

# Co-production of bio-energy and biochar

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IEA Task 33 workshop “Small-scale gasification  
for combined heat and power production”

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# What is biochar?

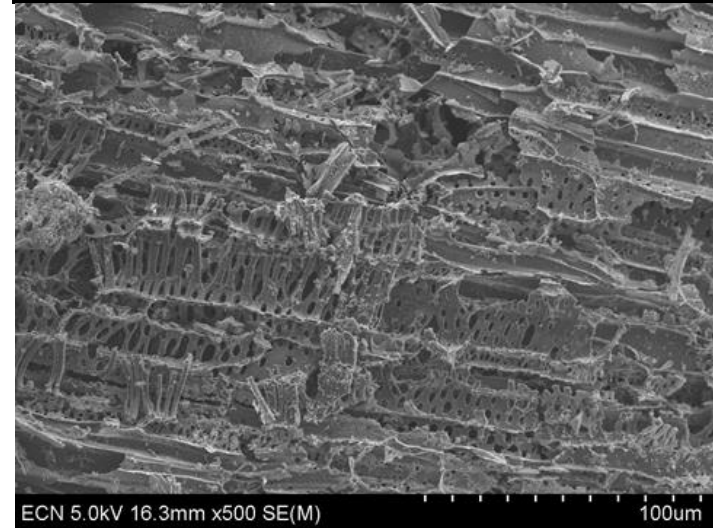
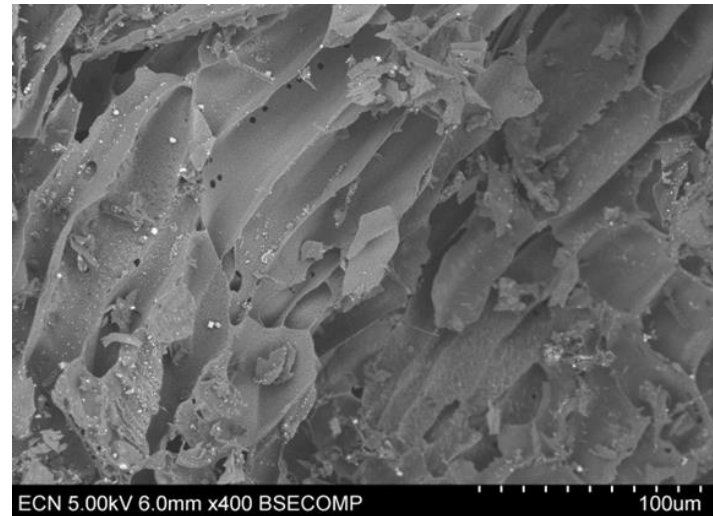
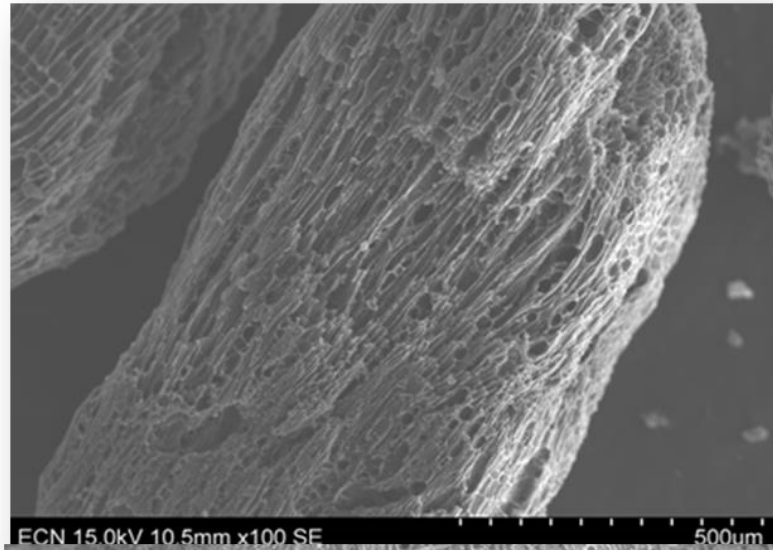
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- A “charcoal”-like product with a large internal pore surface.
- Volatiles are degassed and form a burnable gas for energy generation.
- The carbon skeleton remains as a biochar product.
- Depending on the quality, temperature treatment and pore size distribution, biochar can be used for :
  - 1) Soil improvement.
  - 2) Filter applications (like active carbon).
  - 3) Energy product (low volatile cokes).
- **Bio-CCS option (up to 1000 years carbon storage).**

# Biochar in detail:

wood or agro-residues (paprika and tomato leaves and stems)

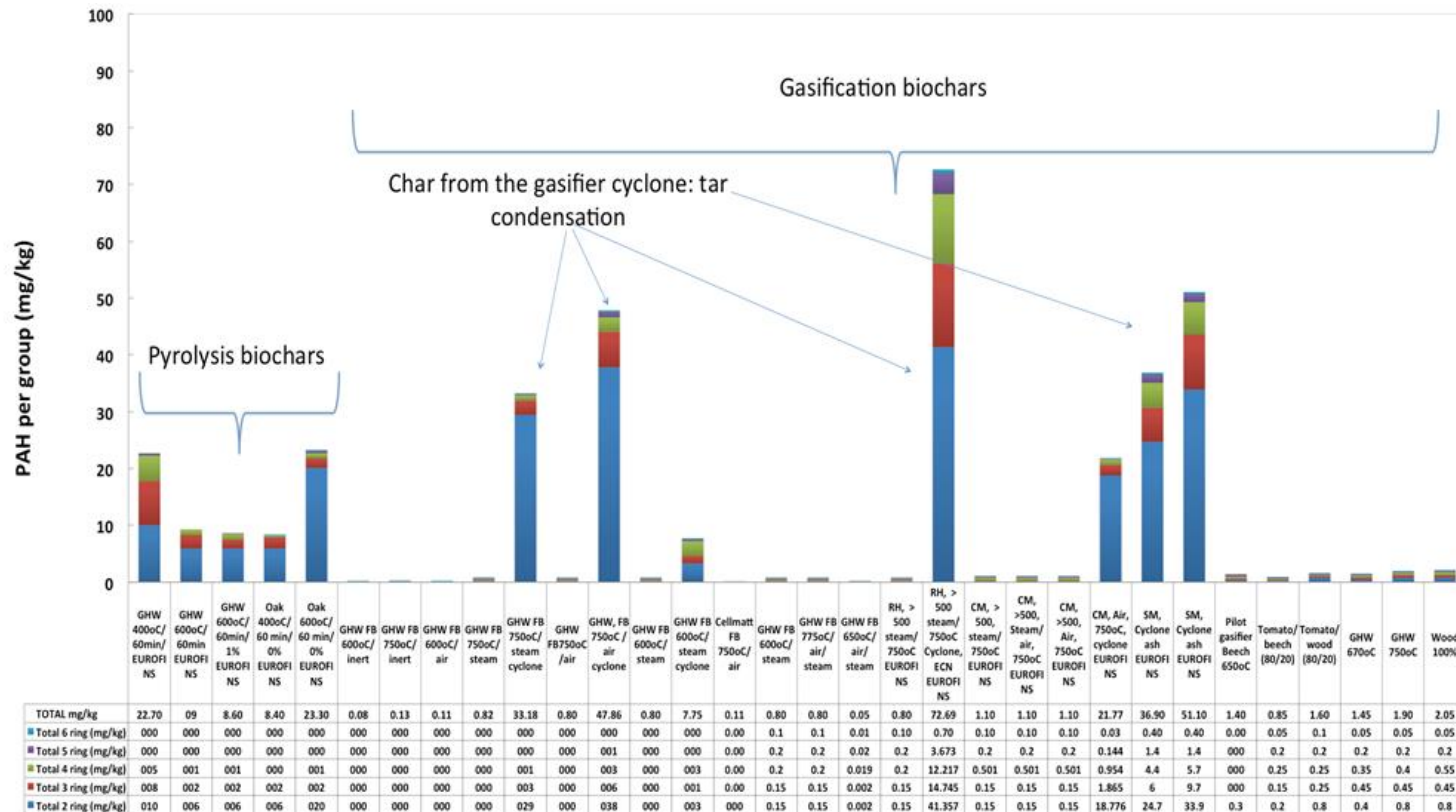


# Biochar production methods

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- Biochar can be produced in two ways:
  - Pyrolysis + subsequent activation.
  - Low temperature gasification ( $T < 700^{\circ}\text{C}$ ).
- Difference to deal with tar condensation:
  - Pyrolysis + activation : removal of tars.
  - Gasification: avoid condensation of tars.
- International standards for PAH content: IBI norm (international) and EBC (European).
  - EBC: 2 quality grades: OK (PAH  $< 12$  mg/kg) and premium (PAH  $< 4$  mg/kg).
- ECN process (FB low-T gasification) developed to avoid condensation by leading the produced gases away from the char and avoid condensation by “harvesting” the biochar from the hot zone.
  - Tar concentrations recently  $< 1$  mg/kg standard.

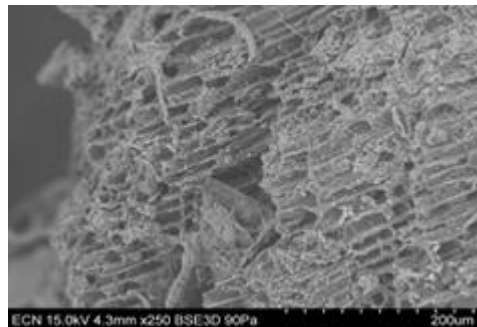
# The most important quality aspect is tar



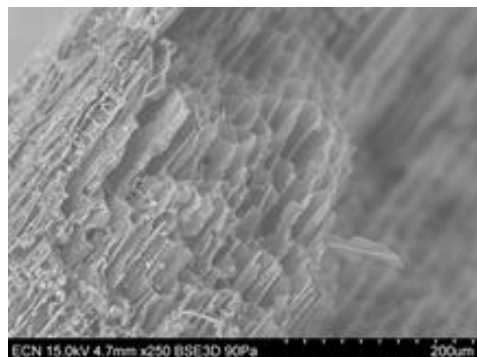
Gasification results in extremely low tar levels if harvested from the hot zone.  
 Activate the Pyrolysis biochars to remove tars

# Current most important biochar project in NL: ENERCHAR

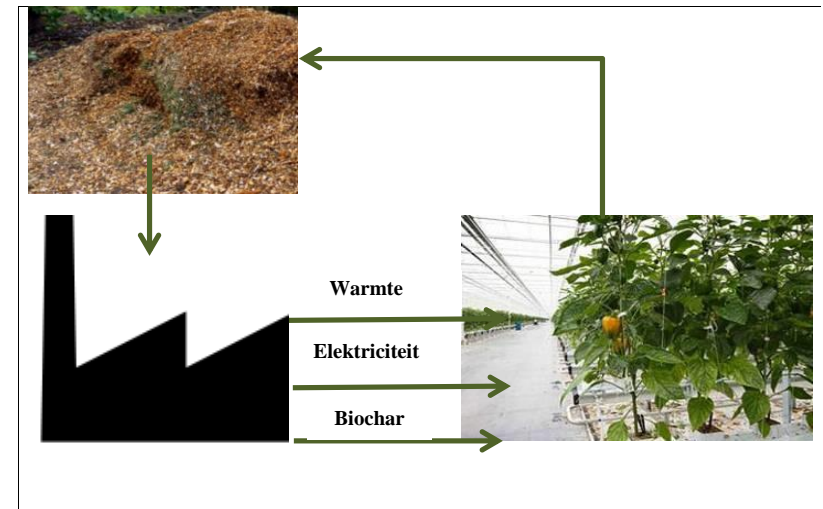
- Reduce energy prices for the greenhouse by using 10-15% agro-residues + co-production of biochar.
- Biochar used as peat replacement.



Peat particle



Biochar particle



# ENERCHAR aims to commercial application in NL

- Reduction of the cost price for bio-energy of 2 to 5 eurocent/kWh by means of cheaper fuel (10-15% agro-residues) en co-production of biochar (based on replacement of peat and light weight materials in potting soil, estimated at 300 euro/ton).
- Realistic greenhouse tests to lead to sufficient confidence in biochar-containing potting soil to enter the market after the project.
- First successful pot trials.



Crysantium pot trials with 30% biochar used as peat replacement in the potting soil.

# Thanks for your attention!

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