

SMART Greenhouse Horticulture in Rwanda

Example for emerging farmers

Erik van Os & Anne Elings
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Financed 50% by  Netherlands Enterprise Agency

SMART Horticulture Rwanda

Building Greenhouse Managing Partner



Project Partners



SMART Horti Business Partners



Aim and Results

■ Goal: introducing technologies that are adapted to local circumstances

■ Design specific greenhouse

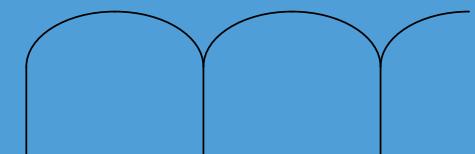
■ Building pilots

■ Training staff

■ Dissemination outside the pilot

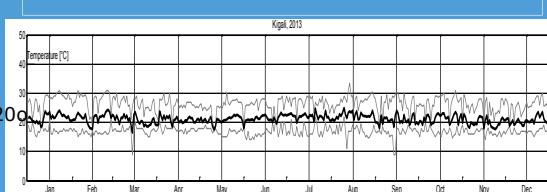
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Climate



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Rwanda, Kigali 2013

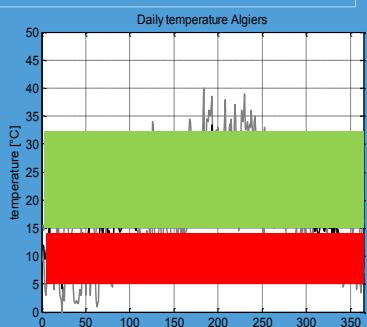


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Algerian climate - temperatures

Typical:
- Heating demand in winter

Challenge:
- High temperatures create need for efficient ventilation
- Extra cooling measures needed in summer



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Malaysia: a greenhouse for lowland tropics

Goal: Introduce a greenhouse suitable for lowland tropical climate conditions.

Greenhouse:

- Natural ventilation
- Insect nets, double-door sluice
- 20 * 30 m
- Drip irrigation
- Coco fibre substrate
- Computerized fertigation

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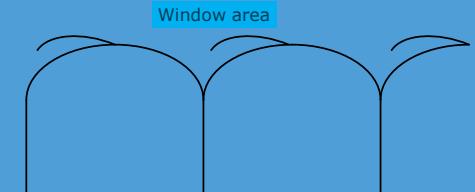

Pilot: how to work in the new greenhouse?





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Design factors: shape + ventilation



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Ventilation

Current tunnels have $\sim 3\%$ window opening
 m^2 window / m^2 greenhouse = 0.03



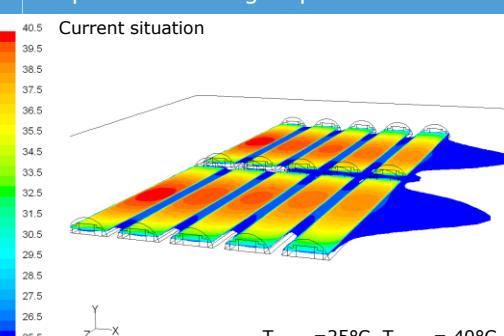
Size: 50 x 8 m
 Ventilation in front

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Temperature in single span tunnels

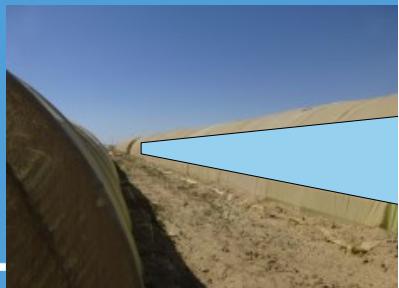
Current situation



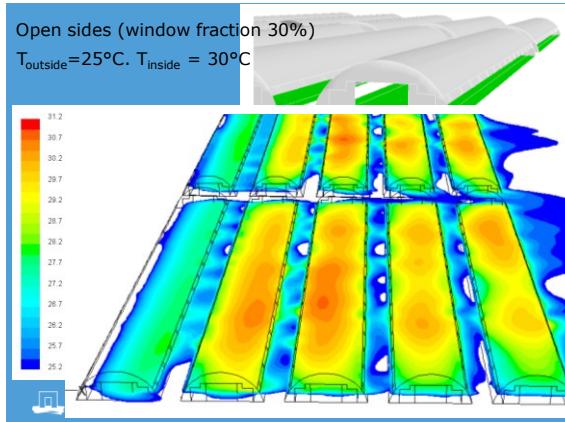
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Ventilation and cooling

30% window opening = m^2 window / m^2 greenhouse = 0.3



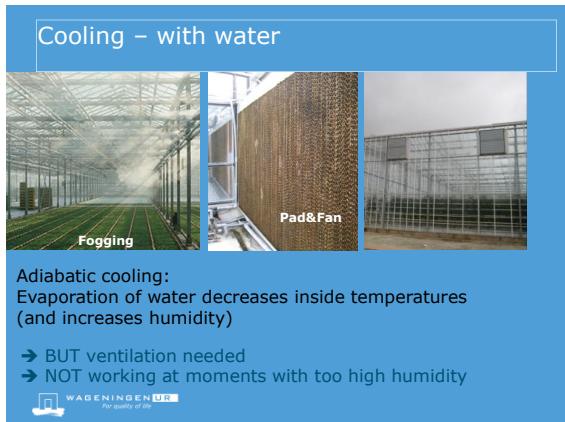
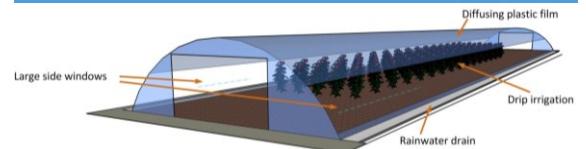
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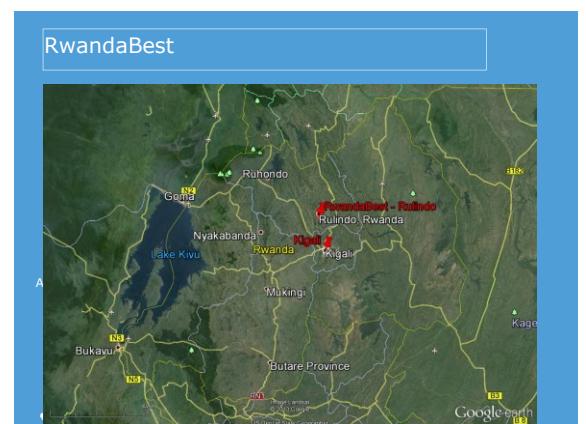
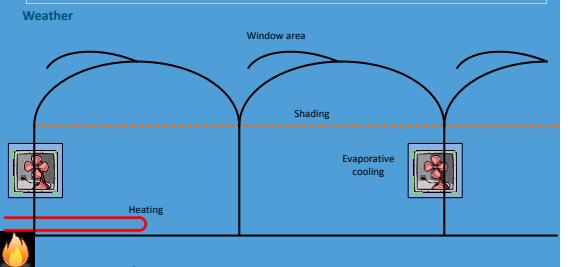
Final design Algeria

- Ventilation: 30%
 - Doors and side walls
 - Insect netting
- Diffuse film
- Rainwater collection
 - Soilless cultivation
- Manual or mechanised operation needed

TNO: calculation of strength



Other design factors



Current situation in Rwanda



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RwandaBest



Expectations RwandaBest

- Own production
- Increased volume
- Stronger market position
- Collaboration with surrounding cooperatives
- Approximately 10 greenhouses, in phases
- Some technology
- Training facilities

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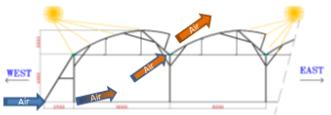
General lines of development

- Pilot with low-tech-plus greenhouse (low-tech plus computerization)
- Training
 - at RwandaBest: **next week**
 - Later: combination with supplying companies
 - of RwandaBest + other producing companies + cooperatives
- Post-harvest value chains
 - Grading, packing, cooling, transport
- Commercial up-scaling of greenhouses to other farms and cooperatives

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Greenport Holland International Design Bosman, Pilot Greenhouse

The Greenhouse model:
'EVEREST 8 M': with windows permanently opened positioned north-south.



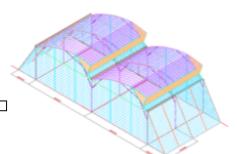
50 mesh anti insect nets will be installed at all points of entry to the greenhouse, which reduces the need for pesticides and saves money.



Resistance:
The structure has been calculated and tested for the worst weather conditions

MODE: EVEREST 8 M

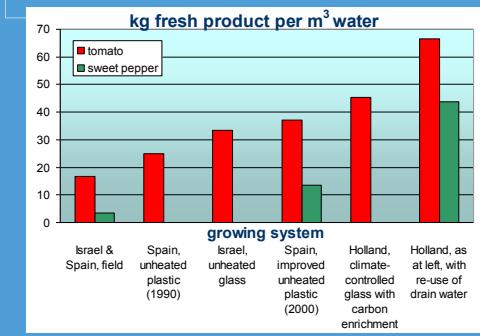
Standard load and lockers plastic	LOCK PLASTIC PROFILES	Wind load	CROP LOAD
	ALUMINUM	150 Km/h	25 KG/M2



iSii Compact Water

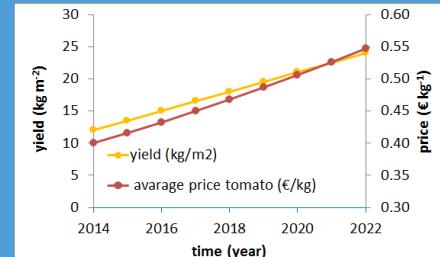


Higher production? More Technology!



Cecilia Stanghellini, WUB Greenhouse Horticulture

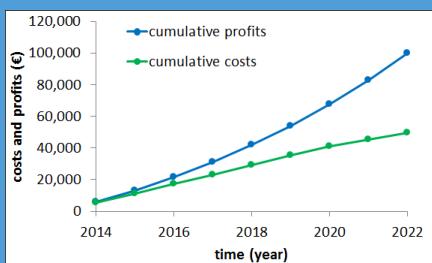
Production increase Rwanda Best





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Budget – Costs & Benefits



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Greenhouse design

■ Temperature & humidity control

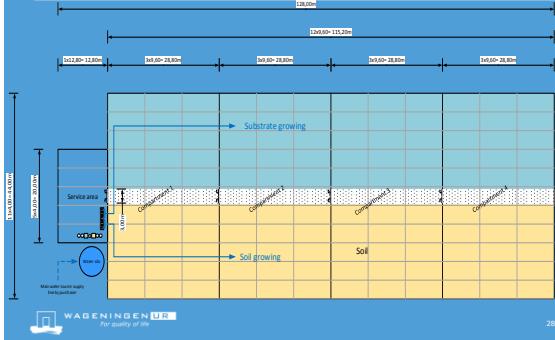
- Ventilation
- Shading
- Heating
- Cooling

■ Cultivation & Irrigation


Substrates
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 Substrat
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Similar: Klein Karoo, South Africa;
mid-tech



Soilless cultivation: how to start?

- Disinfection of the soil
- Cleaning of greenhouse, free of pathogens
- Leveling the soil: 0.2 – 0.5%
 - If not: wet/dry places, disturbed growth
 - Slippery for workers: accidents
 - Diseases: faster outbreak
- Covering the soil against pathogens with plastic liner
 - Against weeds, soil-borne pathogens
 - Light reflection: white; or temperature in winter: black
- Lay down troughs, substrate and drip irrigation
- Filling substrate with nutrient solution
- Planting
- Draining substrate

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Soilless: against soil-born pathogens



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Water quality

- Chemical quality
 - Availability good water
 - Additional water
- Effect of salt on yield
 - Too salt, less yield or quality
- Storage and dosing equipment
- Calculation of recipe of nutrient solution

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Water sources and their contents

- Rainwater
- Tapwater
- Surface water
- Boreholewater

→ Improve with Reverse osmosis



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SUBSTRATE differs from soil:

- Height of substrate 5-10 cm versus soil >100 cm
- Volume 10-20 litre versus > 500 litre
- Nutrients in irrigation water
- Concentration instead of capacity
- No base dressing / nutrient storage in soil
- Irrigation >20 per day versus 1x per week
- Density, water content, air content



Training

- Train the trainers
- WUR, private companies
- Subjects:
 - Greenhouse and climate
 - Cultivation in soil and soilless
 - Pest and diseases
 - Organisation of work
 - Chain and post-harvest

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Thank you for
your attention !



Wageningen UR Summerschool Protected Horticulture
www.wageningenacademy.nl/protectedhorticulture
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