Towards a More Sustainable Water Efficient Protected Cultivation in KSA

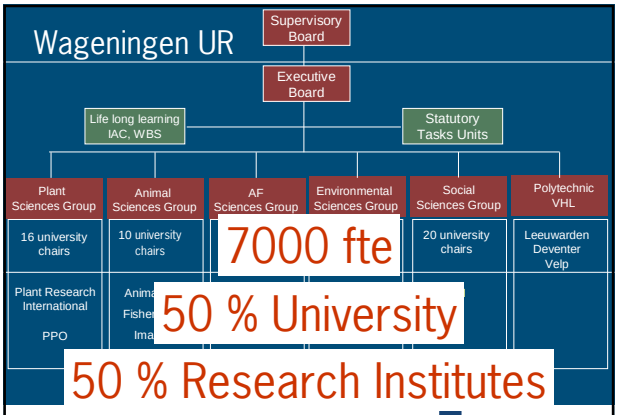
Dr. Ir. Jouke Campen,
Wageningen UR Greenhouse Horticulture

Riyadh, April 7 2010

Outline of the presentation

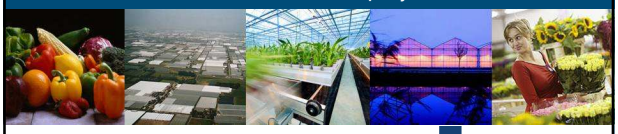
- Wageningen UR Greenhouse Horticulture
- Issues related to protected horticulture in KSA
- Water efficient greenhouse
- Conclusions and discussion

Wageningen UR



Wageningen UR Greenhouse Horticulture

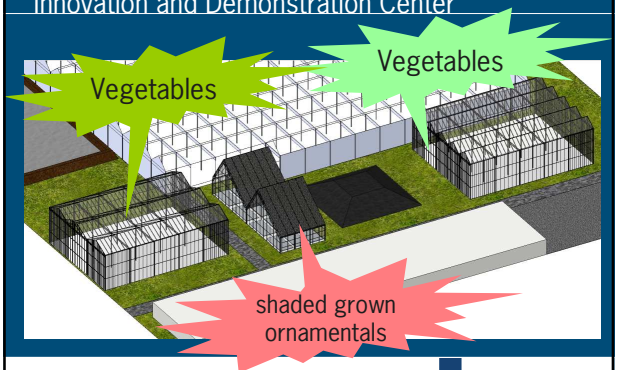
- Mission: Initiate and stimulate innovations for a sustainable greenhouse sector
  - Focus: primary production and integral production system design
- Staff: over 100 researchers
- Annual turnover 12-14 M€ (on project base)



Location: Bleiswijk

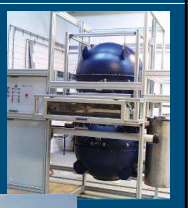
- 85 greenhouse compartments
  - normal ventilation, cooling, complete airco
  - artificial light
  - soil, subtrates, tables
  - Insect breeding
- Crop protection laboratories
- Test facility taste of products

Innovation and Demonstration Center



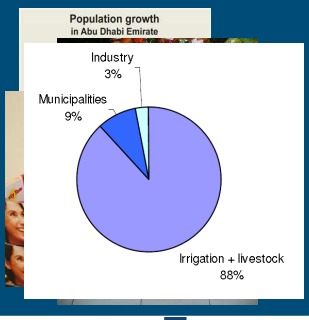
Location Wageningen

- Specific laboratories (e.g. robotics, light measurements)
- 2 Experimental greenhouses

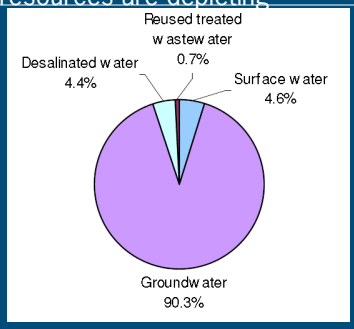


Issues related to protected horticulture in KSA

- Water use
- Need for production increase
- Food safety
- High quality demand



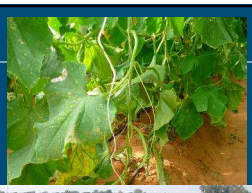
Water resources are depleting



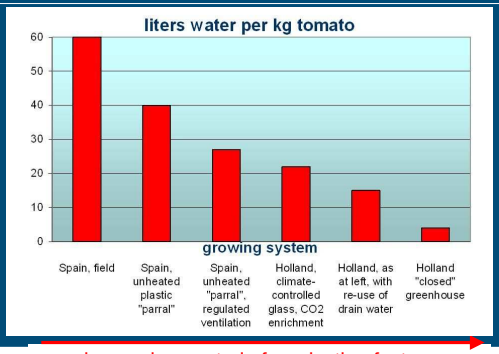
FAO Water report 34 (2009)

Increasing water efficiency: "More crop per drop"

- Irrigation of the plants
- Cooling of the greenhouses (natural ventilation i not an option)
- Alternative water resources

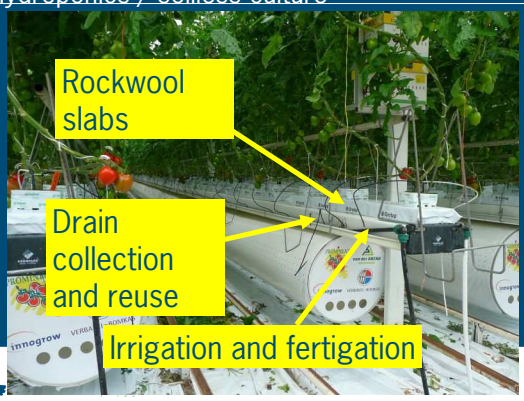


Water use efficiency



increasing control of production factors

Hydroponics / soilless culture

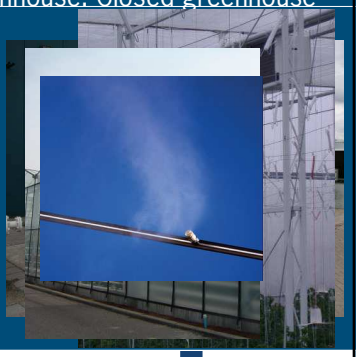


Fertigation unit and water treatment

Water efficient greenhouse: Closed greenhouse

No air exchange with outside

- Cooling system
- Air treatment unit
- Fogging
- CO_2 enrichment
- Covering (no vents)

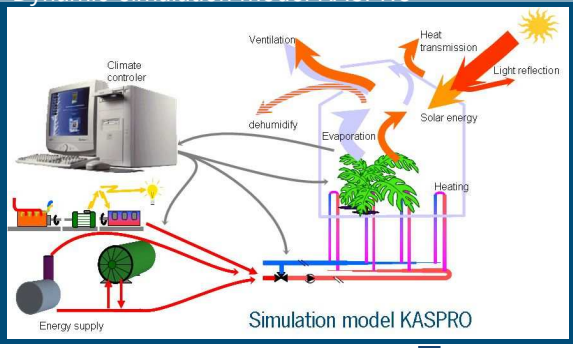


Water efficient greenhouse

+ Low water use ↓ of 80%
+ Low pesticide use
+ High CO_2 levels ↑ 100% production increase
– High energy consumption
– Complex technology

KSA: 7 GJ

Dynamic simulation model KASPRO



Comparison pad & fan <-> closed greenhouse

	P&F	Closed greenhouse
Transpiration (l)	1200	1063
Evaporative cooling (l)	3260	6
Water loss (l)	4460	180

-95% less water use

Comparison pad & fan <-> closed greenhouse

	P&F	Closed greenhouse
Max temperature (°C)	34.8	30.5
Biomass production (kg)	11.4	19.9
Carbon dioxide (kg)	-	34
Cooling need (MJ)	-	3900

+75% dry matter

361 kWh (COP=3)

Conclusions

- Technique increases water efficiency (less water and a higher production)
- Technique increases quality
- Technique should be tested and demonstrated under local circumstances
- Capacity building is essential

Discussion

How to implement this technology in protected horticulture in KSA?

- Government can support sustainable agriculture through the promotion of technology
- Economic feasibility should be demonstrated
- Growers should think in terms of return on investment

Thank for your attention!

Riyadh, April 7 2010