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**ithaka** institute

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# The Goals of EBC

- Define biochar based on scientific evidence and
- Ensure safety of use of biochar
- Ensure sustainability of biochar
- Conformity with national or EU regulations
- Market transparency through partial disclosure of analyses

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# The changes at a glance

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- Chapter 7.12: new, additional limit values for **PAHs**, conformity to EU REACH regulation
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# Pillars of the EBC-Certificate

1. Sustainable provision and production of biomass **feedstock**
2. Energy efficient, low emission **pyrolysis** technique
3. **Biochar quality** – low contaminant level
4. Low hazard **use and application** of biochar

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# EBC Certification Classes

- EBC-Feed
- EBC-AgroOrganic
- EBC-Agro
- EBC-Urban
- EBC-ConsumerMaterials
- EBC-BasicMaterials

# EBC-BasicMaterials

- „basic and fundamental certification class“
  - prerequisite for all future certification classes
  - is compliant with the EU REACH regulation regarding PAHs (does not replace a REACH registration!)
  - provides clear distinction of biochars and wastes from pyrolysis/gasification processes that are not optimized for biochar production
  - may only be traded B2B (declaration of hazards)
  - EBC-certified companies must provide proof of disposal for batches that do not comply with EBC BasicMaterials (e.g. due to malfunction of pyrolysis plant)
  - Possible applications mainly in building materials; aim is further diversification, depending on industry demand.

# EBC-ConsumerMaterials

- for products with direct skin or food contact (plastics), not allowed for medical and health products or food
- biochar dust formation must be avoided in the product

# EBC-Urban

- for use in urban soils (urban trees)
- for soil remediation
- for producing ornamental plants and tree nurseries
- not for food and feed production
- Background:
  - these applications are not subject to agricultural regulations
  - high background of pollutants in cities
  - nevertheless need for strict limits values for health and environmental safety

# EBC-Feed, EBC-Agro, EBC-AgroOrganic

EBC-Feed                   => v.a. EU Catalogue of feed materials  
EBC-AgroOrganic   => v.a. EU regulation on organic products  
EBC-Agro               => v.a. future EU fertilizing product regulation

- EBC continues to go beyond legal requirements
  - Precautionary principle for biochar-specific risks
  - consistency of certification classes, as much as adequate
- no fundamental changes
- certain adaptations of the limit values:
  - PAH
  - heavy metals (Pb) due to fertilizer product regulation

EBC -Certification Class		EBC-Feed	EBC-AgroOrganic	EBC-Agro	EBC-Urban	EBC-ConsumerMaterials	EBC-BasicMaterials
Elemental analysis	Declaration of Ctot, Corg, H, N, O, S, ash						
	H/Corg	< 0.7					
Physical parameters	Water content, dry matter (@ < 3mm particle size), bulk density (TS), WHC, pH, salt content, electrical conductivity of the solid biochar						
TGA	Needs to be presented for the first production batch of a pyrolysis unit						
Nutrients	Declaration of N, P, K, Mg, Ca, Fe						
Heavy metals	Pb	10 g t <sup>-1</sup> (88%DM)	45 g t <sup>-1</sup> DM	120 g t <sup>-1</sup> DM	120 g t <sup>-1</sup> DM	120 g t <sup>-1</sup> DM	declaration, no limit values for certification
	Cd	0.8 g t <sup>-1</sup> (88% DM)	0.7 g t <sup>-1</sup> DM	1,5 g t <sup>-1</sup> DM	1,5 g t <sup>-1</sup> DM	1,5 g t <sup>-1</sup> DM	
	Cu	70 g t <sup>-1</sup> DM	70 g t <sup>-1</sup> DM	100 g t <sup>-1</sup> DM	100 g t <sup>-1</sup> DM	100 g t <sup>-1</sup> DM	
	Ni	25 g t <sup>-1</sup> DM	25 g t <sup>-1</sup> DM	50 g t <sup>-1</sup> DM	50 g t <sup>-1</sup> DM	50 g t <sup>-1</sup> DM	
	Hg	0.1 g t <sup>-1</sup> (88% DM)	0.4 g t <sup>-1</sup> DM	1 g t <sup>-1</sup> DM	1 g t <sup>-1</sup> DM	1 g t <sup>-1</sup> DM	
	Zn	200 g t <sup>-1</sup> DM	200 g t <sup>-1</sup> DM	400 g t <sup>-1</sup> DM	400 g t <sup>-1</sup> DM	400 g t <sup>-1</sup> DM	
	Cr	70 g t <sup>-1</sup> DM	70 g t <sup>-1</sup> DM	90 g t <sup>-1</sup> DM	90 g t <sup>-1</sup> DM	90 g t <sup>-1</sup> DM	
	As	2 g t <sup>-1</sup> (88% DM)	13 g t <sup>-1</sup> DM	13 g t <sup>-1</sup> DM	13 g t <sup>-1</sup> DM	13 g t <sup>-1</sup> DM	
Organic contaminants	16 EPA PAH	declaration	4±2 g t <sup>-1</sup> DM	6.0+2.2 g t <sup>-1</sup> DM	declaration	declaration	not required
	8 EFSA PAH	1.0 g t <sup>-1</sup> DM					4 g t <sup>-1</sup> DM
	benzo[e]pyrene benzo[j]fluoranthene	< 1.0 g t <sup>-1</sup> DM for each of both substances					
	PCB, PCDD/F	See chapter 10	Once per pyrolysis unit for the first production batch. For PCB: 0.2 mg kg <sup>-1</sup> DM, for PCDD/F: 20 ng kg <sup>-1</sup> (I-TEQ OMS), respectively				

Tab.1 Overview of the most important analytical parameters for EBC biochar

# Declaration of the products

- „Each application and thus certification class has its specific requirements.
- Every biochar and biochar-based product must be labelled according to the EBC certification class under which it is traded.
  - If, e.g., a biochar is sold as a building material it must be labelled as EBC-BasicMaterial.
  - An EBC-Agro labelled biochar cannot be traded as building material.
  - EBC-Feed labelled biochar cannot be sold as soil amendment.
- However, the biochar of one production batch can fulfil the requirements of several certification classes. Different packaging units from one and the same production batch can thus be sold under different labels (e.g., EBC-Feed, EBC-Agro, and EBC-ConsumerProducts).
- However, a packaging unit must not be labelled with more than one certification class. “
- Providing batch-ID to the customer

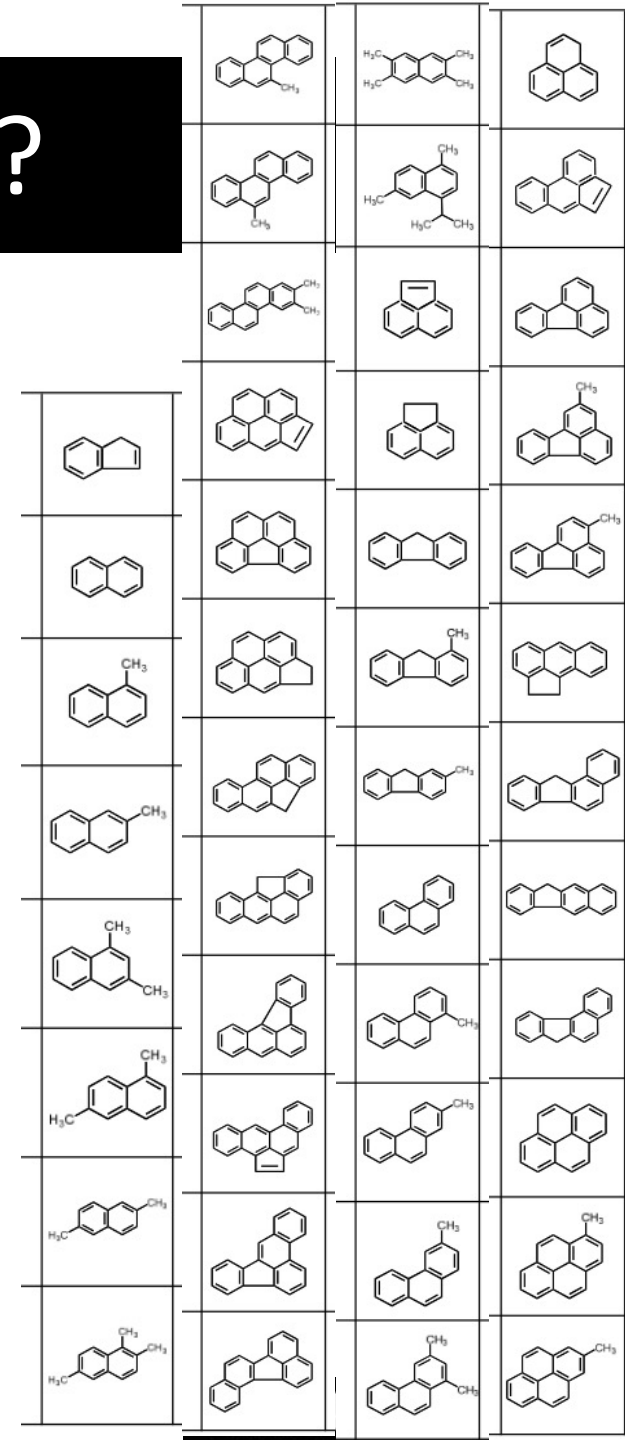
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# What are PAHs?

- more than 300 known compounds with different properties, different toxicity
- for monitoring and regulation, a selection of these is quantified and assigned limit values

(Figures from Achten & Andersson)



# PAH selection for analysis

## 16-EPA-PAH

*no definite  
evidence of  
carcinogenicity*

- Naphthalene
- Acenaphthylene
- Acenaphthene
- Fluorene
- Phenanthrene
- Anthracene
- Fluoranthene
- Pyrene

*proven carcinogenic*

## 8-EFSA-PAH

- Benzo[*a*]anthracene
- Chrysene
- Benzo[*b*]fluoranthene
- Benzo[*k*]fluoranthene
- Benzo[*a*]pyrene
- Dibenzo[*a,h*]anthracene
- Indeno[1,2,3-*cd*]pyrene
- Benzo[*ghi*]perylene

EFSA: European Food  
Safety Authority

EU: EU-REACH-Regulation

- Benzo[*e*]pyrene
- Benzo[*j*]fluoranthene

## 8-EU-PAH

# New PAH limit values

$\Sigma$ 16-EPA-PAH	$\Sigma$ 8-EFSA-PAH	8-EU-PAH
EBC-AgroOrganic $4.0 \pm 2.0 \text{ mg kg}^{-1}$	$1 \text{ mg kg}^{-1}$	
EBC-Industrial- $6.0 \pm 2.2 \text{ mg kg}^{-1}$	-BasicMaterials $4 \text{ mg kg}^{-1}$	$1 \text{ mg kg}^{-1}$ each (per congener)
⇒Conformity with regulations on agriculture	⇒increased safety	⇒Conformity with EU-REACH-Reg.

*All applicable requirements must be met simultaneously.  
Standard PAH-analysis is sufficient, no more feed-PAHs.*


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# EBC feed alone does not turn you into a feed producer

- Regulation (EC) 1831/2003 **“laying down requirements for feed hygiene”**
  - a feed manufacturer is responsible for feed safety
  - "Feed business operators [...] shall put in place, implement and maintain, a permanent written procedure or procedures based on the HACCP principles"
  - HACCP = Hazard Analysis and Critical Control Point
- What does EBC contribute?
  - Ensuring Biochar-specific feed safety during production (permissible biomasses, inorganic and organic pollutants in the biochar).
- What does EBC not contribute?
  - Warranty with regard to impurities (stones, metal parts, broken glass, etc.)
  - Feed safety during storage and transport
  - HACCP

# Path to optimal feed safety

- EBC requires regulatory proof of registration as feed manufacturer
  - EBC strongly recommends GMP+ certification
- 
- The logo for GMP+ International, featuring the text 'GMP+' in white inside a green rounded rectangle, followed by the word 'International' in a smaller, purple font.
- Cooperation between GMP+ and EBC/Ithaka
  - Goal on the part of Ithaka: mandatory dual certification

# The changes at a glance

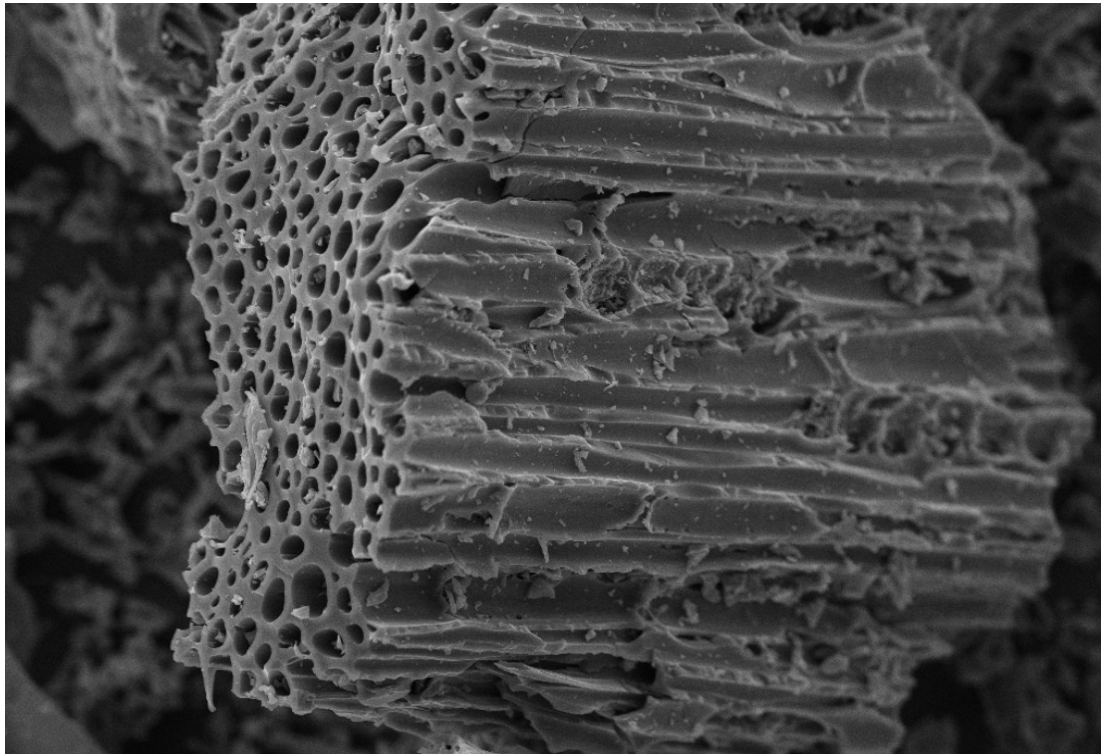
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# water content

- EBC-Feed, EBC-AgroOrganic, EBC-Agro, EBC-Urban:
  - Dust formation must be prevented by suitable water content
  - Strong recommendation: 30% water content
- EBC-ConsumerMaterials, EBC-BasicMaterials
  - may be handled at any water content
  - if dust formation is not prevented:
    - in the case of EBC consumables, also here only B2B
    - hazards must be declared according to applicable regulations

# Water holding capacity (WHC) replacing BET

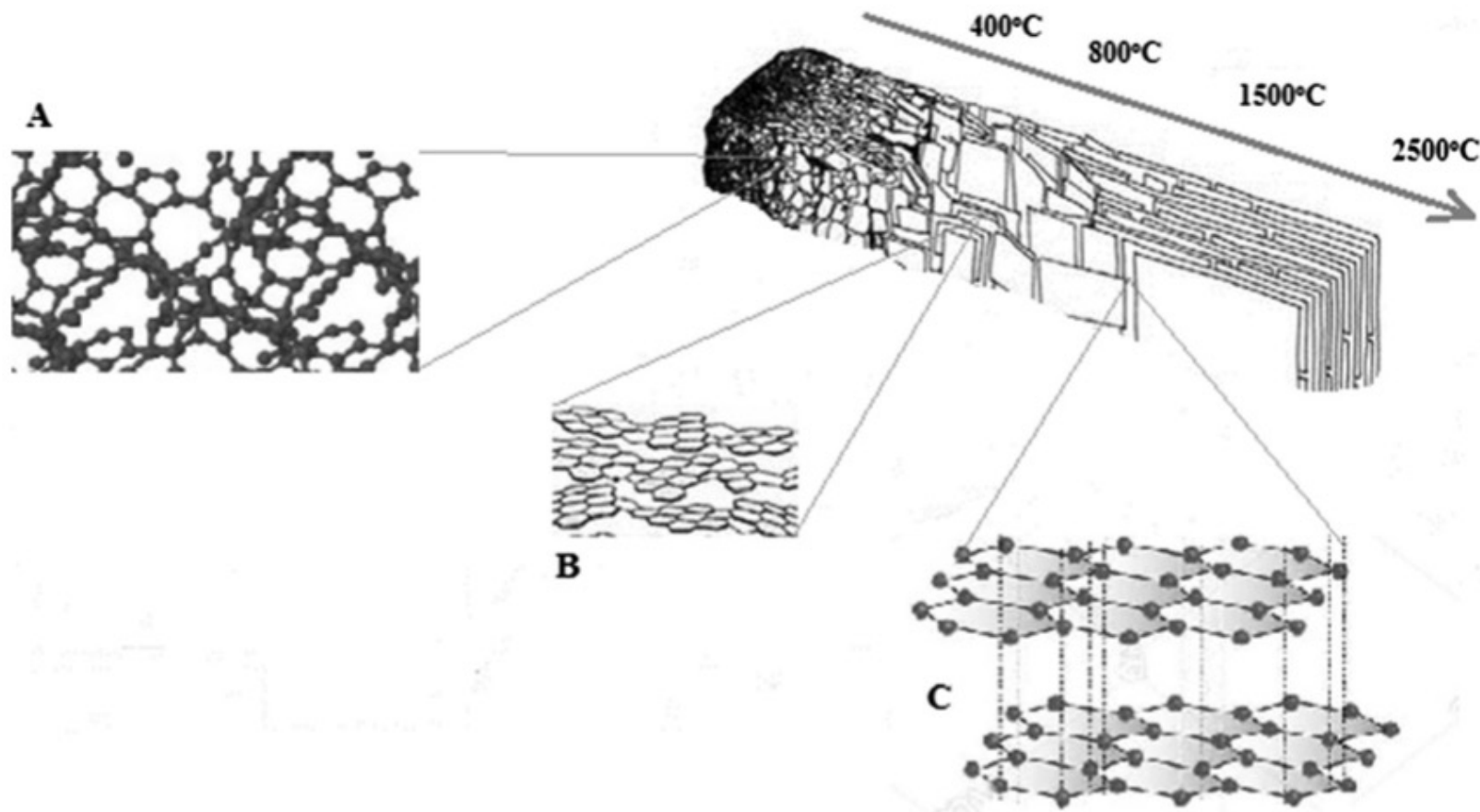
- Determination of BET only optional
  - Information provided is limited and has unclear meaning with regard to agronomic performance
  - Determination of water holding capacity (WHC) mandatory



# Conductivity of Solid Biochar

- not to be confused with the "conductivity", which is determined in the suspension/filtrate of the biochar => estimate for the content of soluble salts
- Measuring principle: Biochar is ground, pressed and the electrical resistance is measured along the pressure direction
- Objectives:
  - Simplify mapping of highly complex properties of the biochar
  - Simplify quality control of the pyrolysis process in the factory

# Conductivity of Solid Biochar



**Fig. 3** Pyrolysis temperature effect on biochar: **a** amorphous carbon; **b** turbostratic carbon; **c** graphite carbon

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# Definition Batch

- Definition batch
  - max. 365 days
  - uniform temperature with short-term fluctuations of max. 20% (600 °C = 480-720°C)
  - uniform biomass, for blends tolerance of 20% (50% husk + 50% wood = 40-60% husk + 40-60% wood)
  - documentation of all interruptions
- Completion of a batch and new production batch must be registered on the EBC website
- Production batches cannot be registered retroactively. The start of a production batch is at the earliest the day of registration on the EBC website

# Sampling and validity of the analysis

- General rules :
  - representative sampling by accredited sampler
  - Sending analysis sample only after registration
- First Batch: sampling within 2 month
- Next batch with same parameters:
  - Analysis of the previous batch remains valid until new analysis is performed
  - Sampling within one year after last sampling
- Sampling should be completed during the inspection visit

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# Permissible Biomass

„Only biomass and no fossil carbon may be used to produce biochar. The EBC positive list (Appendix 1) indicates which types of biomasses are permissible for each application class.

- Restriction to plant biomass has been removed

# Permissible biomasses vs. plastics

„ To produce EBC-Feed, EBC-Agro, EBC-AgroOrganic, and EBC-Urban qualities, unavoidable contamination of the biomass by plastic and rubber waste must not exceed 1% (m/m). To produce biochar for materials (EBC-ConsumerMaterial, EBC-BasicMaterials) plastic and rubber contents of up to 10% can be accepted, though these are subject to declaration and require the written approval of Carbon Standards International.

➤ Ongoing research may allow higher limits in the future

Positive list of permissible biomasses for the production of biochar

European Biochar Certificate

Feedstock

Origin	Feedstock	ID	EBC-Feed	EBC-AgroOrganic	EBC-Agro	EBC-Urban	EBC-ConsumerMaterials	EBC-BasicMaterials	Special requirements and notes
Agriculture: biomass from agricultural farms, including both residues and biomass deliberately cultivated for biochar production.	Annual energy crops (e.g. corn, rape, sugar beets, sunflowers) grown specifically for energy or material biomass use.	Ag-01	✓	✓	✓	✓	✓	✓	For EBC-AgroOrganic only from organic cultivation. For C-sink certification, the amount of fertilizer used must be declared.
	Perennial energy crops (e.g. miscanthus, marbled silphium, meadow cuttings) grown specifically for energetic or material biomass use	Ag-02	✓	✓	✓	✓	✓	✓	For EBC-AgroOrganic only from organic cultivation. For C-sink certification, the amount of fertilizer used must be declared.
	Woody biomass from short rotation plantations (SRC)	Ag-03	✓	✓	✓	✓	✓	✓	For EBC-AgroOrganic only from organic cultivation. For C-sink certification, the amount of fertilizer used must be declared.
	Tree, vine and shrub pruning	Ag-04	✓	✓	✓	✓	✓	✓	Particular attention to be paid to heavy metals from crop protection spraying. For EBC-Feed: only from defined and documented sources, biomass from municipal collection not allowed.
	Harvest residues such as straw, cabbage, leaves, stalks, husks	Ag-05	✓	✓	✓	✓	✓	✓	Particular attention to be paid to heavy metals from crop protection spraying.
	Old straw and grain dust	Ag-06		✓	✓	✓	✓	✓	Observe worker's protection in case of heavily dusty biomasses.
	Vegetables	Ag-07		✓	✓	✓	✓	✓	Only residual and waste materials that cannot or can no longer be used as animal feed. For EBC-AgroOrganic only from organic farming
	Seeds	Ag-08		✓	✓	✓	✓	✓	This only concerns expired seeds. For EBC-AgroBio only seeds from organic farming. Mineral
Forestry and wood processing: Natural bark and wood, untreated or mechanically treated, from forestry operations, sawmills or similar operations	Bark	F-01	✓	✓	✓	✓	✓	✓	
	Wood chips only from mechanically treated wood (pure firewood)	F-02	✓	✓	✓	✓	✓	✓	Only from certified, sustainable forestry. Approved are the FSC and the PEFC labels, others on request.
	Wood, wood residues from mechanical processing (waste wood A1)	F-03	✓	✓	✓	✓	✓	✓	Only from certified, sustainable forestry. Approved are the FSC and the PEFC labels, others on request. For EBC-Feed: only from defined, well documented sources, biomass from municipal collection not allowed.
	Sawdust, sawdust shavings	F-04	✓	✓	✓	✓	✓	✓	Only from certified, sustainable forestry. Approved are the FSC and the PEFC labels, others on request.
Landscape management: Residues generated by municipalities, landowners, landscaping contractors, NGOs active in nature conservation	Foliage	S-01		✓	✓	✓	✓	✓	No road wiping material. Special measures for checking leaves for contamination can be determined in the instruction manual.
	Root stocks	S-03		✓	✓	✓	✓	✓	The soil content is considered an additive and must not exceed 10% of the DM.
	Biomass from nature conservation	S-04	(✓)	✓	✓	✓	✓	✓	For EBC-Feed: only from defined, well documented sources, biomass from municipal collection not allowed.
	General landscaping residues	S-05	(✓)	✓	✓	✓	✓	✓	For EBC-Feed: only from defined, well documented sources, road-side biomass and biomass from municipal collection not allowed.
	Urban green cuttings	R-01		✓	✓	✓	✓	✓	Without food- and other biomass processing wastes
	Waste paper	R-02			(✓)	(✓)	✓	✓	For EBC-Agro only defined sub-assortments from defined sources (paper with low mineral filler content and without varnishes) and with small amounts of foreign matter: total content of synthetic coating, varnishes and plastic contamination max not exceed 1% (10% for EBC-ConsumerMaterials and EBC-BasicMaterials, individual approval needed when 1% limit is exceeded). To be regulated in the operation

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# EBC certified companies

- Biochar producer
  - on-site inspection
- Processing companies and traders
  - on-site inspection if  $> 10$  t p.a.
- Trader of packaged goods
  - no certification needed
- Private Label Traders
  - remote inspection

Contact

Imprint

European Biochar Certificate ©

Developed and ensured by the Ithaka Institute

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Pflanzenkohle-Zertifizierung, Analyse & Beratung: [www.european-biochar.org](http://www.european-biochar.org)