

Carbon capture from waste and usage in horticulture

An unique Dutch cooperation



Dutch Waste Management Association
Partner in the circular economy

Outline

- Dutch horticulture
- CO₂ demand
- Benefits combination horticulture with waste sector
- Cooperation and challenges
- Conclusions

DUTCH HORTICULTURE



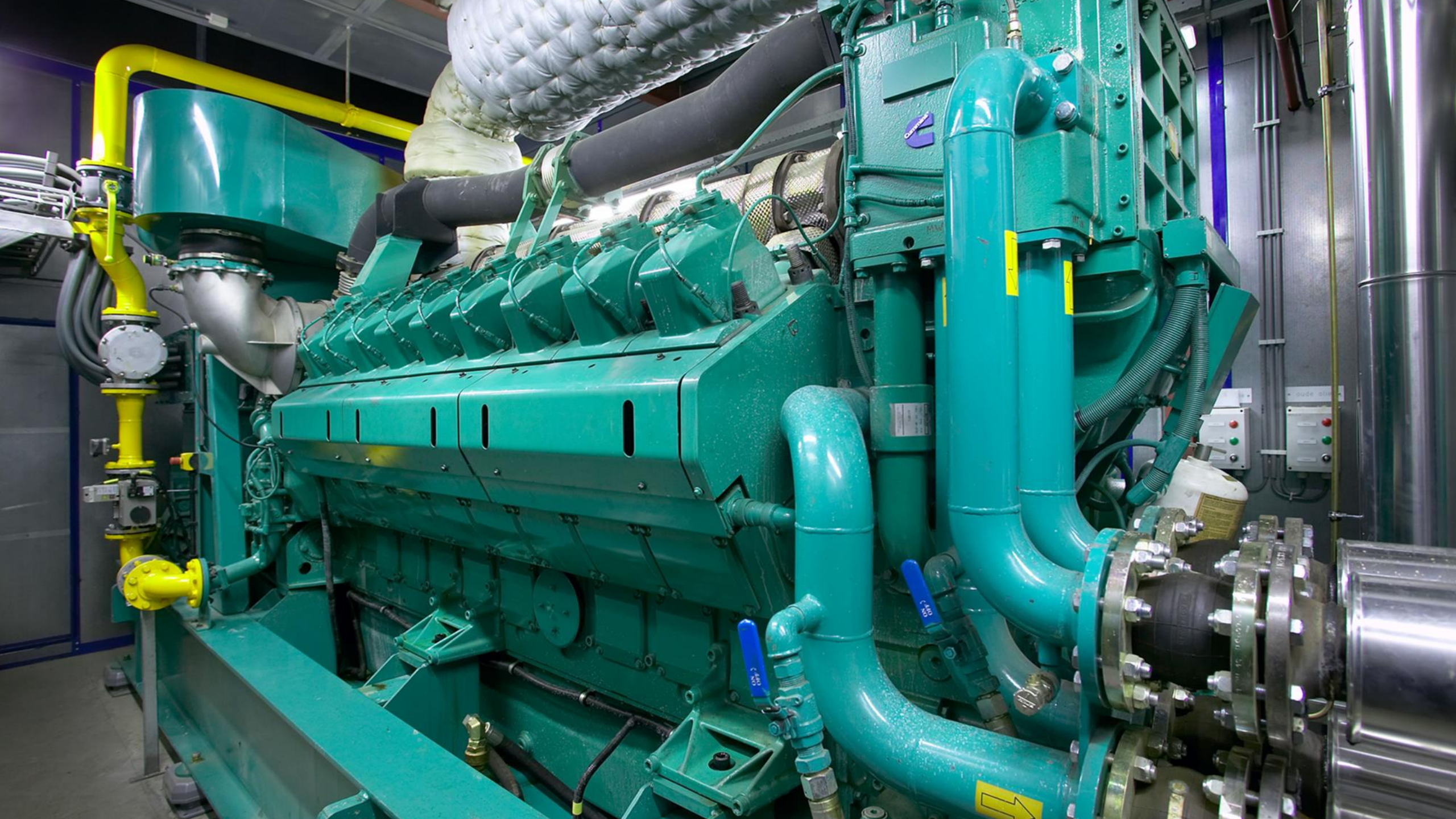
Surface	9.200 ha
Gas usage	7,5 % of Dutch consumption
	3,2 billion m³
CHP	2.700 MWe
CO₂ emissions	1990 6,8 Mton
	2016 5,6 Mton
Energy efficiency index	1990: 100
	2016: 41
Employment	2500 greenhouse companies
	400.000 jobs (total complex)
Added value	7,7 billion euro







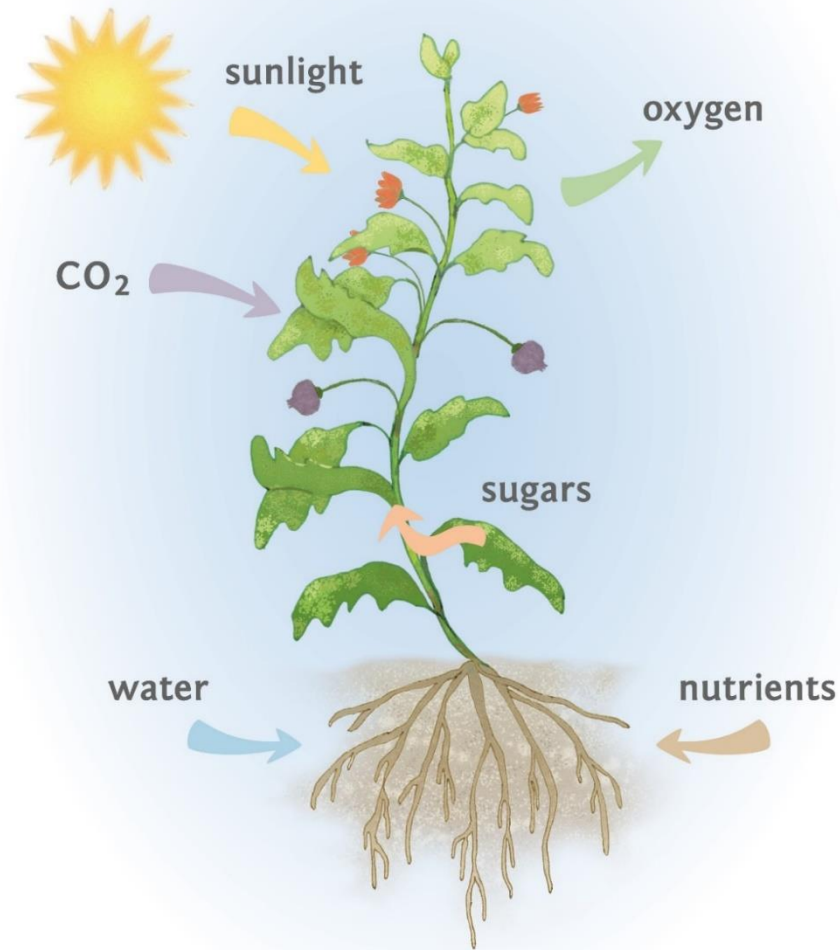






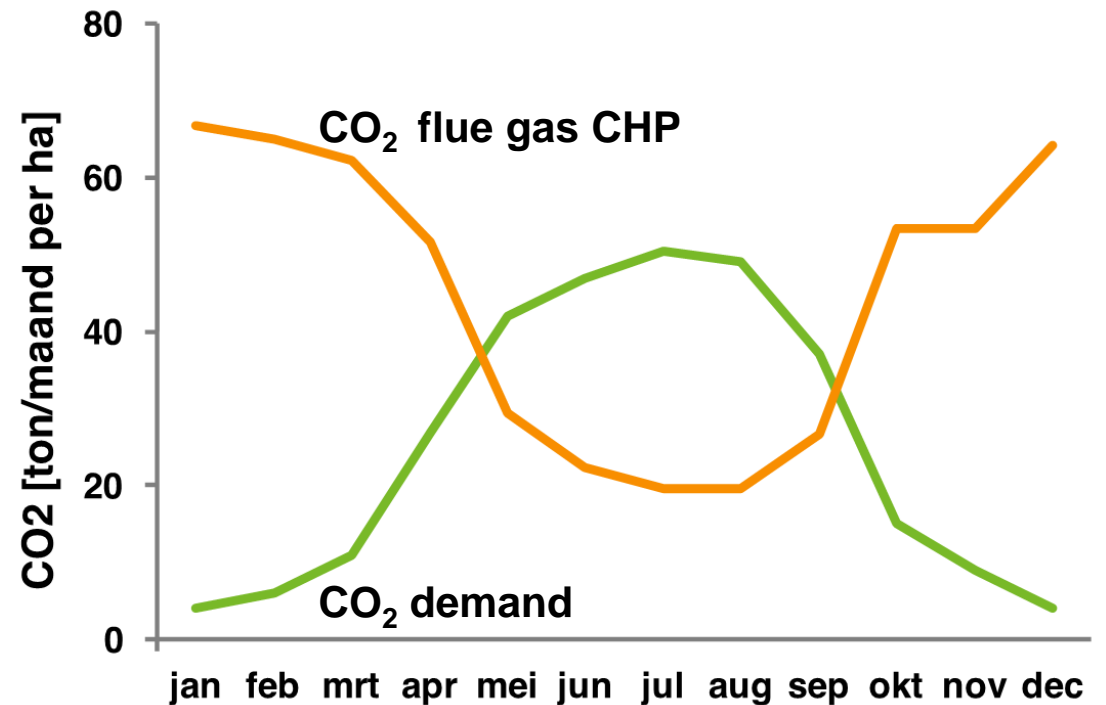
CO₂ demand

Photosynthesis



Towards sustainable horticulture

- Natural gas current main source for CO₂
- Energy transition:
 - energy saving
 - renewable heat and electricity
- ‘External’ CO₂ needed, especially in summer
- CO₂ demand ~ 2 million tons / year



Why cooperate with waste sector?

- CO₂ seen as resource, drive to work on it!
- CO₂ availability is high
- Geographical distribution over the country
- Match demand and amount available
- CO₂ mostly from biogenic source (2/3)

Why cooperate with waste sector?



Dutch waste-to-energy plants

Number of plants 12 (all R1)

Capacity 8 Mt

Energy production 35 PJ

of which renewable 54%

% of total Dutch renewable energy 16%

CO₂ emissions 8 Mt

of which biogenic 64%

Why CCU waste sector?

Social ambitions

Contribution waste sector

WORLD

- COP 21
- Emission 'Cap & Trade'
- EU-targets: 20-20-20%
- National Energy agreement 2023
- Dutch climate ambition 2050
- Recycling targets
- Local energy initiatives

- CO₂-capture and usage
- Energy efficiency
- Process efficiency
- Material efficiency

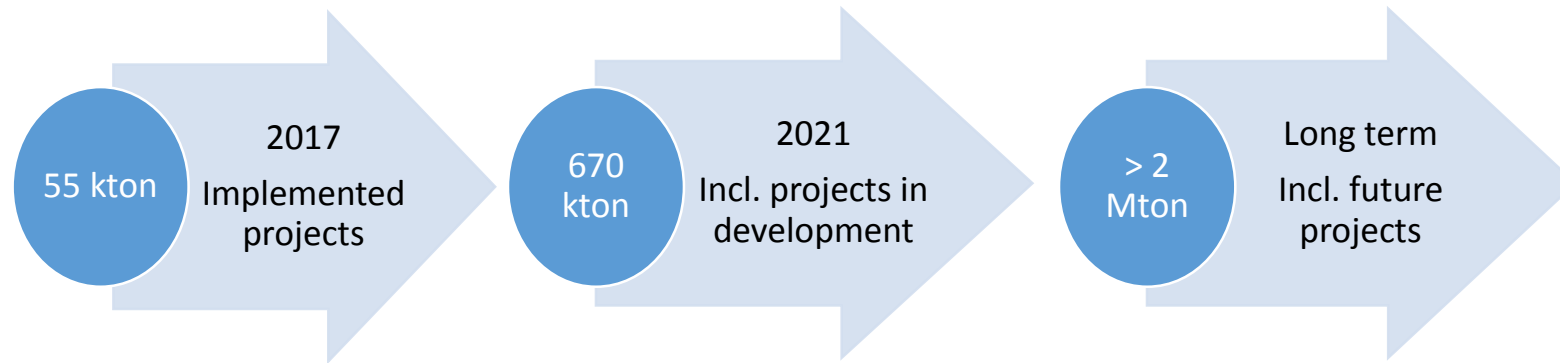
LOCAL

- Landfill ban

Why CCU waste sector?

- ETS not suitable for Waste-to-Energy
- No possibilities for direct reduction of CO₂
- Contribution via CCU:
 - Large potential CO₂
 - Technically possible
 - Useful application CO₂ in e.g. horticulture, industry and transport
- CCU contributes to energy saving, recycling and sustainable economy

CCU projects / potential



- Implemented projects: CO₂ as building block for CaCO₃ and NaHCO₃, liquid CO₂
- Projects in development: horticulture
- Future projects: fulfil further demand horticulture, supply to & development of other applications
- Feasibility studies and pilot projects
- CO₂ smart grid: connect sources, user and storage possibilities

Merits CCU / prospects

1. Emission reductions supply to horticulture
2. Emission reductions supply to & development of other applications (CO₂ as raw material)
3. Additional emission reduction by combination CCU/CCS:

Challenges

- Business case
- CCS focus
- CO₂ accounting
- CO₂ purity
- Status CO₂

Final conclusions

Large potential for capture of CO₂ in waste sector and usage in horticulture:

- Cost-effective
- Contribution to sustainability targets horticulture
- Achievable in short term
- Additional emission reduction possible

Questions?

Thank you for your attention



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