

# Sustainable Moroccan horticulture

It all starts with YOU

*AGRIFOOD - Interdisciplinary Thesis Lab 2022-2023*

**Centre for Sustainability**

Leiden-Delft-Erasmus Universities



# What are the challenges?

In 2050..

- ❑ 9.6 billion people
- ❑ Climate change
- ❑ Morocco
  - ❑ + 3 degrees Celsius
  - ❑ -10% precipitation
  - ❑ 6x more demand for water

→ Food production in quantity and quality

→ Mitigating the impact of climate change



# Why is this interdisciplinary thesis lab important?

- More efficient and sustainable cultivation
- Adjusting practices, strategies and production systems
- Dynamics and interconnections
- Interdisciplinary approach
- Knowledge inventory for step-wise improvements
- Learning and exchanging
- Meeting field professionals & academic experts



# What did the excursion to Morocco bring us?

- Experiencing real-life setting, limitations and possibilities
- Meeting partner organisations & students
- Getting inspiration and/or collecting data





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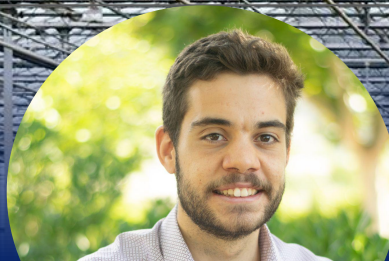




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Jerry Lappas  
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Studies

# The student team

# The theses

## Technology

Sustainability assessment of hydroponic farming systems - Javier

Sustainable pest management in Agadir-Florence

Data-Driven Growing - Nick

Introduction strategies for sustainable greenhouses in Morocco - Amir

## Justice

Justice in the Water Energy Food Nexus in Souss Massa - Dieneke

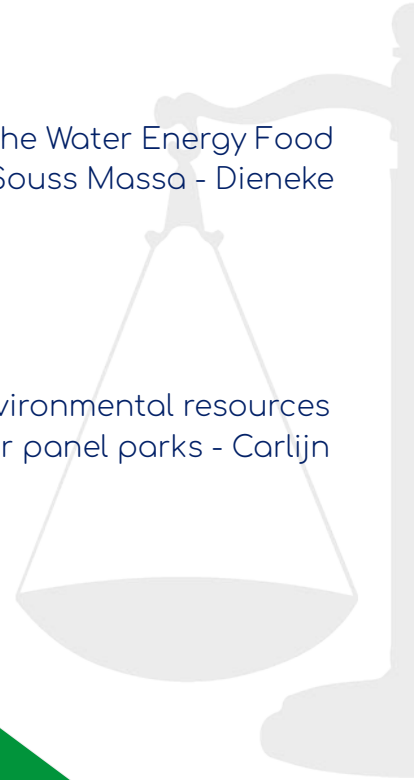
Power dynamics and environmental resources large-scale solar panel parks - Carlijn

## Business

Successful collaboration in international horticulture stakeholder networks - Marc

Influence of Moroccan and Dutch culture on the horticultural sector in Sous-Massa - Anne

Supply Chain Resilience - Melody





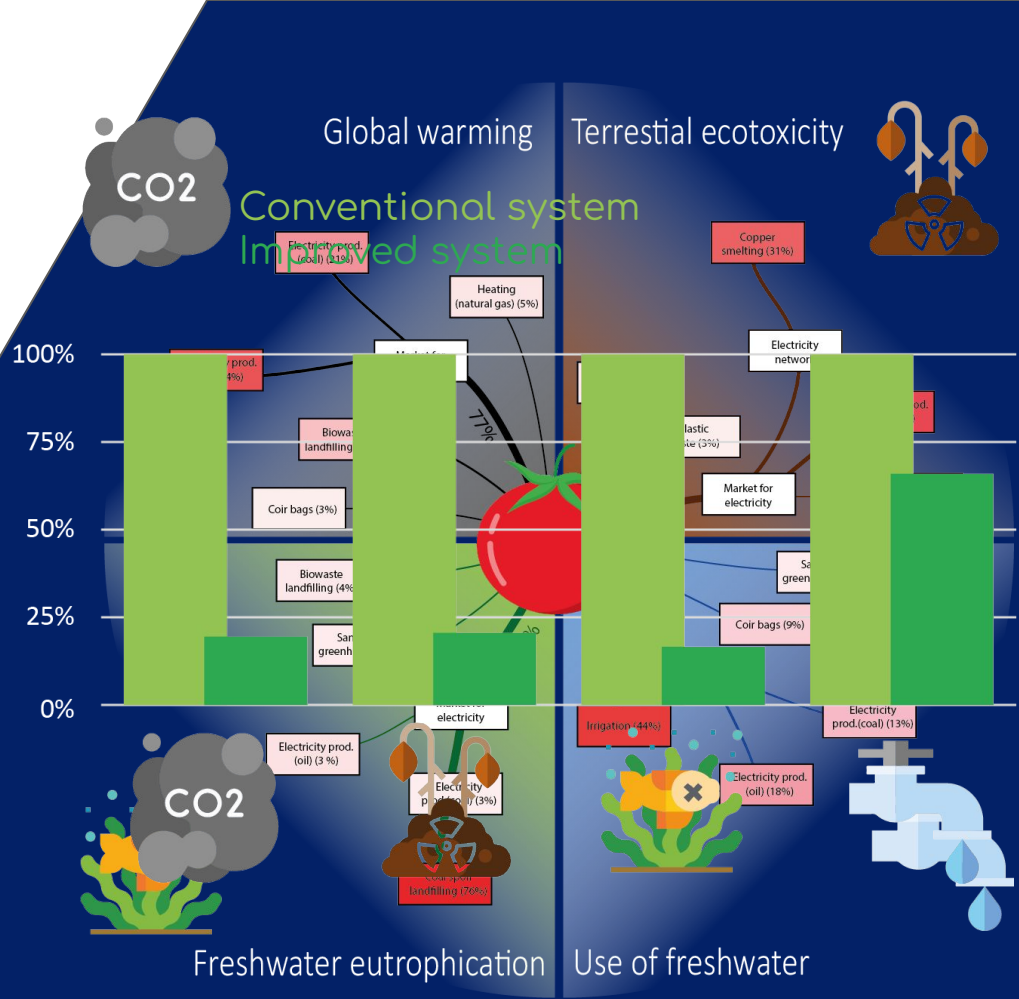
# How to upgrade the current system

- Not by just copying Dutch High-tech systems
  - show consequences (LCA):
    - Environmental: high energy consumption, waste generation with poor management → some solutions (renewables, compost, data driven...) but... second type of consequences:
    - Obstacles: lack of knowledge, conservative attitude, hesitancy toward technological implementation, high product price and so on.
- How to overcome these obstacles?



# How can we sustainably improve moroccan horticulture?

- Use of renewable energy sources like wind and solar panels.
- Biowaste and promote global posting of organic wastes protocols and eco-design products
- Plastics waste collection and recycling facilities
- Responsible for terrestrial
- Eradicate the existing sector.





## Recommendations on how to implement new technologies

- Knowledge gain through showing this overcomes the lack of knowledge and partially the hesitancy.
- Gradual implementation
- Network building

The hesitancy is overcome by gradual implementation and justification of the expense through the creation of a final product market.



# Cases: Irrigation → How data driven can help

- The problem when drip irrigation was implemented (bounce effect)
- How the government could have prevented water use increase by installing (introducing, enforcing) sensors.
- Additional benefits: increase of trust of farmers on new technologies by tracking the progress. Open the door to further development.



How does collaboration among stakeholders within the horticultural sector in Sous-Massa contribute to achieving a resilient supply chain?

1

## Moroccan- Dutch Collaboration

- Cluster of horticultural organisations in Souss-Massa
  - Triple helix approach
  - Moroccan and Dutch culture in working relations

2

## Supply Chain Resilience

- Fresh export supply chain in Agadir
- Identify potential negative impact of strategies in the long-term





# Collaboration

## Challenges

*Dutch actors do not have ties to all relevant organizations*

*Various types of organisations in Morocco*

Key players:

- Apefel
- IAV Hassan II University



Will the demo greenhouse lead to adoption?



- Involvement in the cluster with enough priority
- Misalignment among stakeholders





# Resilient Supply Chain

## *Local context*

- Preharvest & export stages are hotspots
- Unpredictable weather patterns
- Impact of globalization



## *Strategies & Capability*

Capability of:

- Anticipation
- Resistance
- Recover
- Response



## *Identification*



Risky adaptations in the long term

- Lack of diversity
- Neglect local market



# Integrated Advice



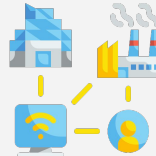
Understand the local context and needs

*E.g. cultivating methods, supply chain, stakeholder relations, existing needs*



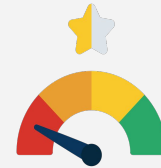
## Stimulate collaboration

- Among moroccan stakeholders
- Moroccan-Dutch ties
- Be aware of cultural influences



## Address the entire supply chain

- Include more stakeholders
- Involve representatives of the entire supply chain



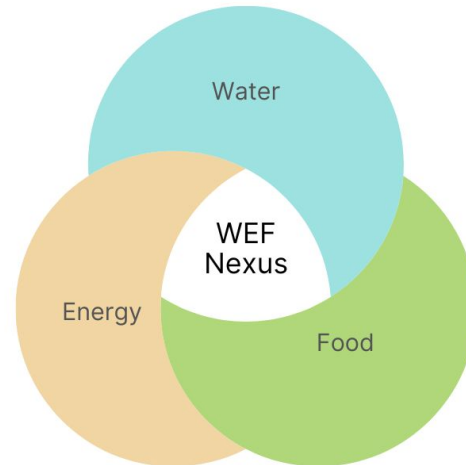
## Monitoring

- ESG monitoring to identify barriers



# Problem statement

- Achieving Justice in the Adoption of the Water-Energy-Food Nexus
- Power Dynamics and Local Resource Access in large-scale solar farms







# Results

- Droughts are intensifying, but **lack of consensus** over impact of solar energy and other innovations
- **Competition** for (water) resources for agriculture and large-scale solar farms
- Water resource **alternatives** exist, but are very energy intensive
- **Benefits** of large-scale solar farms are for 'Global North' → **burdens** for Moroccan government
- **Economic activities** (e.g. subsidies, foreign investments) impact justice




# Advice

- Prioritizing decentralized projects to achieve (energy) sovereignty
- Need for green technologies to local context
- Alternative water sources need to be powered by green energy
- Promotion of principles of participation, procedural justice, & recognition → highlighting the interconnectedness of justice principles
- Knowledge and technology-based recommendations

# Shared advice

- No drastic changes but step-wise improvements
- Adaptation to Moroccan agricultural context
- Resistant to local climate conditions
- Demonstrations
- Awareness of future challenges
- Education through training
- Collaboration between farmers for knowledge transfer
- Monitoring implemented technologies
- Long-term relation between Dutch and Moroccan parties



*Operating greenhouses in Morocco **efficiently, sustainably** and **fairly** through the transfer and creation of knowledge with (high-tech) solutions and collaborations*

# Special thanks to the coordinator team



Coen Hubers



Jan van den Ende



Esther van der Ent





Seed 2 Feed

Horti Tech

Jiffy

GROWING SOLUTIONS



# Towards greener moroccan horticulture!



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