

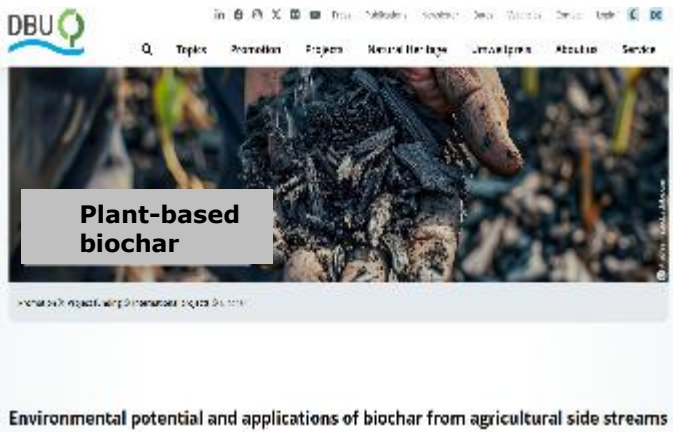
DBU – International Funding cluster „Plant-based Biochar“

Enhanced climate protection through biochar production and application in Central, Eastern and South-Eastern Europe (CEE/SEE)

DBU FUNDING CLUSTER PLANT-BASED BIOCHAR

The aim of the cluster:

"Scientific research, technological development and exemplary innovative practical applications of plant-based biochar as a sustainable contribution to climate protection, agriculture and the environment in Central, Eastern and South-Eastern Europe."



- Since 2012, several DBU projects in Germany and Africa on the topic of plant-based biochar
- Future funding for demonstration and research projects in CEE/SEE
- Current DBU projects on CEE/SEE at TU Berlin and JLU Gießen

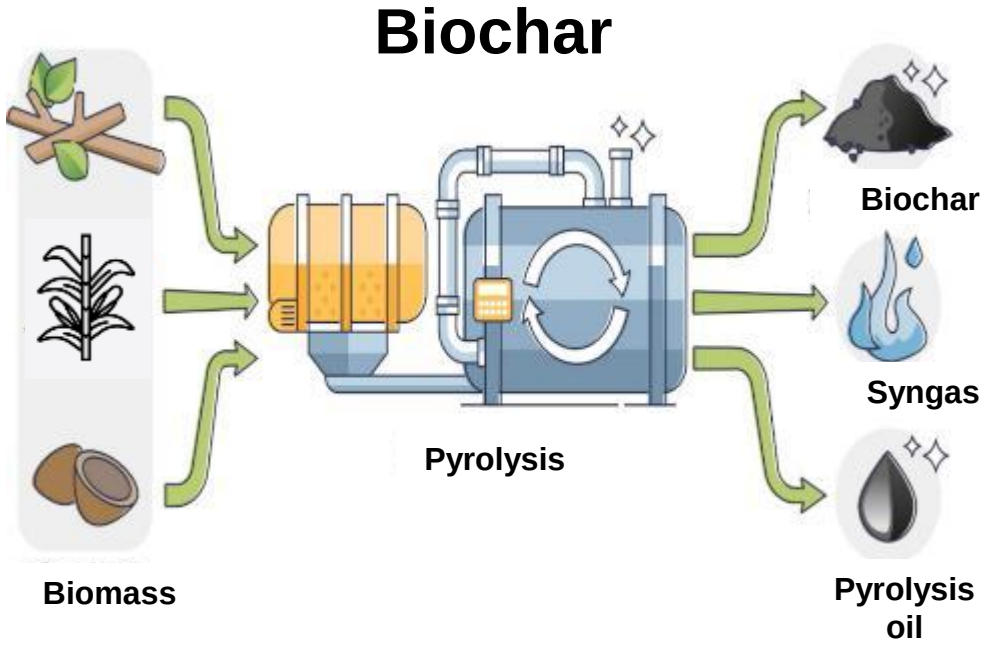
COUNTRY REPORTS

- On the base of a scoping of 19 target countries, led by TUB
  - Identifying the 10 countries with the greatest potential
  - Listing the parameters to be included in the country studies
- In-depth country analyses serve to systematically map out the framework conditions, such as biomass potential, the legal framework, economic conditions and promising business models.

- Application process:
  - Proposals to be submitted directly to the DBU
  - Costs completely covered by the DBU

WHAT IS PLANT-BASED BIOCHAR AND HOW IS IT PRODUCED?

- carbon-rich material
- is produced by pyrolysis, i.e. the separation of the more volatile components by heating plant residues to approx. 300–900°C in an oxygen-deprived environment
- source material for biochar: agricultural and forestry residues – specifically materials that have no other environmentally beneficial use



Graphical view of the pyrolysis process.
Image: VectorMine/stock.adobe.com

POTENTIAL OF PLANT-BASED BIOCHAR



Improving soil health

- can help improve soil structure in poor and degraded soils
- increases water retention capacity
- improves nutrient availability and reduces the need for fertilisers
- fosters microbial activity
- reduces erosion and soil loss
- helps to control soil-borne diseases



Cleaning up the environment

- adsorbs problematic organic pollutants (e.g. antibiotics, agrochemicals, polychlorinated biphenyls – PCBs, polycyclic aromatic hydrocarbons – PAHs)
- capturs inorganic contaminents (phosphate, ammonia, heavy metals)
- reduces the mobility and toxicity of substances

POTENTIAL OF PLANT-BASED BIOCHAR
(cont.)



Optimising building materials

- low-cost carbon additive
- strengthens composites
- can partially replace cement in high-performance concrete



Applications in metallurgy

- renewable carbon replaces fossil coal
- source of carbon for chemical and metallurgical processes
- reduces CO_2 emissions in steel and metal production



Use as a feed additive

- improves animal health and productivity



Contributing to climate protection

- sequesters stable carbon in the soil
- reduces greenhouse gas emissions (e.g. CH_4 and N_2O) through the adsorption of reactive carbon and nitrogen compounds

REQUIREMENTS FOR SUSTAINABLE PRODUCTION AND USE OF PLANT-BASED BIOCHAR

The raw material is crucial

- high-quality biochar can be produced from contaminant-free, dry plant residues
- Feedstocks contaminated with pollutants (heavy metals, PAHs, etc.) may not be completely detoxified by pyrolysis

Pyrolysis procedures and process control are relevant

- The process design allows for a wide range of product properties, depending on temperature, residence time, reaction zoning, air supply and, where applicable, water injection
- In the event of unsuitable process control or problematic components in the raw material, there is a risk of an additional increase in pollutant load, e.g. through the formation of polycyclic aromatic hydrocarbons (PAHs)

REQUIREMENTS FOR SUSTAINABLE PRODUCTION AND USE OF PLANT-BASED BIOCHAR (cont.)

Application-optimised biochar products

- Targeted production of product properties defined for specific applications
- Knowledge of relevant product properties is important for different applications (soil improvement, pollutant adsorption)
- Biochar containing pollutants has limited applicability

Socio-economic prerequisites

- Availability of biomass (e.g. relevant quantity and quality, logistical costs and transport emissions)
- Stakeholder interest (e.g. interested farmers, organisations, investors, social acceptance)

RELEVANT BIOCHAR STANDARDS

Global Artisan C-Sink Standard:

- Certifies small, low-tech, community-based biochar producers to create verifiable carbon sinks.

European Biochar Certificate (EBC):

- Certified sustainably produced, high-quality biochar, subject to strict regulations regarding materials, emissions and traceability across (professional) production systems.
- Developed by Ithaka Institute and Carbon Standards International (CSI)

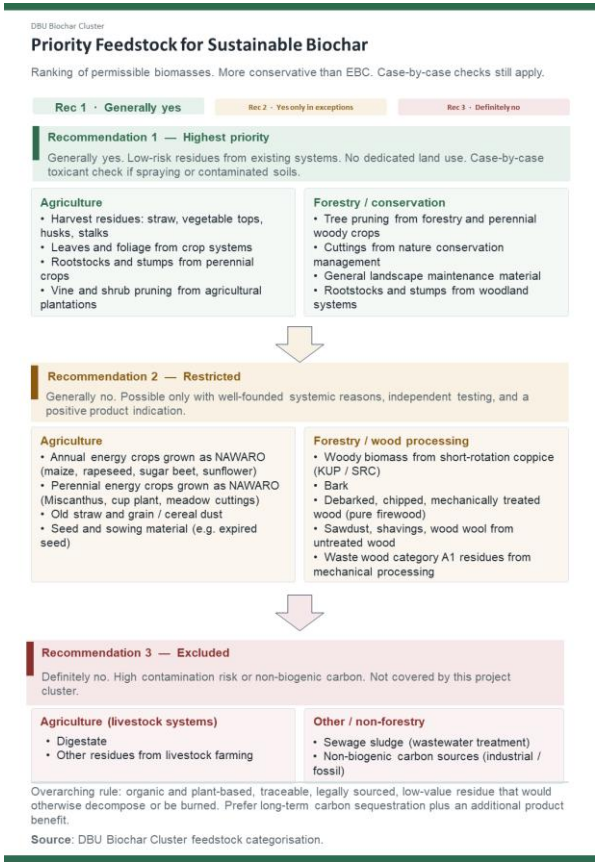
World Biochar Certificate (WBC):

- Ensures sustainably sourced biomass, CO_2-positive biochar production and annually audited product quality through globally applicable guidelines.

PLANT-BASED BIOCHAR CLUSTER - IN VERY SHORT

Basic Prerequisites:

- No competition with higher-value uses of plant residues (e.g. firewood)
- Qualitative standards are met during production (EBC)



DBU Biochar Cluster

Priority Feedstock for Sustainable Biochar

Ranking of permissible biomasses. More conservative than EBC. Case-by-case checks still apply.

Rec 1 · Generally yes | Rec 2 · Yes only in exceptions | Rec 3 · Definitely no

Recommendation 1 — Highest priority

Generally yes. Low-risk residues from existing systems. No dedicated land use. Case-by-case toxicant check if spraying or contaminated soils.

Agriculture
- Harvest residues: straw, vegetable tops, husks, stalks
- Leaves and foliage from crop systems
- Rootstocks and stumps from perennial crops
- Vine and shrub pruning from agricultural plantations

Forestry / conservation
- Tree pruning from forestry and perennial woody crops
- Cuttings from nature conservation management
- General landscape maintenance material
- Rootstocks and stumps from woodland systems

Recommendation 2 — Restricted

Generally no. Possible only with well-founded systemic reasons, independent testing, and a positive product indication.

Agriculture
- Annual energy crops grown as NAWARO (maize, rapeseed, sugar beet, sunflower)
- Perennial energy crops grown as NAWARO (Miscanthus, cup plant, meadow cuttings)
- Old straw and grain / cereal dust
- Seed and sowing material (e.g. expired seed)

Forestry / wood processing
- Woody biomass from short-rotation coppice (KUP / SRC)
- Bark
- Debarked, chipped, mechanically treated wood (pure firewood)
- Sawdust, shavings, wood wool from untreated wood
- Waste wood category A1 residues from mechanical processing

Recommendation 3 — Excluded

Definitely no. High contamination risk or non-biogenic carbon. Not covered by this project cluster.

Agriculture (livestock systems)
- Digestate
- Other residues from livestock farming

Other / non-forestry
- Sewage sludge (wastewater treatment)
- Non-biogenic carbon sources (industrial / fossil)

Overarching rule: organic and plant-based, traceable, legally sourced, low-value residue that would otherwise decompose or be burned. Prefer long-term carbon sequestration plus an additional product benefit.

Source: DBU Biochar Cluster feedstock categorisation.