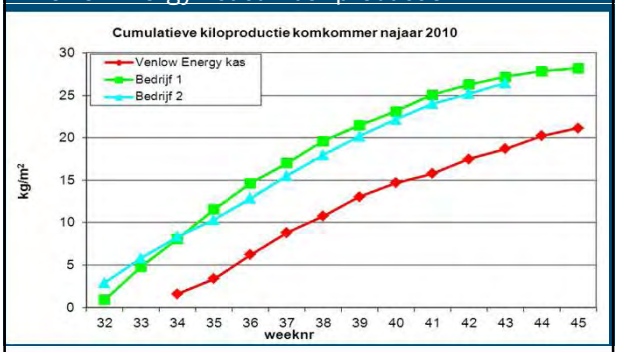
- Greenhouses
  - Sunergy Greenhouse
  - FlowDeck Greenhouse
  - Sun Wind Greenhouse
- Ca. 500m^2 each greenhouse

VenlowEnergyGreenhouse

VenlowEnergy - covering

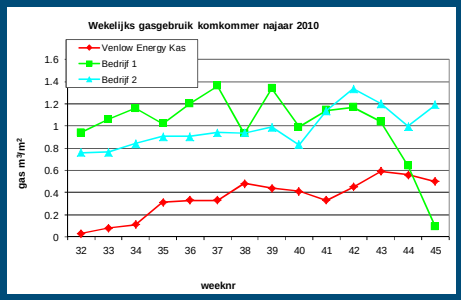


VenlowEnergy - cucumber production



21 kg per m^2

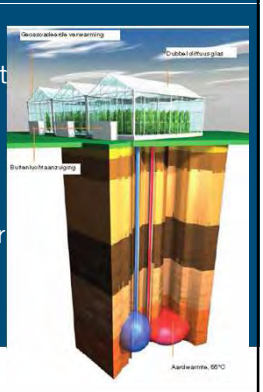
Venlow Energy - energy consumption



5m^{3}gas per m^2

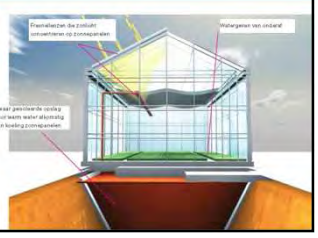
Tomato production in the future

- Heating using geothermal heat
- Double layer diffuse cover
- Controlled dehumidification using outside air with heat recovery
- Cascaded heating systems for optimal use of low temperature heat



Phaleanopsis company of the future

- Fresnel lenses to collect heat and electricity
- New watering system
- Storage of high temperature heat

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Thanks to all my colleagues
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