Tackling Sustainability Challenges Urban and Vertical Farming

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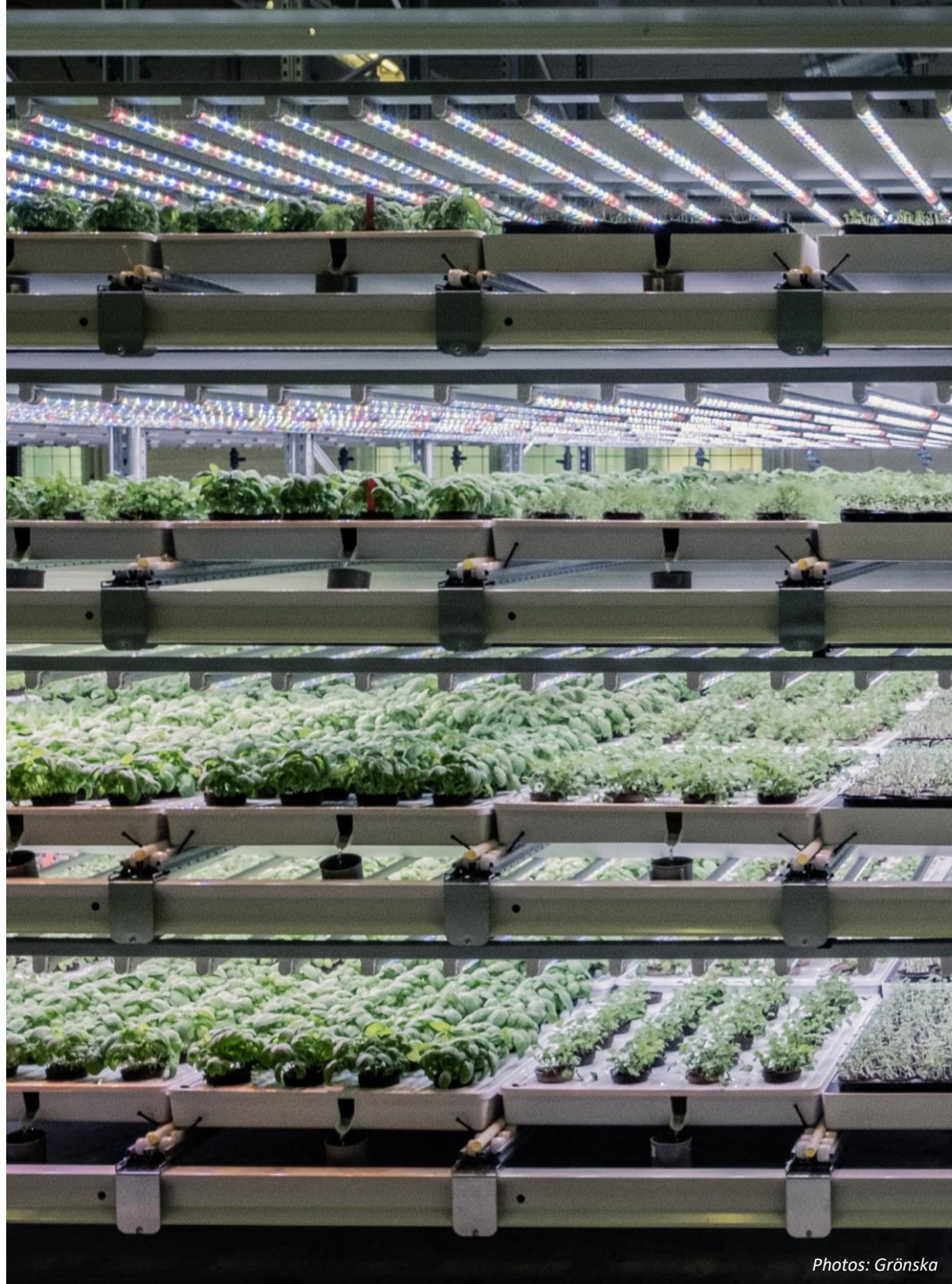
Urban/Vertical Farming

- Growing in layers to increase productive area
- Hydroponic/Aeroponic/Aquaponic systems
- Different Sizes/Configurations:
  - Plant Factories
  - Modular/Hyper-Local Systems
- Typically with LEDs as lighting source
- With/Without Soil
- Typically producing leafy greens and herbs
  - Can be expanded and integrated with other products
  - Gen 1-Gen 2 and Aquaponic, etc.



Photos: Grönska

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The Expectations and Discourse Employed

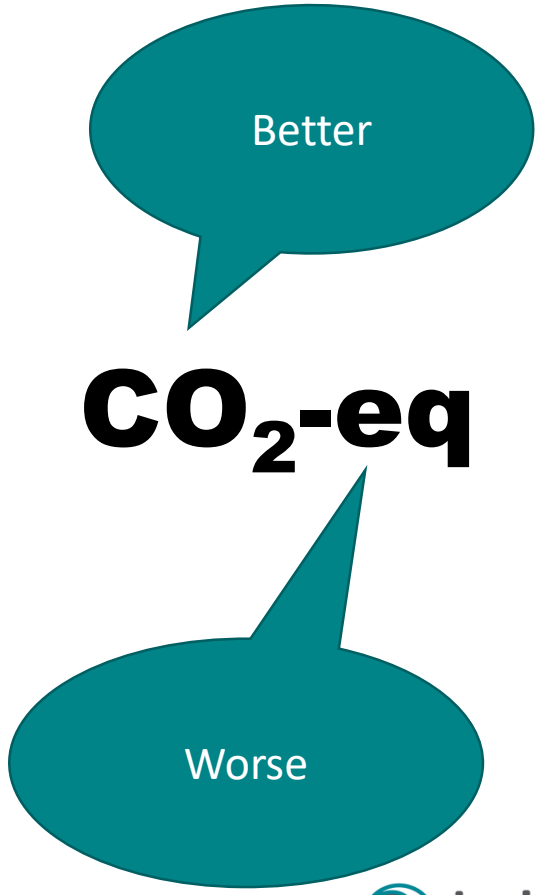
- Self-Sufficient Urban Areas
- Reduced Transportation and Water Consumption
- Improved Yields per Area
- Resource-Efficient Methods
- Potential Expansion

This often leads to criticism of their systems…

Photos: Grönska

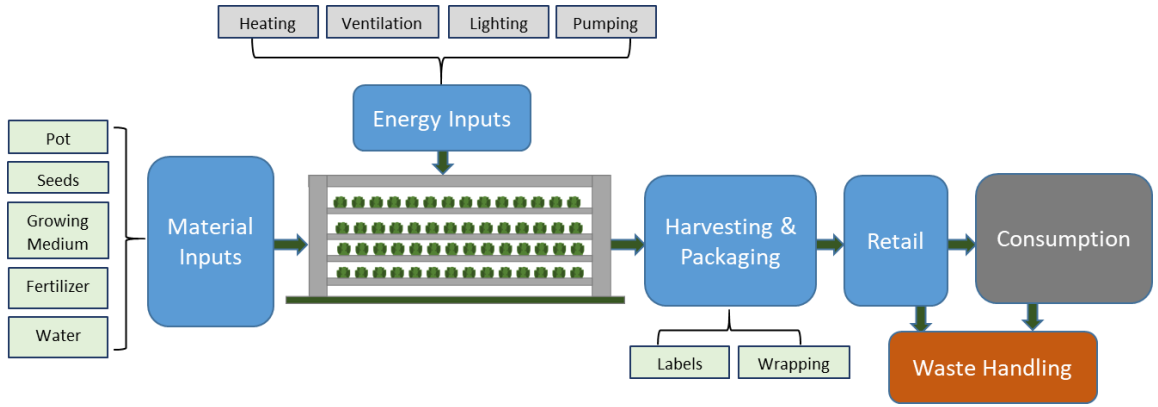
LCA Perspective (Use and Misuse)

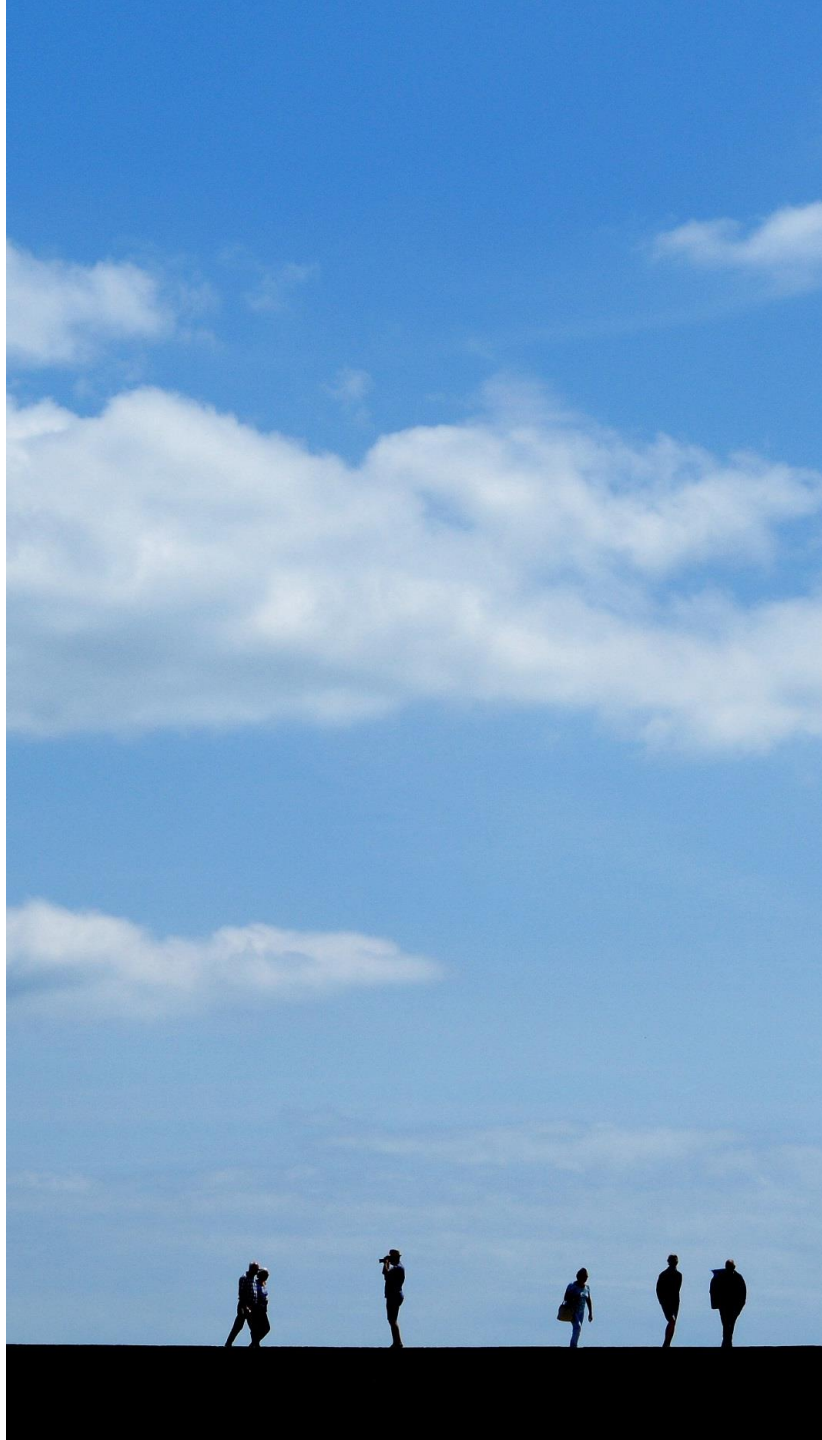
- Some claims may be unsubstantiated
- Comparative Assertions to other crops, systems, services
- Staying Objective/Transparent through Life Cycle-Based Methods Large number of critics
- Claims of the ”incompetence” of LCA practitioners and methods
- Important to add Validity/Legitimacy
- Rapidly expanding subject of inquiry, new methods, data and indicators being developed



Applying Life Cycle Methods

- **Where**-do the impacts/benefits occur?
- **How**-can we reduce/improve these?
- **What**-available materials, utilities, systems and technologies can be used?
- **Who**-can support the transition?



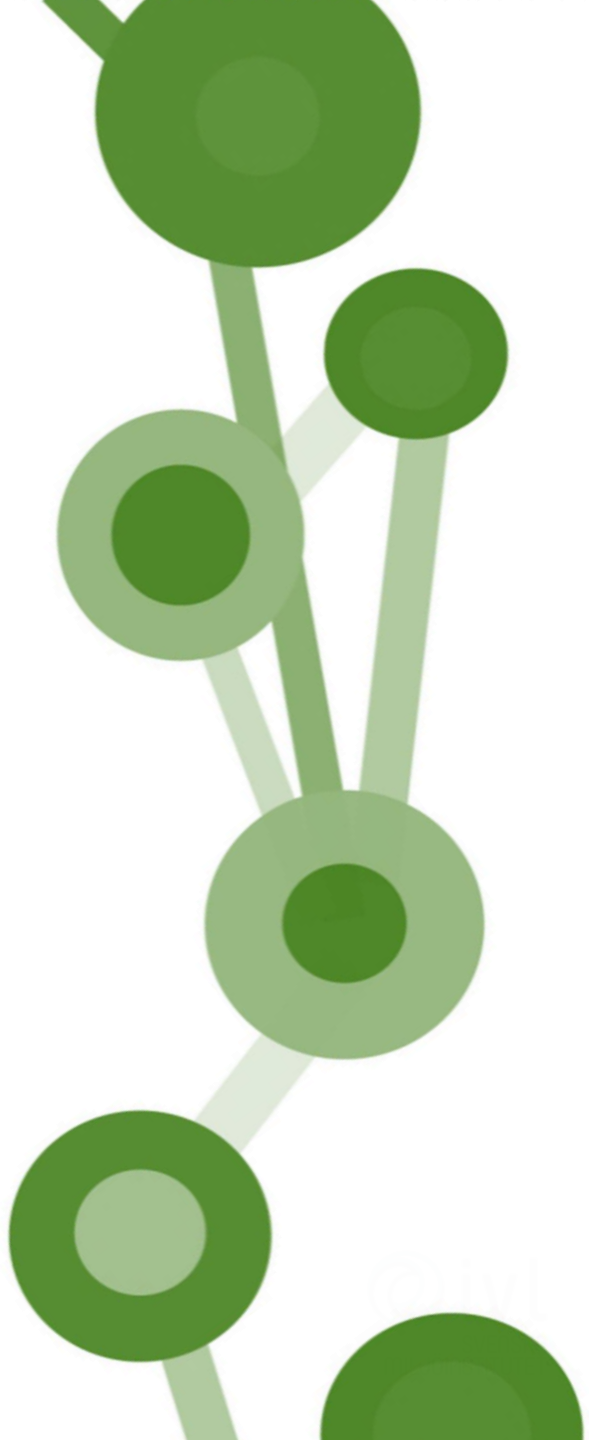


Challenges from an LC perspective

- Emerging/Evolving systems which constantly improve and progress
  - New Optimization/Automation
- Energy Demand (and timing)
  - Attributional or Consequential Modeling
- Functional Unit of the Systems
  - Plants (potted, harvested), Growing-Services, Nutrition, Quality, End-of-Life Treatment (packaging, growing media)
- Expanding the discourse/rhetoric used, and include other indicators to show the value for local food systems and markets
- Avoiding Comparative Assertions

Improving Circularity through Symbiotic Development

- Employing urban residual materials
  - Nutrient Requirements (Biofertilizers)
  - Water
  - Growing Media (Fibrous Material)
  - Carbon Dioxide
- Create synergies to urban infrastructure
  - Heating and cooling for reduced energy demand/increased efficiency
  - Un-used Space
  - Logistic and other market-based systems



Conclusions

- Rapidly expanding in urban/peri-urban areas
- Expectations create criticism
- Developing systems and potential
- Many challenges in using LCA to assess the sustinability
- More input from other life cycle based methods needed
- Potential for improving systems through circular solutions and optimization

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Current Projects

- **Vinnova- Sustainable Urban Farming**
  - Innovations for a Sustainable Society (2020-2022)
  - www.ivl.se/suf
- **FORMAS-Assessing the Sustainability of Urban Agriculture**
  - Increased mobility between academy and practice (2020-2021)
- **FORMAS-Expectations and Implications of Circularity in Society**
  - Early Career Researcher Grant (2021-2024)
- **Vinnova- Growoff 2.0 (Growing Services in Modular Solutions)**
  - Foodtech and Fashion Tech (2019-2020)
- **Viable Cities/Sharing Cities Sweden-Urban Agriculture and Urban Symbiosis**
- **Swedish EPA (2018-2019)**
  - Circular use of materials for urban farming systems
- **GrönBostad (2017)**
  - LCA-Grönska and NodeFarm

Thank You

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