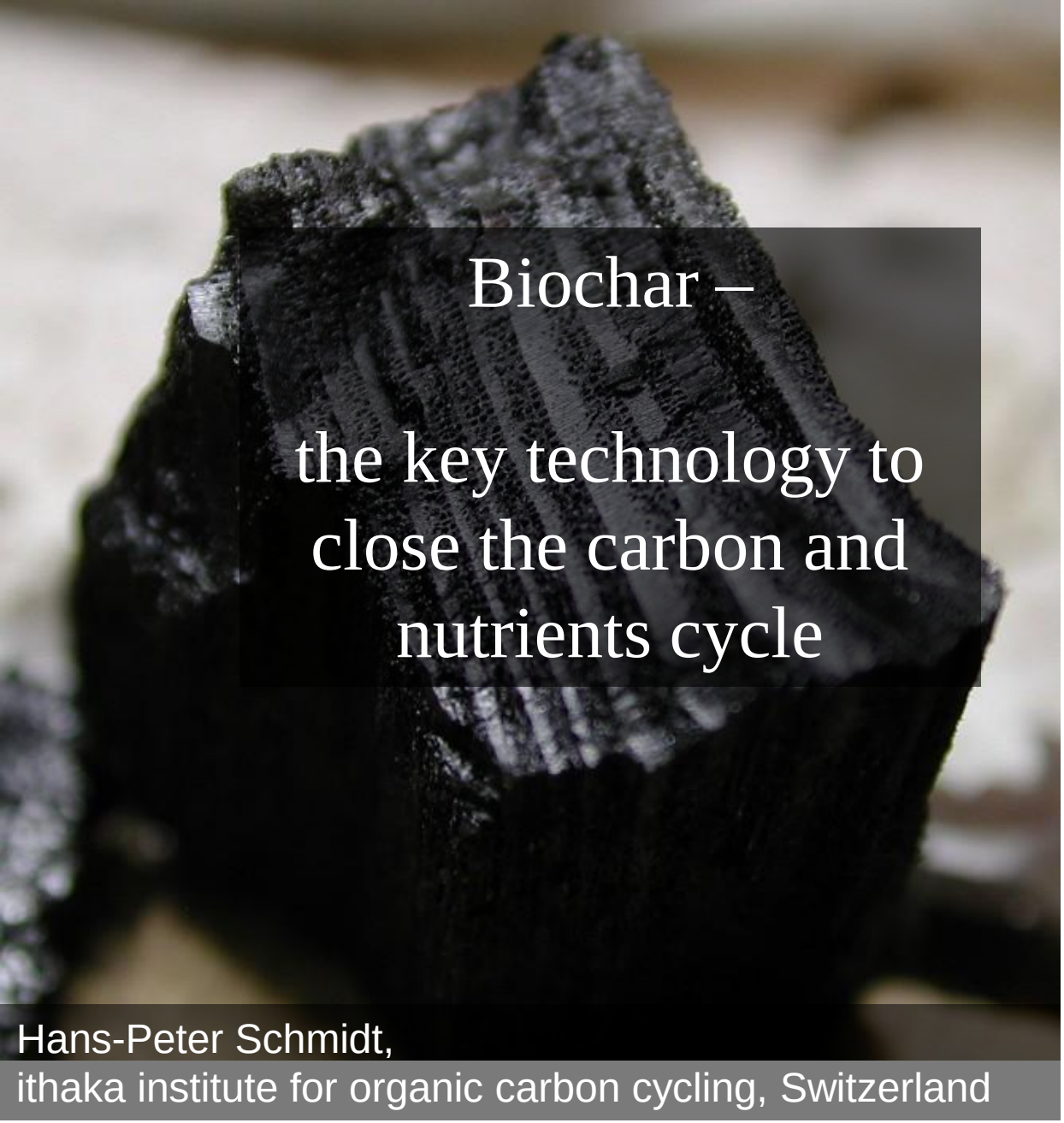


Biochar –

the key technology to close the carbon and nutrients cycle

Hans-Peter Schmidt,
ithaka institute for organic carbon cycling, Switzerland

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

cost

EBC foundation | certificate

ithaka institute

Biochar in Ghana 2009/2010

Biochar-Compost in Ghana

yield
control versus biochar-substrate:

	2010	2011	2012	2013
S-Ghana	1.5	2	2.6	3
N-Ghana	0.9	1,8	2,4	

Biochar-Compost Ghana

50% Poultry Manure and 50% biowaste, cotton straw, sheabutter waste, rice husks

1 kg substrate / m2

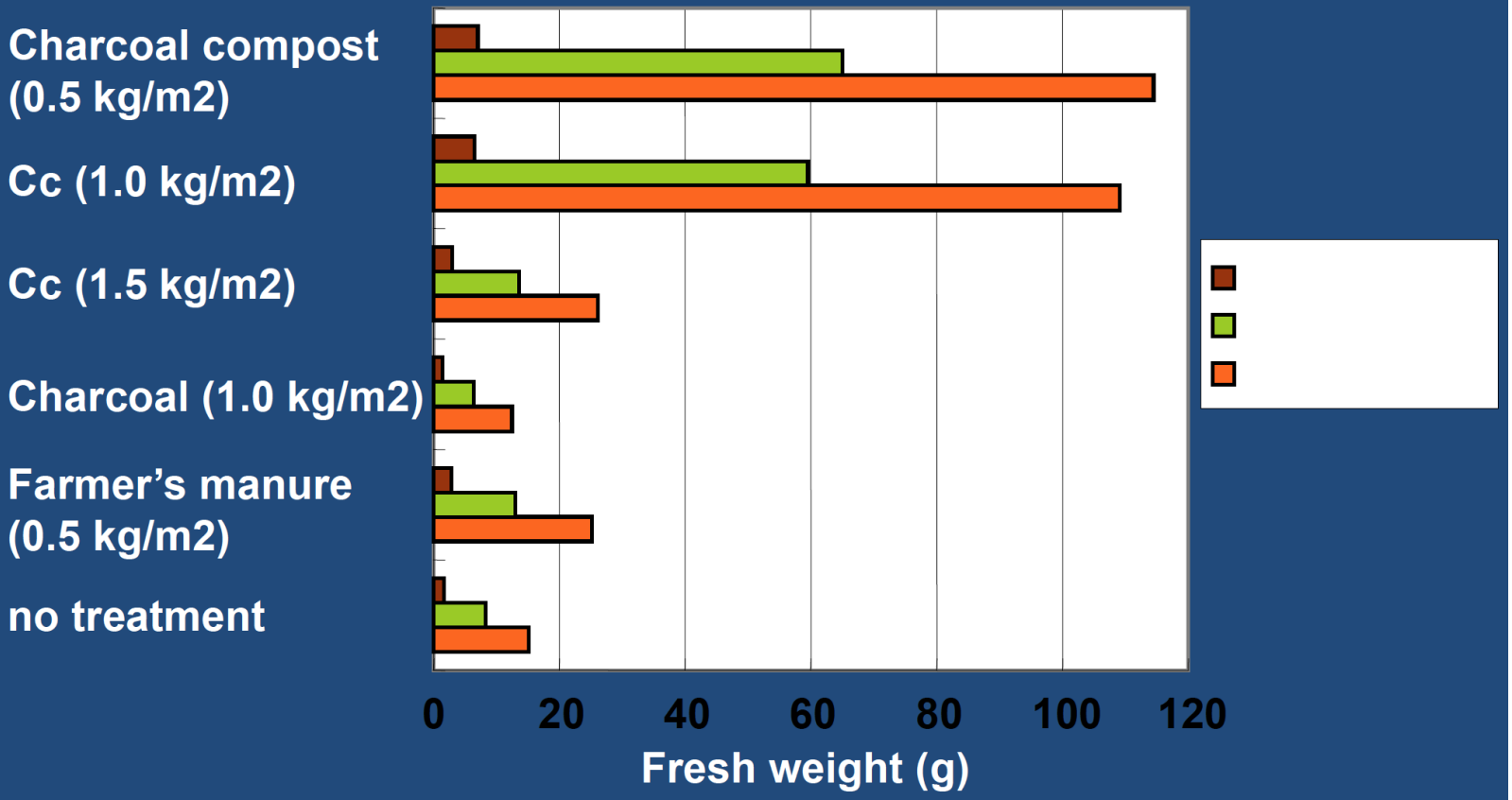
Left to rig

① Control
② Compost 0.5kg
③ Charcoal 1.0kg
④ Charcoal com post 1.5kg
⑤ C. C 1.0kg
⑥ C. C 0.5kg

The effects of charcoal compost on the plant growth(China)

Osaka Institute of Technology
Makoto Ogawa

1 - 2) Soy bean

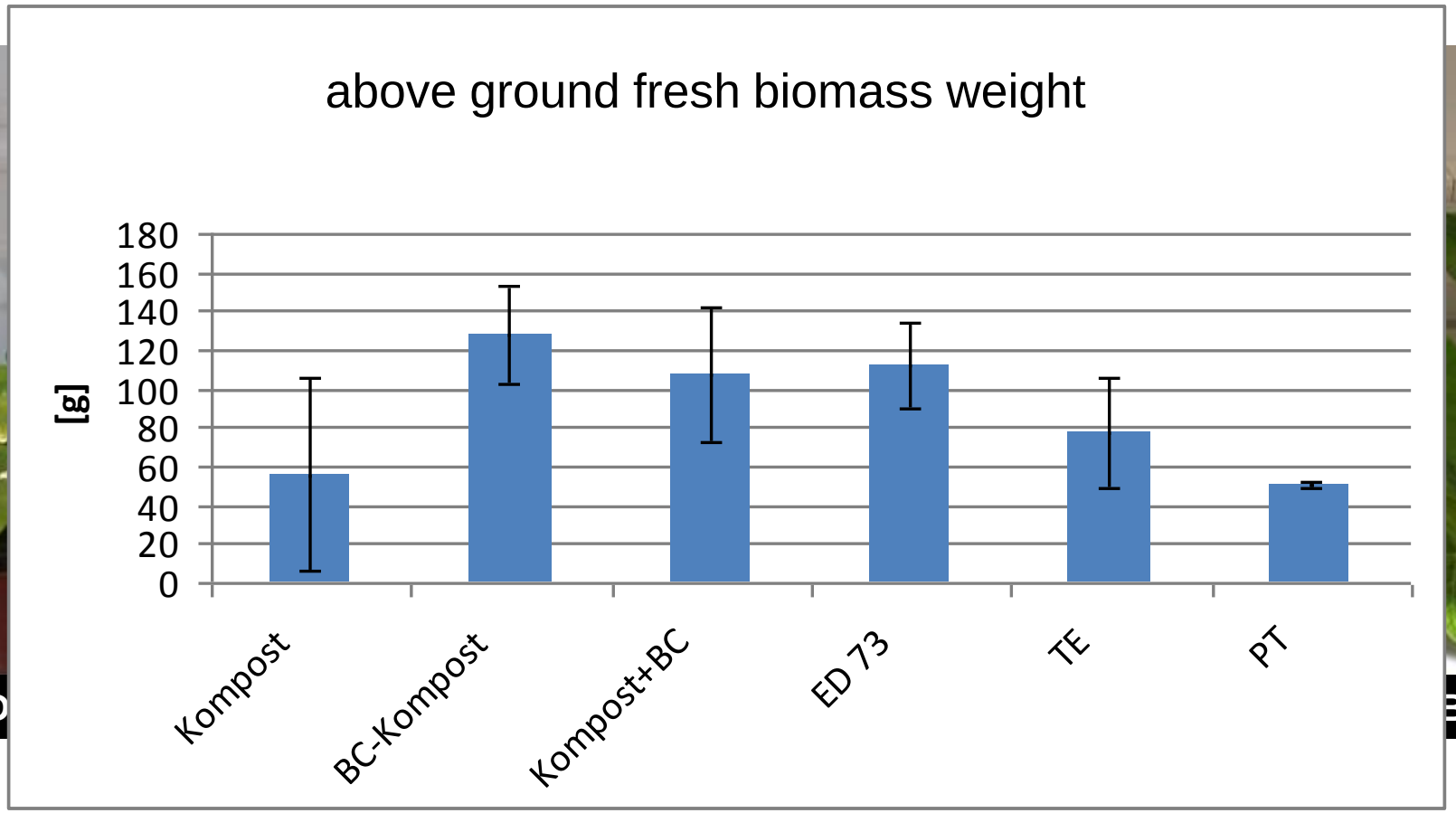


The effects of charcoal compost on the growth of soy bean.

Osaka Institute of Technology
Makoto Ogawa

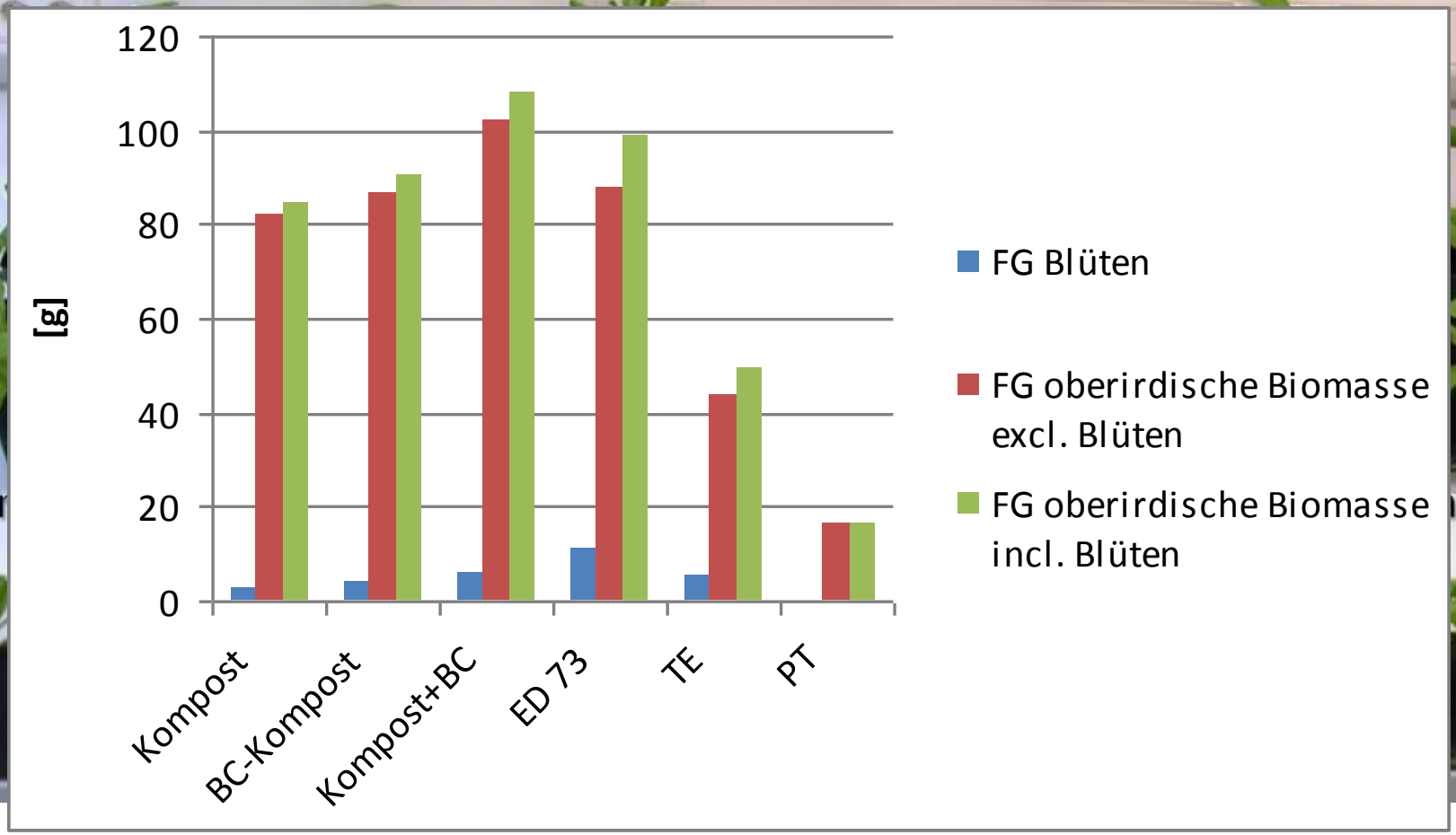
Peat substrate : BC-compost pumpkin

peat ED



BC-

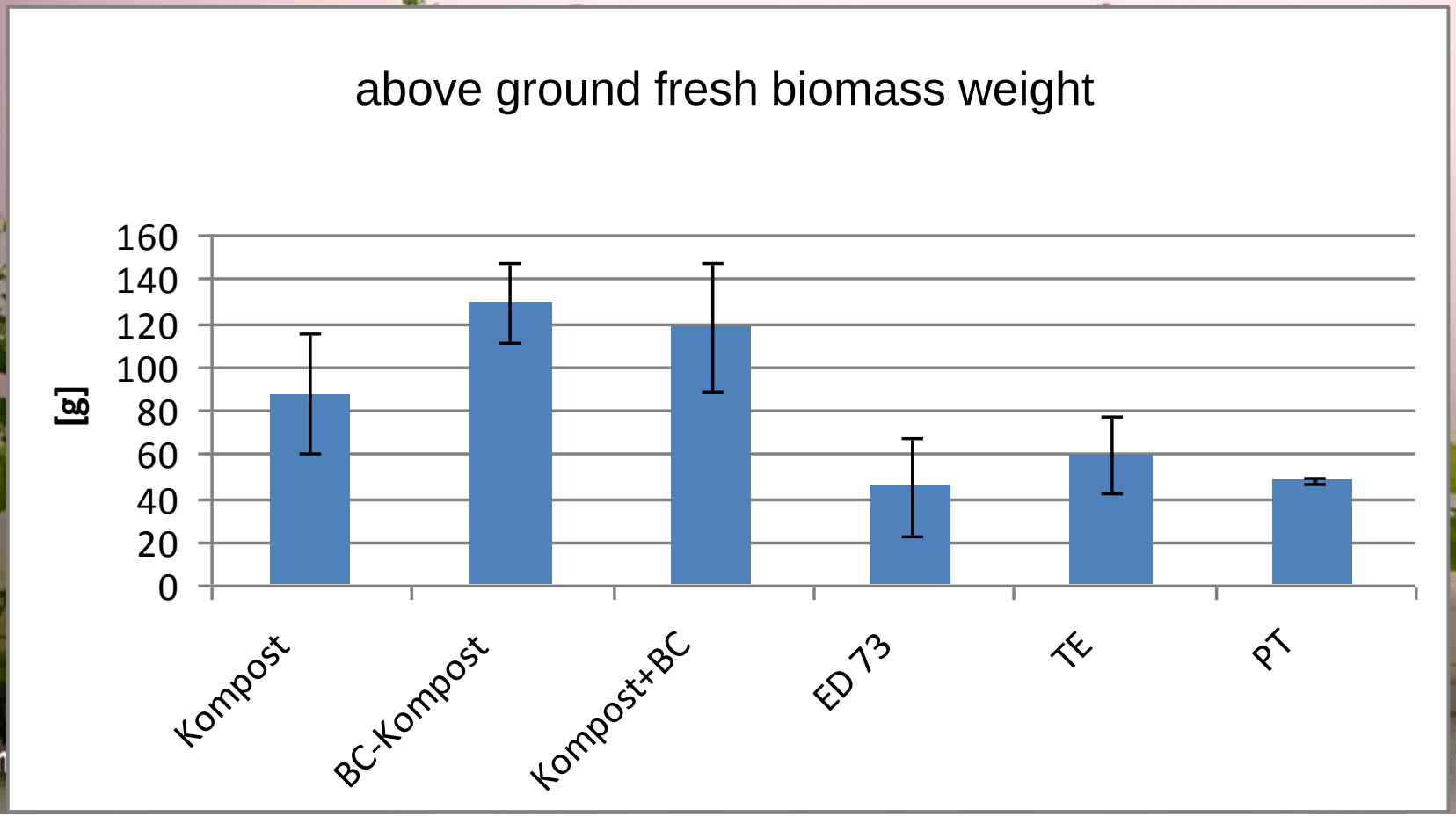
Calendula


120
100
80
60
40
20
0
[g]
Kompost
BC-Kompost
Kompost+BC
ED 73
TE
PT
FG Blüten
FG oberirdische Biomasse excl. Blüten
FG oberirdische Biomasse incl. Blüten

Aerobic Composting with Biochar

Substrate	Compost	BC-Compost
Cow manure	5	5
Horse manure	0.6	0.6
Chicken manure	0.1	0.1
Straw	0.3	0.3
Biochar	0	1.5
clay soil	0.6	0.6
rock powder	0.07	0.07
compost	0.02	0.02
Total volume	6.7	8.2

Nicotina benthamiana



Enhancing Crop Yields by Restoring SOC POOL

Table II. Potential of increase in food grains in the tropics and subtropics through improvement in soil quality by adopting recommended management practices which enhance the SOC pool

Crop	Region	Area	Yield (kg ha^{-1})	Increase in SOC pool by 0·5 Mg C ha^{-1} y^{-1}		Increase in SOC pool by 1 Mg C ha^{-1} y^{-1}	
				Increase in yield (kg ha^{-1} y^{-1})	Productivity increase (10^6 Mg y^{-1})	Increase in yield (kg ha^{-1} y^{-1})	Productivity increase (10^6 Mg y^{-1})
Wheat							
	Africa	8·9	1571	10–20	0·09–0·18	20–40	0·18–0·36
	Latin America	9·0	2515	25–35	0·225–0·315	50–70	0·45–0·63
	Asia	97·1	2535	15–25	1·455–2·43	30–50	2·91–4·86
	Africa	20·1	670	15–25	0·30–5·00	30–50	0·60–1·00
	Latin America	0·2	1516	25–35	0·005–0·005	50–70	0·01–0·01
	Asia	14·6	820	15–25	0·22–0·365 0·52–0·87	30–50	0·44–0·73 1·05–1·74
Beans (*Phaseolus* and *Vigna* spp.)							
	Africa	3·1	668	20–30	0·06–0·095	40–60	0·12–0·19
	Latin America	8·0	743	20–30	0·16–0·24	40–60	0·32–0·48
	Asia	14·7	640	15–25	0·22–0·37 0·44–0·70	30–50	0·44–0·74 0·88–1·41
Soybean							
	Africa	0·92	973	10–15	0·01–0·015	20–30	0·02–0·03
	Latin America	24·0	2389	15–25	0·36–0·60	30–50	0·72–1·20
	Asia	16·9	1398	10–15	0·17–0·25 0·54–0·87	20–30	0·34–0·51 1·08–1·74
Total					11·89–19·74 (15·8 ± 5·6)	—	23·78–39·48 (31·6 ± 11·1)

1 g ha y^{-1} increase in SOC equals 0·02 per cent increase in SOC pool at 20 cm depth per year in soil with a bulk density of 1·3 Mg m^{-3}. The data on area and crop yield are from FAO (2000).

increase of SOC by 1 t / ha increases yields in developing countries

wheat: 20 – 70 kg / ha
corn: 30 – 300 kg /ha
rice: 50 – 60 kg /ha

Lal, 2011

Soil Organic Carbon

C : N : OP : S = 1 : 11 : 45 : 65*

to increase the **soil organic carbon content by 1%**
in the upper 30 cm of a soil for 1 hectare:

27 t carbon (eq. 38 t biochar)

2.400 kg nitrogen

600 kg phosphorus

400 kg sulphur

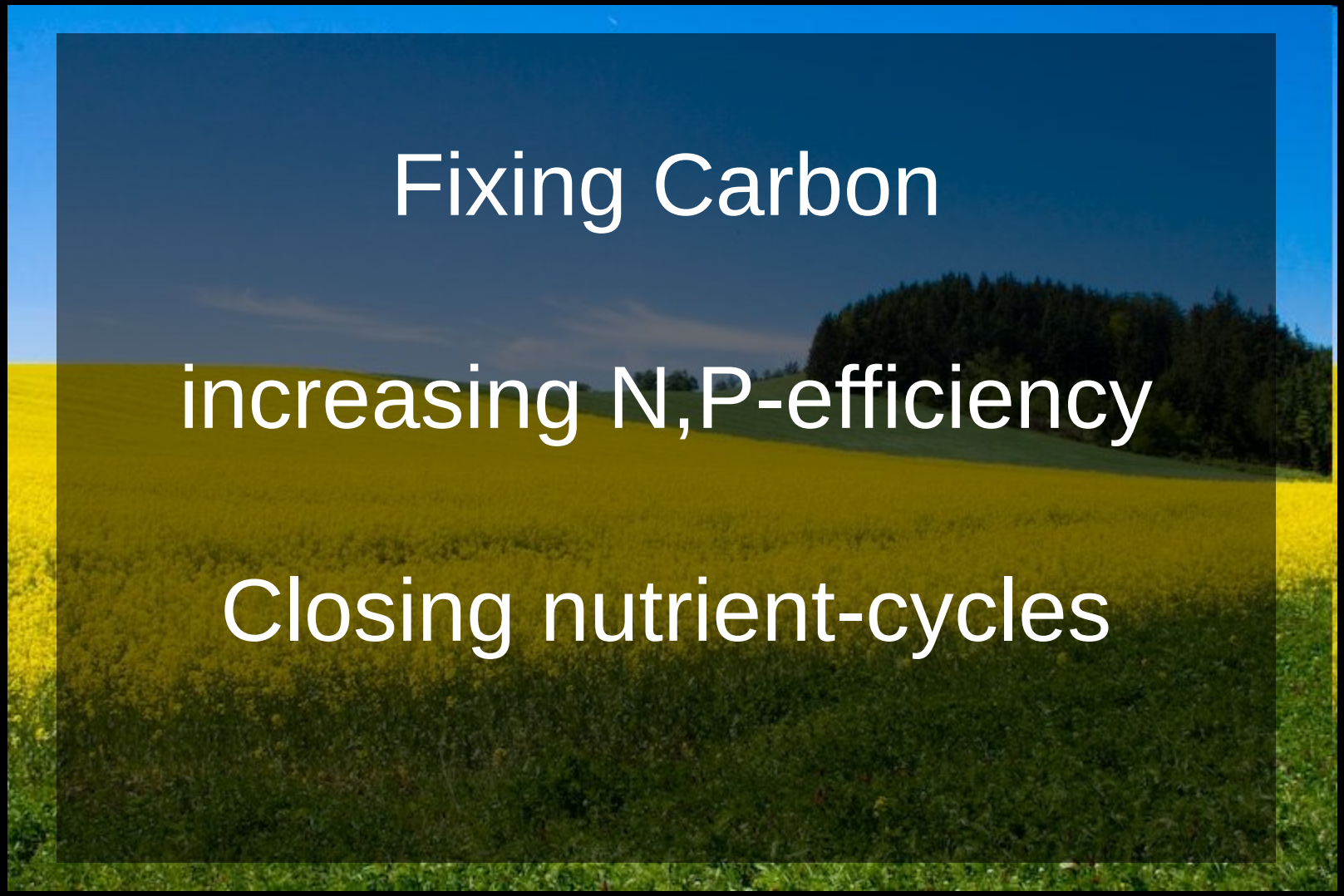
* Kirkby, 2011

Carbon N-P Fertilizer

	kg
Biochar	**850**
Ammonia-Nitrate	215
Urea	182
Diammoniumhydrogenphosphate	46
Phosphoric acid (75%)	92
Total amount of fertilzer	**1385**
water	655

in % of biochar

Nmin [%]	PO4 [%]	P2O5 [%]
20,0	**11,8**	**8,8**

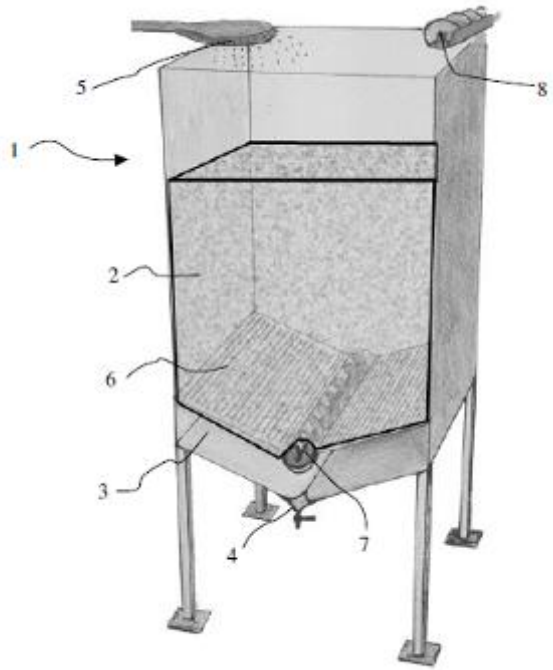

Fixing Carbon
increasing N,P-efficiency
Closing nutrient-cycles

liquid manure filtration

solid-liquid separation

filtration of liquid manure through biochar

Fig. 1



Continuous charging of biochar by nutrient rich liquids

Charging with liquid manure

1- 1,5 % BC

in liquid manure

Reducing NH3-losses, methane emissions, increases plant nutrient efficiency, decreases nutrient leaching and odors

Cumulative loss of NH3

Cumulative loss of NH_3 relative to the control:

- Slight increase for BC22
- 5-10% reduction for BC24
- ***Strong reduction*** for PSBC24 and PS (low pH of the slurry)

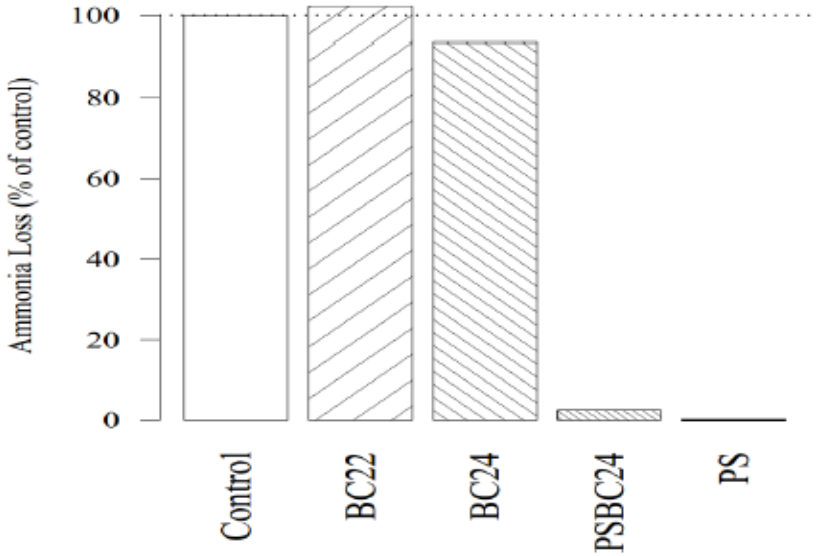


Figure 2: *Cumulative ammonia loss during 8.5 h of measurement (21 days of storage) relative to Control.*

BC - Biochar
PS – Phosphoric acid

HÄNI C, Kupper T, 2012,
Bern University of Applied Sciences,

Cascading use of biochar

Use it nine times – pay it only once

silage

feed additive

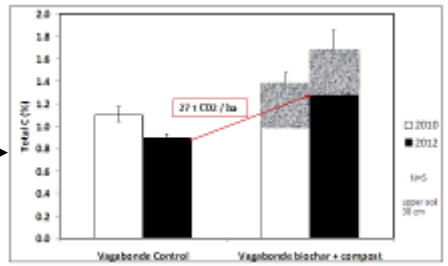
litter additive

liquid manure treatment

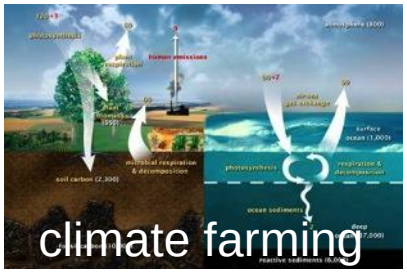
composting

urban soil substrate

soil amendment



humus increase



climate farming

1. Silage

Cascading use of biochar

1.

Charging biochar with malolactic bacteria and add

1 % BC to silage

reducing mycotoxins and butyric acid, adsorption of pesticides and herbicides

2. Feed additive

Cascading use of biochar

2.

1 % BC for feeding

Carbon-Feed

increases energy efficiency of digestion, decreases milk cells, adsorption of gram positive bacteria (botulisme), pesticides, herbicides, reducing odors, fixation of nutrients, improvement of barn climate

CarbonFeed

Ingredients: Wheat bran (40 %), biochar (15 %), sugar cane molasses, linseed, alpine herbs, corn flakes, wheat flakes, barley flakes, minerals

Water 43 %, raw proteins 7.5 %, raw ash 5.2 %, raw fibre 4.7 %, raw fat 1.7 %, sodium 0.03 %, calcium 0.08 %, phosphorous 0.5 %, magnesium 0.2 %, lysine 2.7 g/kg, methionine 1.0 g/kg

For cows, horses, chicken, pigs, sheep – dogs, cats …

Zanzibar Red Colobus Monkey Eating Charcoal

Photo: Martin Harvey. CORBIS

The red colobus monkeys, *Procolobus kirkii*, eat charcoal, Zanzibar, Tanzania). These endangered animals have specially adapted stomachs which enable them to feed principally on leaves. They eat charcoal from burnt tree stumps and branches to detoxify poisons (mainly phenolics) obtained from their leafy diet and convert them into proteines

Struhsaker, T.T., Cooney, D.O., Siex, K.S., 1997. Charcoal Consumption by Zanzibar Red Colobus Monkeys: Its Function and Its Ecological and Demographic Consequences. Int. J. Primatol. 18, 61–72.

1% Biochar in Feed for Germany

13 Million cattle (650 000 t BC)
27 Million pigs (780 000 t BC)
2,4 Million sheep (43 000 t BC)
130 Million poultry (260 000 t BC)

1,7 Million tonnes biochar per year
5 Million tonnes CO2 per year
0,6% of annual CO2 emission in Germany

All statistics refer to Germany

Adsorption of anti-bacteria, anti-infectica, anti-parasitica, hormones, analgetica, pathogenes, herbicides, pesticides

Cost of annual animal drugs: 19.2 Billion US-Dollar worldwide

Reduction of methane emission caused by rumination

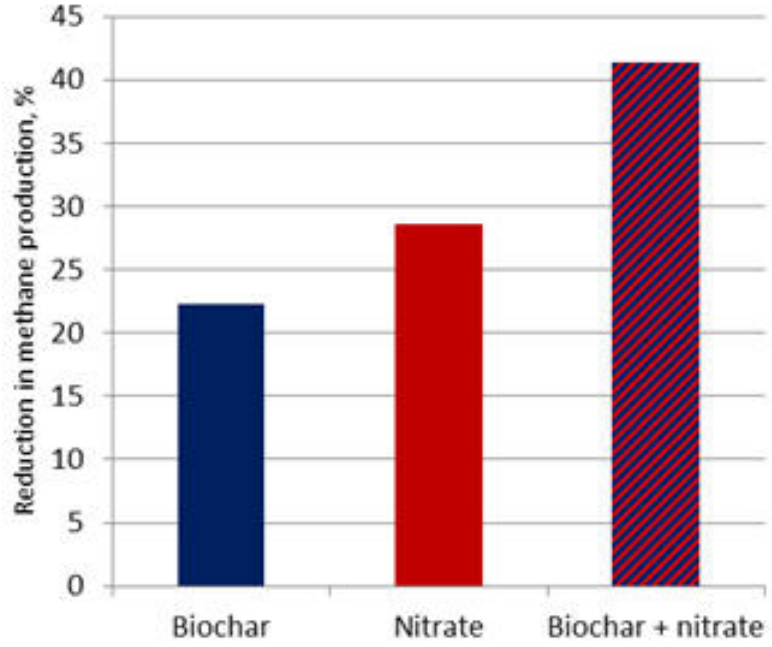


Figure 4. Reduction in methane due to biochar and nitrate in local "Yellow" cattle fed cassava root and cassava foliage supplemented or not with biochar and with urea or potassium nitrate as NPN source

http://www.lrrd.org/lrrd24/11/leng24199.htm for full details

BC – Biochar
KN – form of potassium nitrate

Leng et al 2012, Biochar reduces enteric methane and improves growth and feed conversion in local "Yellow" cattle fed cassava root chips and fresh cassava foliage

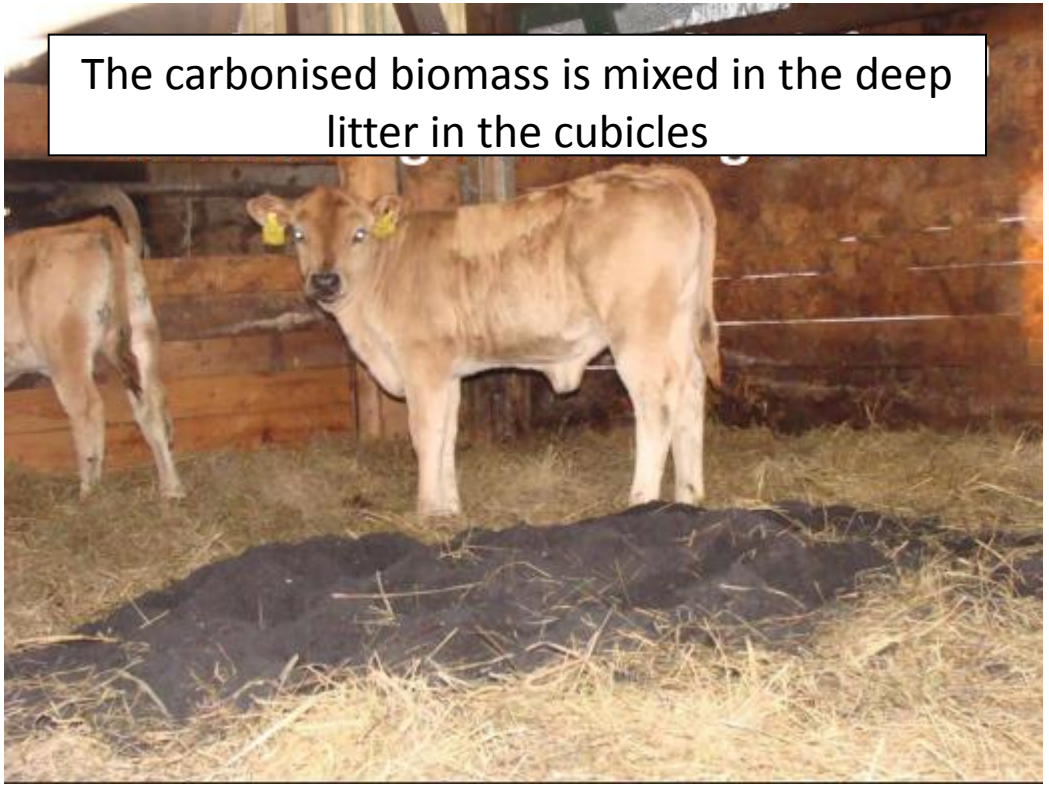
Black Burger Methane Reduction

3. Litter Amendment

Cascading use of biochar

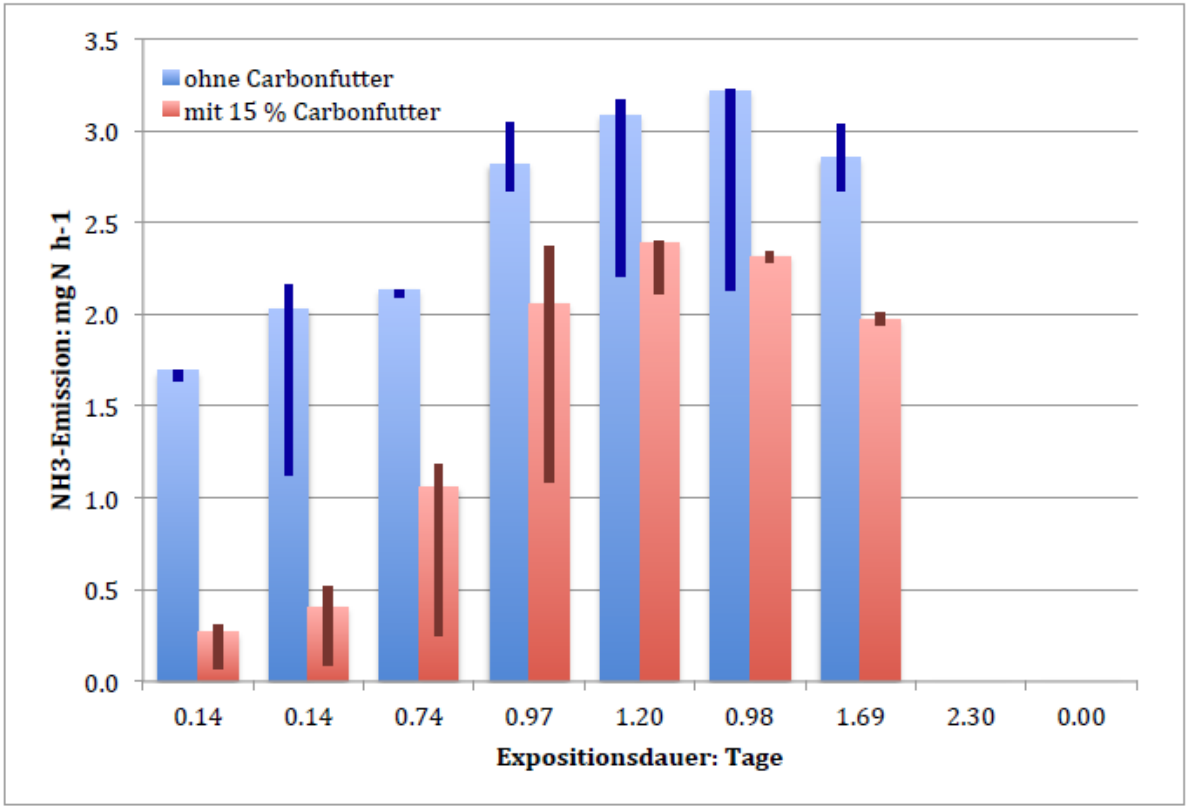
3.

5 - 10 % BC in litter

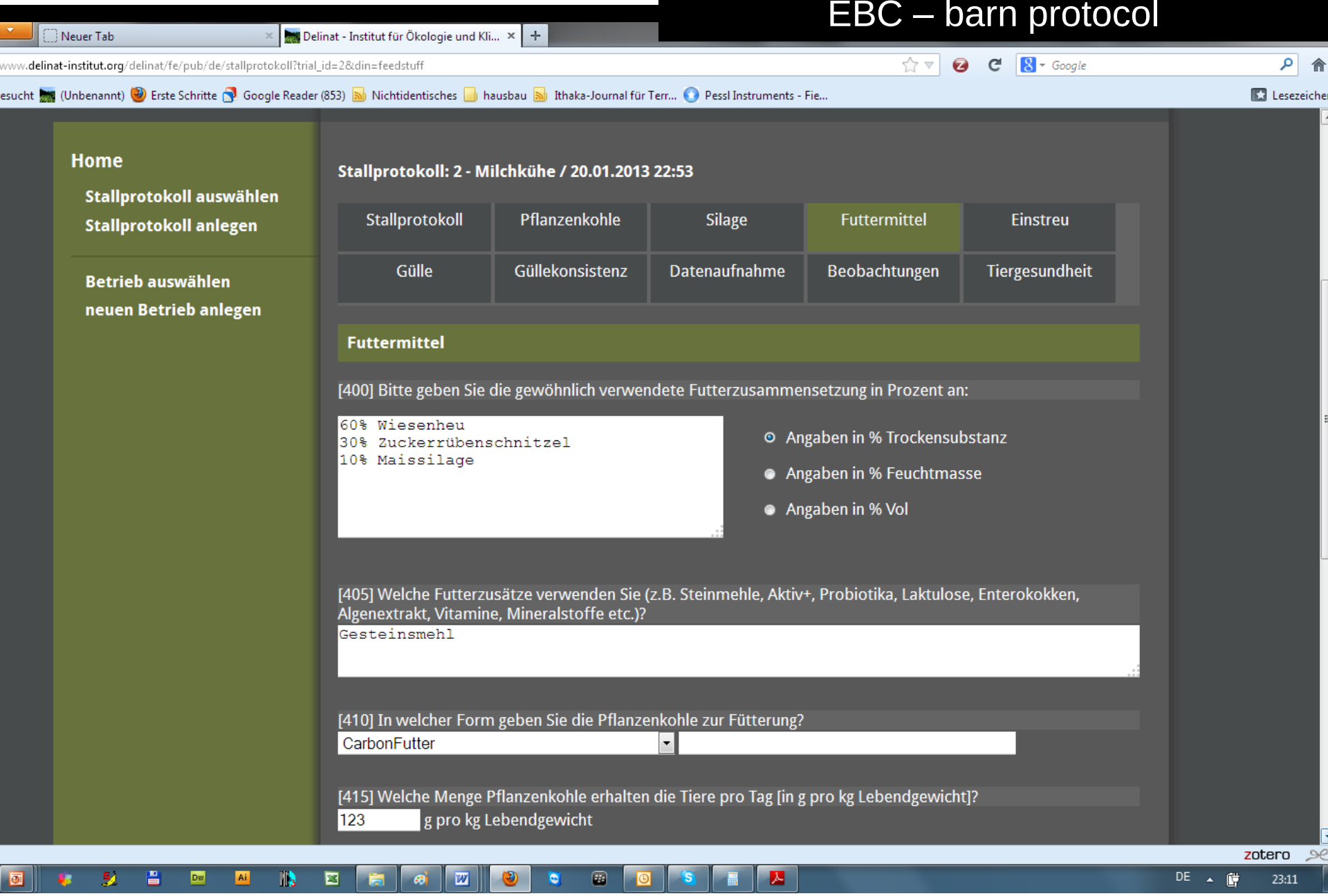


reducing humidity and odors, fixation of nutrients, reducing NH3 and CH4 emissions, ameliorates hygiene, hoof infections

Biochar induced ammonia reduction in chicken farm



EBC – barn protocol



ithaka institute

EBC – barn protocol

Biochar for bedding:

84% less odors

First results from 30 farms

Biochar for bedding:
84% less odors

Biochar as feed additive:

77% less dysenterie

62% animals are calmer and balanced

77% less odor in barns

Observation: cells in milk decreased, less streptococcus, less rumen ulcer, better fitness

EBC – barn protocol

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84% less odors

Biochar as feed additive:

77% less dysenteries

62% animals are calmer and balanced

77% less odor in barns

Observation: cells in milk decreased, less streptococcus, less rumen ulcer, better fitness

Biochar as liquid manure additive

79% less odors
63% less cauterization of the liquid manure

More examples from livestock farms with CarbonFeed

Poultry farms

3 days after beginn of treatment with fermented biochar, vermifugation of round worms took place

Cow farm

one year after beginning administration, cows did not need any veterinary treatment during the first year of administration

Swine farms

pigs did not need any more antibiotic treatment during the first six months of administration

Chicks

the mortality rate decreased in a chicken farm, while at the same time a high and continual increase in weight of 90 - 100g per day was observed

5. Composting the manure

Cascading use of biochar

5.

Composting the carbon manure + the separated solids of the liquid manure

10 – 20% biochar

“Swiss Terra Preta”

reduction of GHG during composting

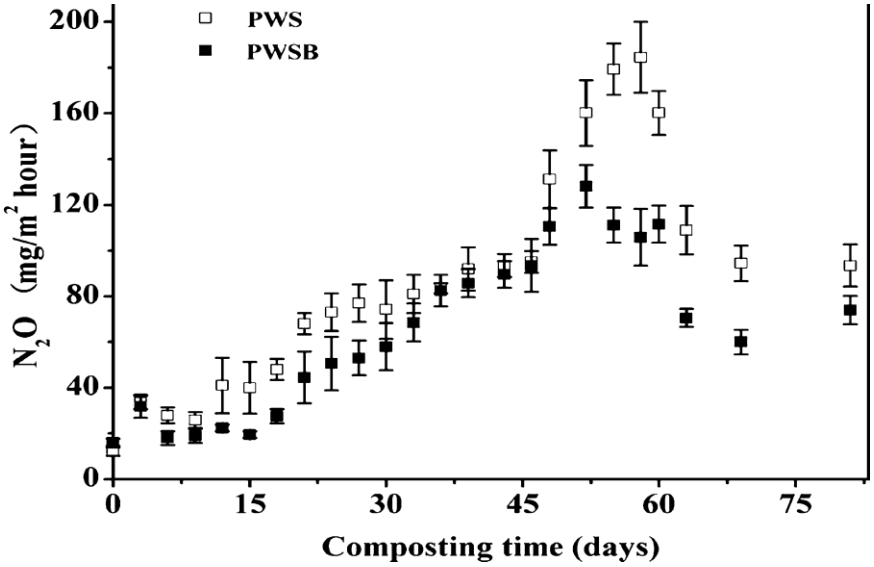


Figure 2. Changes in N2O emission rate during pig manure composting.

Wang et al. 2012: dx.doi.org/10.1021/es305293h | Environ. Sci. Technol.

Chen et al. 2010, Chemosphere 78:
up to 65% reduced N loss (total Kjeldahl N) with up to 9% bamboo biochar addition (pig manure + sawdust +/- BC (pH 8.8)

Swiss Terra Preta

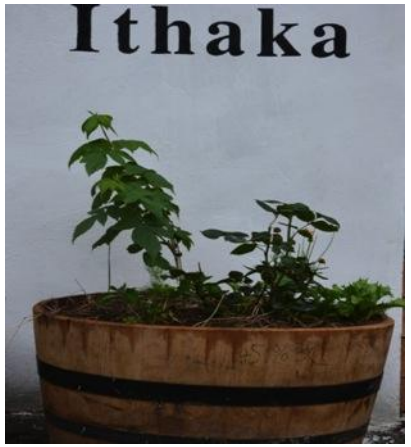
greenhouse substrates, urban farming, pot substrates, special cultures, tree nurcery

Corresponding to 1000 t biochar / ha

Biochar-Compost Substrates

100% BC

70% BC



45% BC

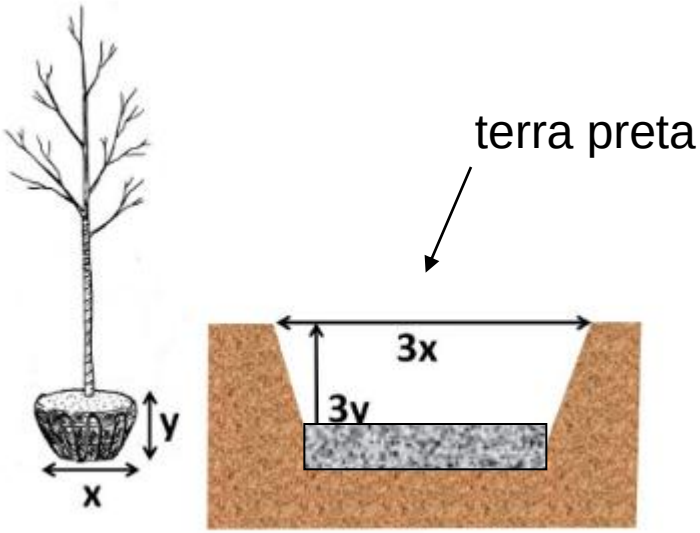
0% BC

15% BC

30% BC

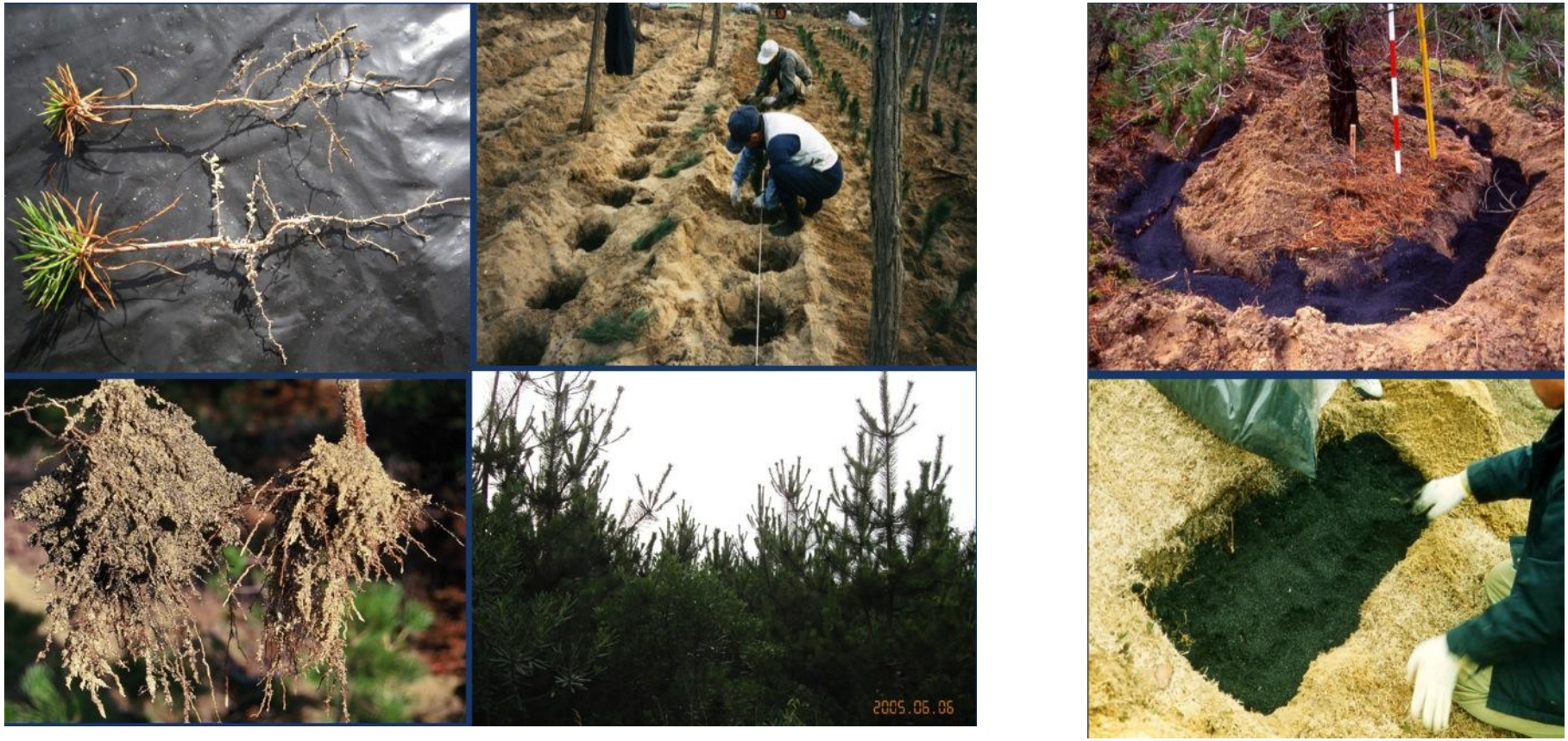
Biobeds for streetwater decontamination

Planting trees with terra preta



Highly concentrated hotspots close to the roots

Planting trees with terra preta



Highly concentrated hotspots close to the roots

under the roots: biochar substrates

7. Soil Amendment

Cascading use of biochar

7.

Soil amendment

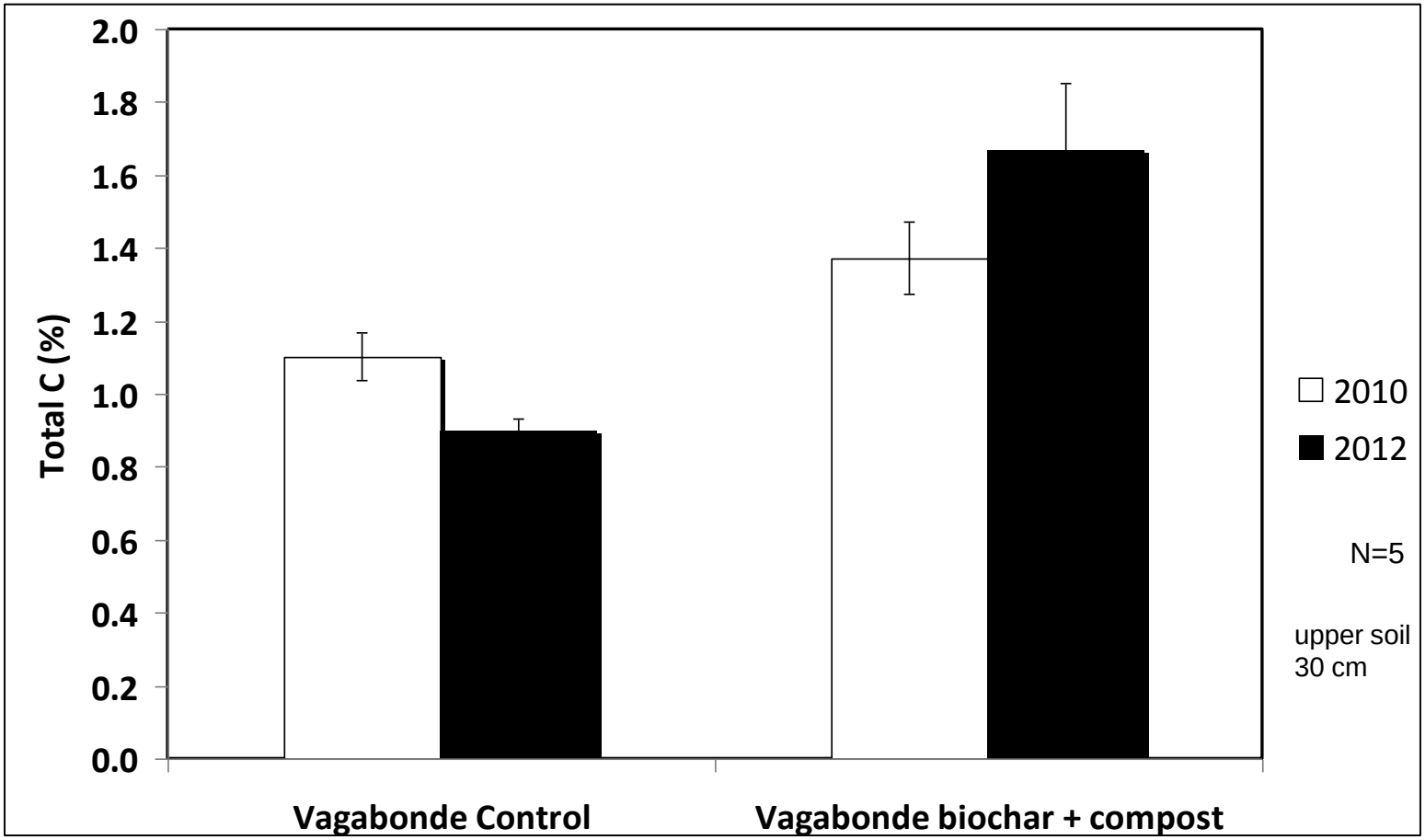
Fixation of nutrients

Increase of SOM

8. Increase of humus (SOC)

Cascading use of biochar

10 t BC / ha = ca. 0,5% total C in upper soil

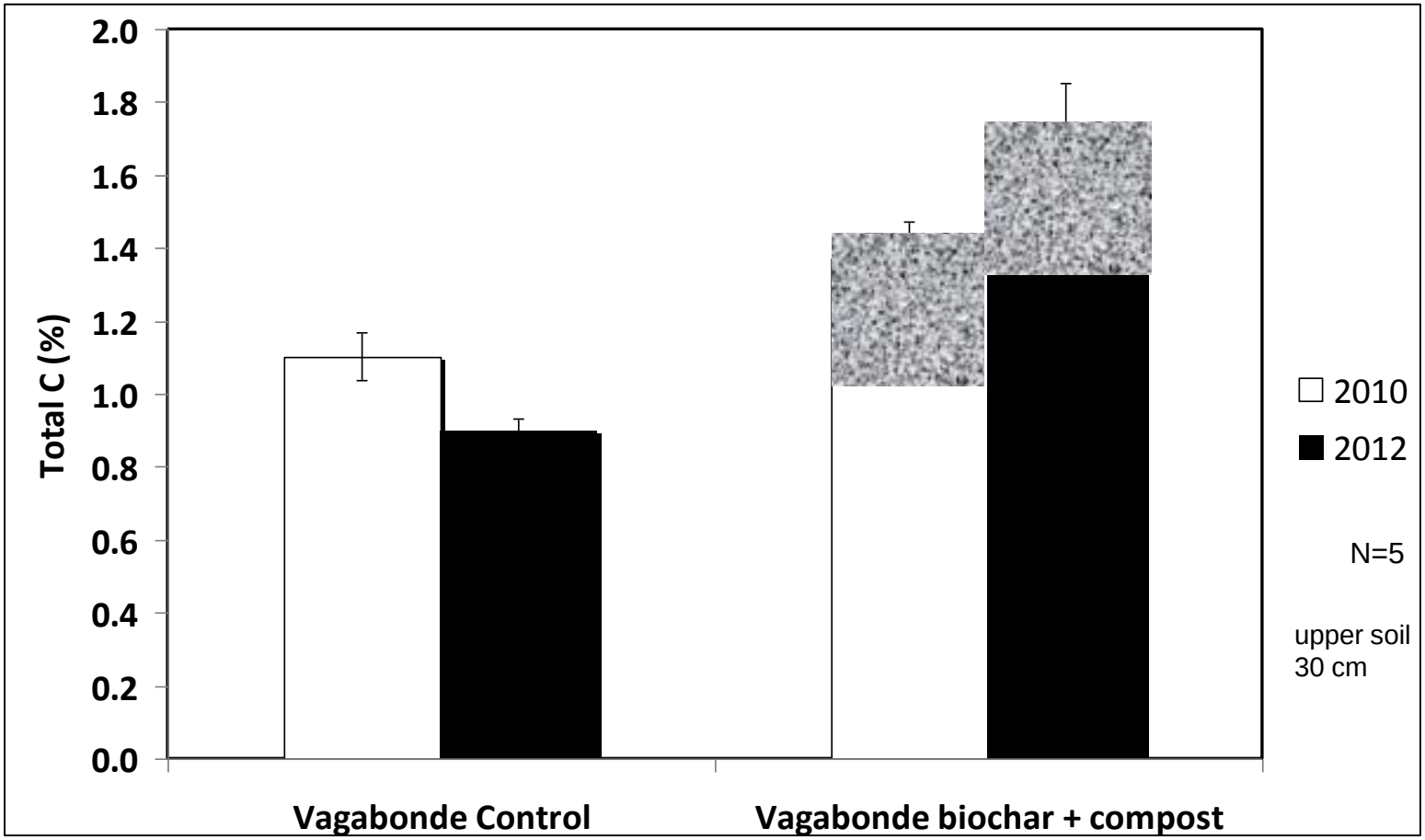


Data from a vineyard field trial in Valais

8. Increase of humus (SOC)

Cascading use of biochar

10 t BC / ha = ca. 0,5% total C in upper soil



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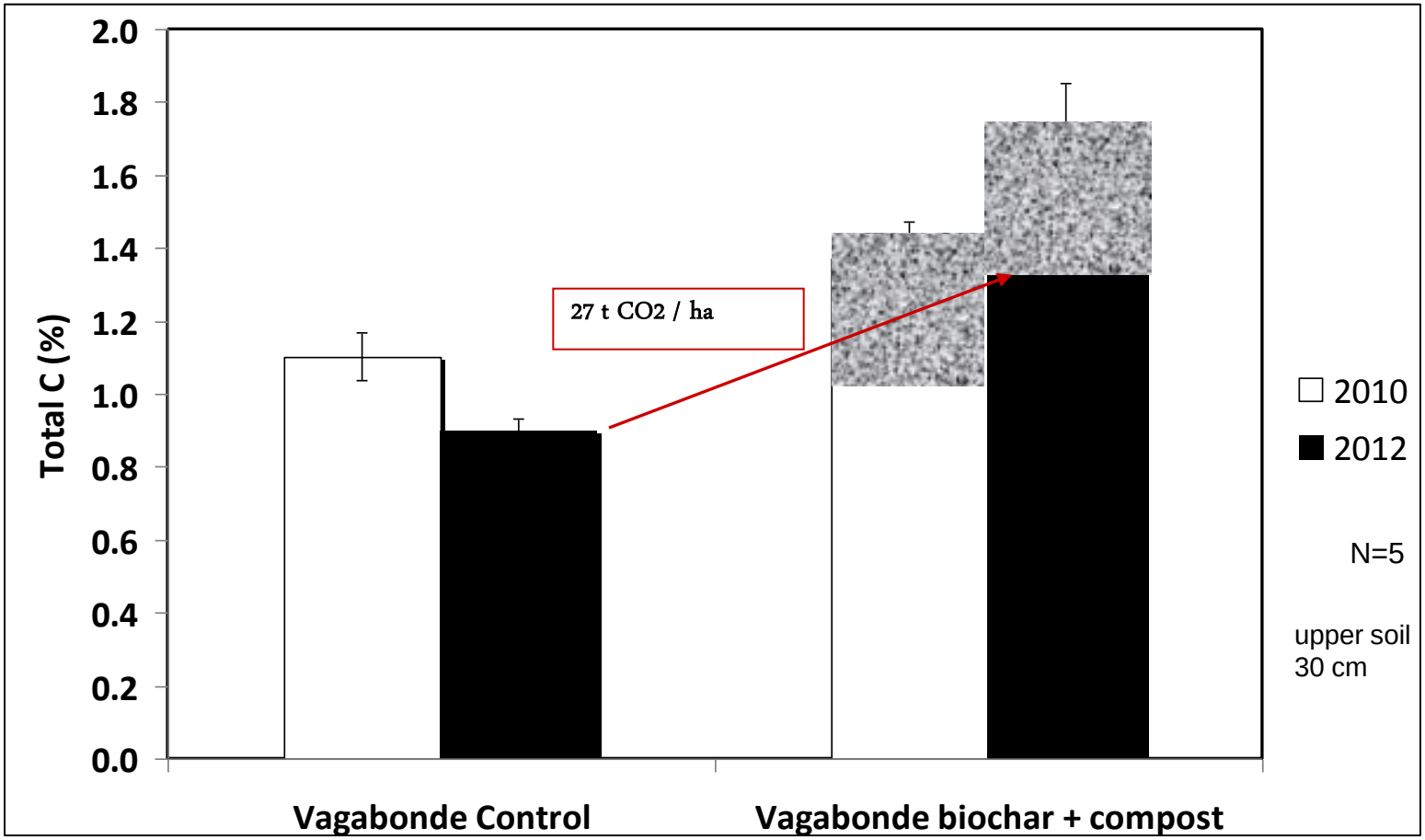


Data from a vineyard field trial in Valais

9. Carbon sequestration

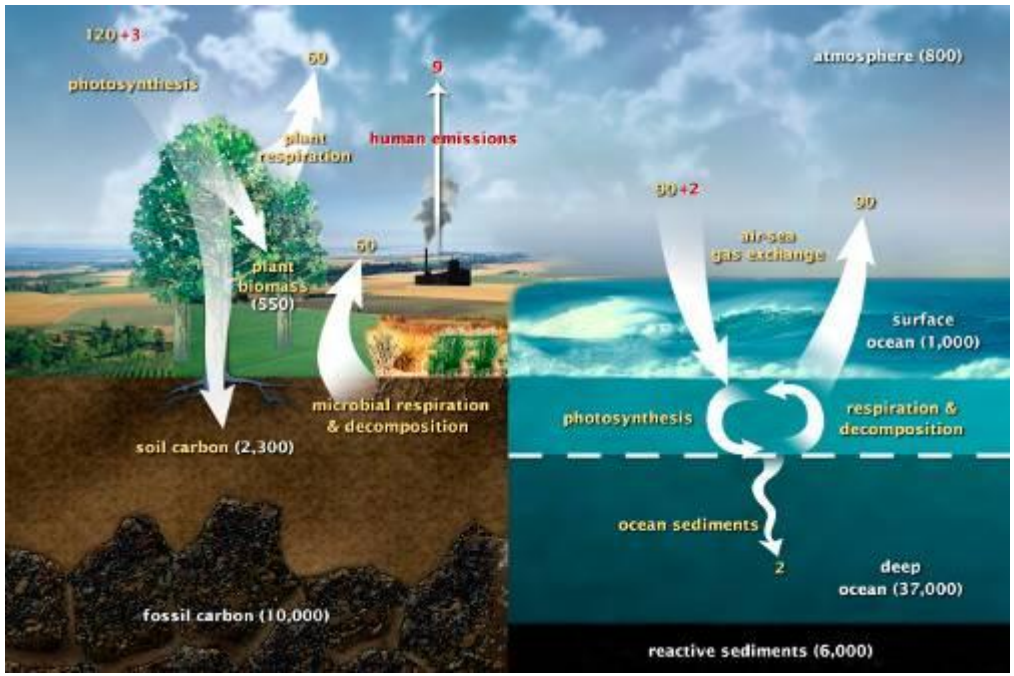
Cascading use of biochar

9.

Carbon sequestration:

SOM, BC

Reducing NH_3, CH_4, N_20



CO2-certificates?

Ecosystem Service Certificate

A Biochar Cascade

Adding complexity to multiply yields

Albert Bates
Global Village Institute
for Appropriate Technology

55 Uses of Biochar

farming

Soil amendment

7. Carbon fertiliser, 8. Compost, 9. Substitute for peat in potting soil, 10. Plant protection, 11. Compensatory fertiliser for trace elements

Livestock farming

1. Silage agent, 2. Feed additive / supplement, 3. Litter additive, 4. Slurry treatment, 5. Manure composting, 6. Water treatment in fish farming

Biogas produktion

21. Biomass additive, 22. Biogas slurry treatment

55 Uses of Biochar

farming

Soil amendment
7. Carbon fertiliser, 8. Compost, 9. Substitute for peat in potting soil, 10. Plant protection, 11. Compensatory fertiliser for trace elements

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Biogas produktion
21. Biomass additive, 22. Biogas slurry treatment

decontamination

Decontamination of soil and natural water
17. Soil additive for soil remediation, 18. highly adsorbing, plantable soil substrates *19. A barrier preventing pesticides getting into surface water 20. Treating pond and lake water*

2.6 Waste water and sewage treatment
23. Active carbon filter, 24. Pre-rinsing additive, 25. Soil substrate for organic plant beds, 26. Composting toilets

2.7 Treatment of drinking water
27. Micro-filters, 28. Macro-filters in developing countries

2.8 Exhaust filter
29. Controlling emissions, 30. Room air filters

55 Uses of Biochar

industry

Building material

12. Insulation, 13. Air decontamination, 14. Decontamination of earth foundations, 15. Humidity regulation, 16. Protection against electromagnetic radiation (“electrosmog”)

Textile industry

45. Fabric additive for functional underwear, 46. Thermal insulation for functional clothing, 47. Deodorant for shoe soles

Food industry

48. Conservation of food 49. Digesting helper

55 Uses of Biochar

industry

Building material
12. Insulation, 13. Air decontamination, 14. Decontamination of earth foundations, 15. Humidity regulation, 16. Protection against electromagnetic radiation ("electrosmog")

Textile industry
45. Fabric additive for functional underwear, 46. Thermal insulation for functional clothing, 47. Deodorant for shoe soles

Food industry
48. Conservation of food 49. Digesting helper

Wellness
48. Filling for mattresses, 49. filling for pillows

Radio protection
*50. Shield against electromagnetic radiation (*microwaves, TV, Netzgeräte, computer)

Further uses
Industrial materials (31. carbon fibres, 32. plastics)
Electronics (33. semiconductors, 34. batteries)
Metallurgy (35. metal reduction)
Cosmetics (36. soaps, 37. skin-cream, 38. therapeutic bath additives)
Paints and colouring (39. food colorants, 40. industrial paints)
Energy production (41. pellets, 42. substitute for lignite)
Medicines (43. detoxification, 44. carrier for active pharmaceutical ingredients)

Biochar in Textile Industry

45. Fabric additive for functional underwear, 46. Thermal insulation for functional clothing, 47. Deodorant for shoe soles

30% bambou-char

Conservation of Food

Regulation of humidity, anti-bacteriologic,
adsorption of ethylen

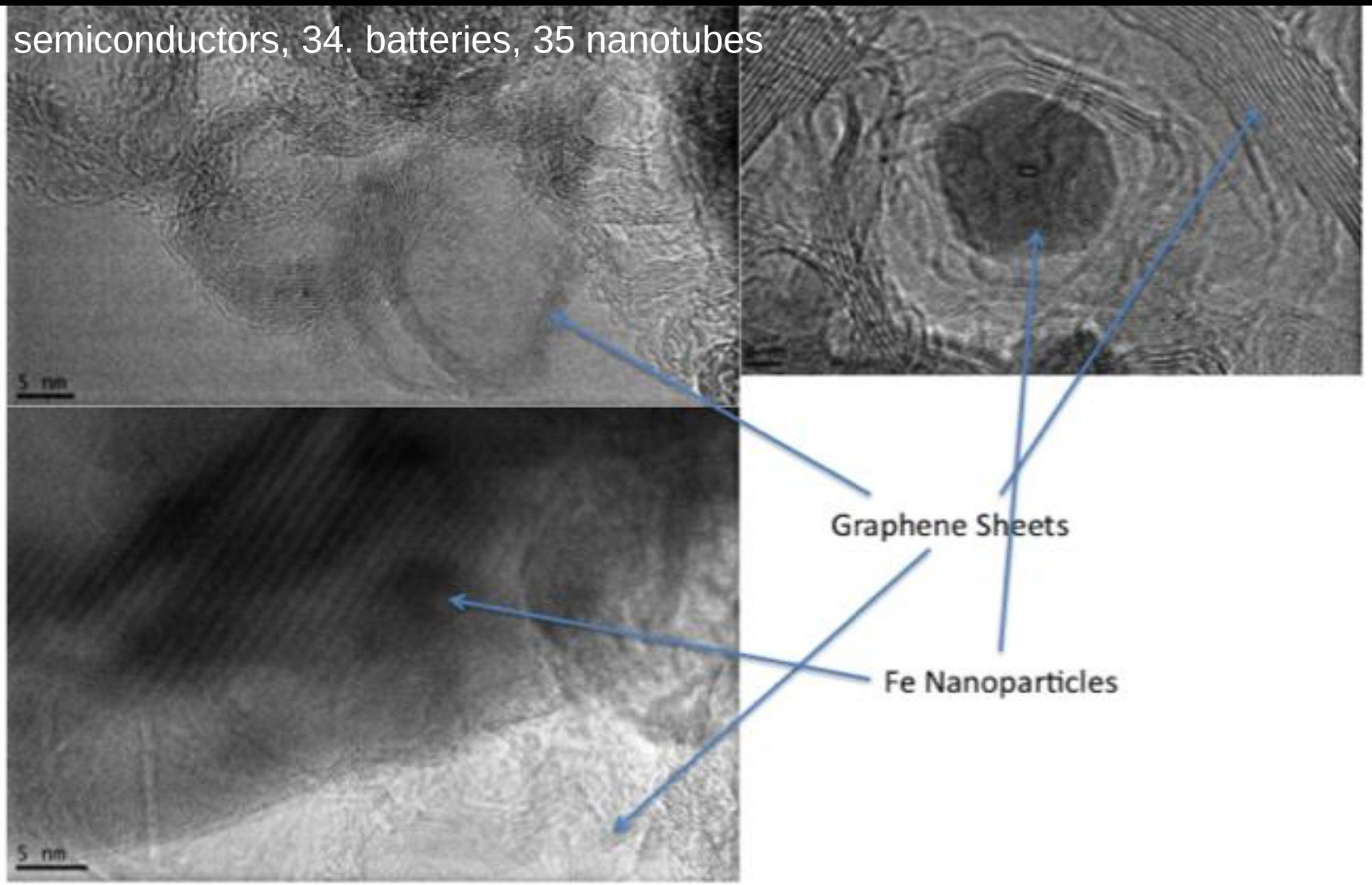
Cosmetics

36. soaps, 37. skin-cream, 38. therapeutic bath additives)

Biochar Food

Graphen

semiconductors, 34. batteries, 35 nanotubes



Forest Waste for Supercapacitors

https://www.pddnet.com/news/2013/10/forest-waste-cheaper-greener-supercapacitors#!

Biochar-Clay-Plaster for optimal indoor climate

humidity control, thermal insulation, toxin fixation, electro-magnetic shielding

50% Biochar

Biochar for habitats

Effects of Biochar-Plaster

Regulation / buffering of humidity
Insulation
Noise protection
Toxin binding (solvents, VOC)
Blocking of high frequency radiation
Low electrostatic charging of air
Conservation of wood
Reduction of dust (mites!)

Effects of Biochar-Plaster

Deodorising

aesthetic

Anti-bacteriological, fungicide (repellent)

Air cleaning

Increase of redox potential

Emission of far-infrared radiation

Ithaka Institute‘s conferencing room

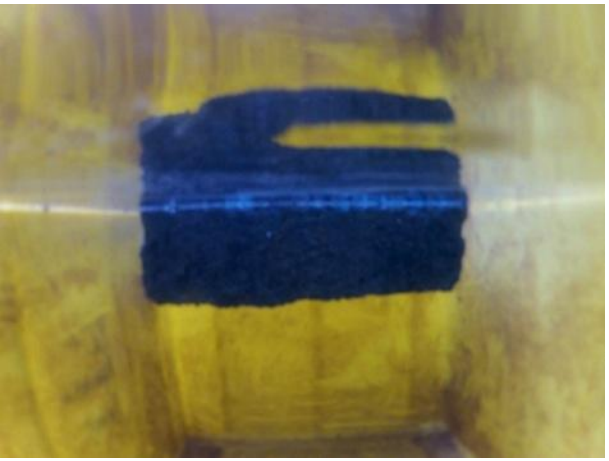
Painted with with Claycolour

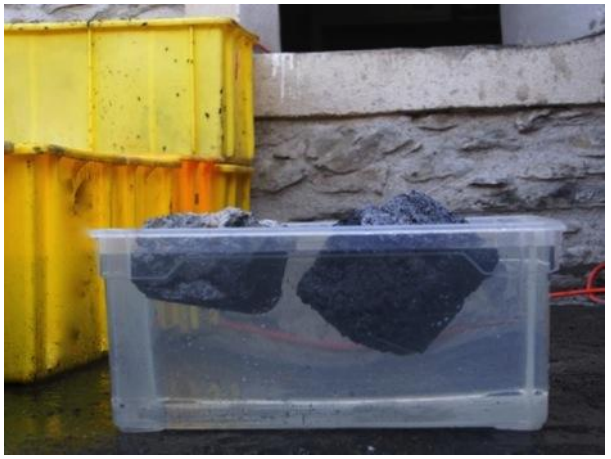
Ithaka Institute‘s Office

biochar bricks

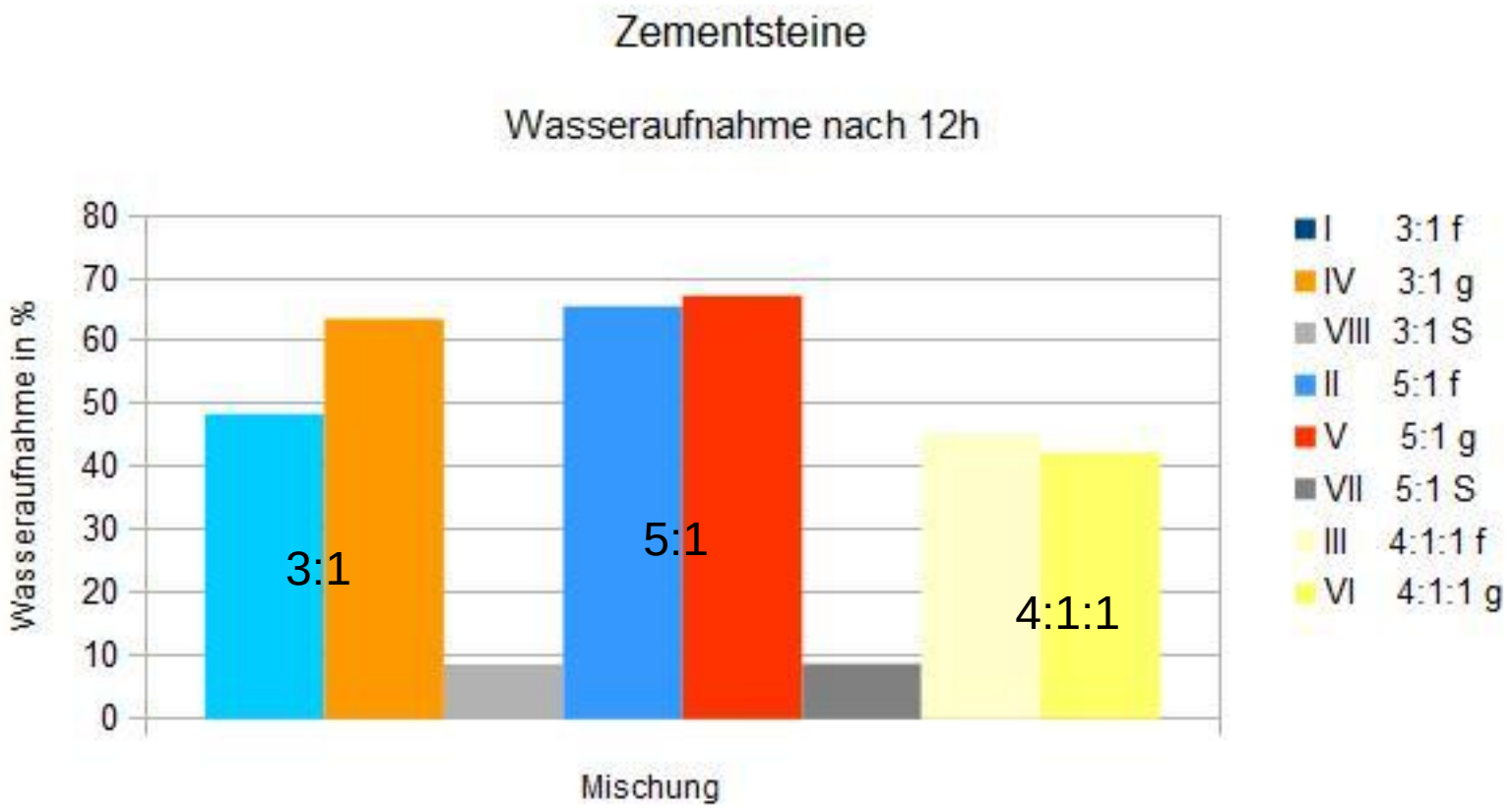
cement
limes
clay

biochar bricks can swimm





water-uptake of biochar bricks



Fridge House in Kenya

Biochar Housing as Carbon Sink

1 t biochar in the wall is some 2.5 t CO_2 less in the atmosphere

Biochar Housing as Carbon Sink

Biochar Pillows


Where do we get the Carbon from?

Establish the Carbon Exchange Market

EBC foundation | certificate

Schmidt HP,(Delinat Institute), Abiven S (University Zurich), Kammann C (University Giessen), Glaser B (University Halle), Bucheli T (ART Reckenholz), Haren Rv (Kiemkracht), Starmann I (InKnowCom), Leifeld J (ART Reckenholz)

Pillars of the EBC-Certificate

www.european-biochar.org

EBC foundation | certificate

1. Sustainable provision and production of biomass **feedstock – (positive list)**
2. Energy efficient, low emission **pyrolysis** technique
3. **Biochar characterization** – key parameters
4. **Biochar quality** – low contaminant level
5. Low hazard **use and application** of biochar

D	Measure	Analysis value	basic	premium	Annexe *	Method	Remarks, thresholds
Biomass used							
301	Only biomasses listed in the positive list were used?		☐				
302	All non-organic waste was removed		☐				
303	The biomasses were not contaminated by paint, solvents or other synthetic materials.		☐				
304	When using primary agricultural products, it is guaranteed that these were grown in a sustainable manner.			☐			
305	No forestry products were used from forests not managed in a sustainable manner		☐				
306	Biomasses used were not transported to the pyrolysis plant over distances greater than 80 km			☐			exemption
Biochar properties - test results per batch							
501	Biochar carbon content in %	_____	☐		x	☐	Threshold: 50%
502	Black carbon content in % of the overall carbon content	_____					Guideline: 10 - 40% (not mandatory)
503	H/Corg ratio of the biochar	_____	☐			☐	Threshold: 0.7
504	O/Corg ratio of the biochar	_____					Guideline: 0.4
505	An analysis of the nutrients contained in the biochar is available and attached to the delivery documents?		☐		*		
506.01	Lead concentration in g/t	_____	☐	☐		☐	basic: 150 g/ t_____ premium: 120 g/t
506.02	Cadmium concentration in g/t	_____	☐	☐		☐	basic: 1.5 g/t _____ premium: 1 g/t
506.03	Copper concentration in g/t	_____	☐			☐	Threshold: 100 g/t
506.04	Nickel concentration in g/t	_____	☐	☐		☐	basic: 50 g/t _____ premium: 30 g/t (exemption)
506.05	Mercury concentration in g/t	_____	☐			☐	Threshold: 1 g/t
506.06	Zinc concentration in g/t	_____	☐	☐		☐	basic: 400 g/t _____ premium: 300 g/t
506.07	Chromium concentration in g/t	_____	☐	☐		☐	basic: 90 g/t _____ premium: 80 g/t
507,01	pH value	_____	☐				

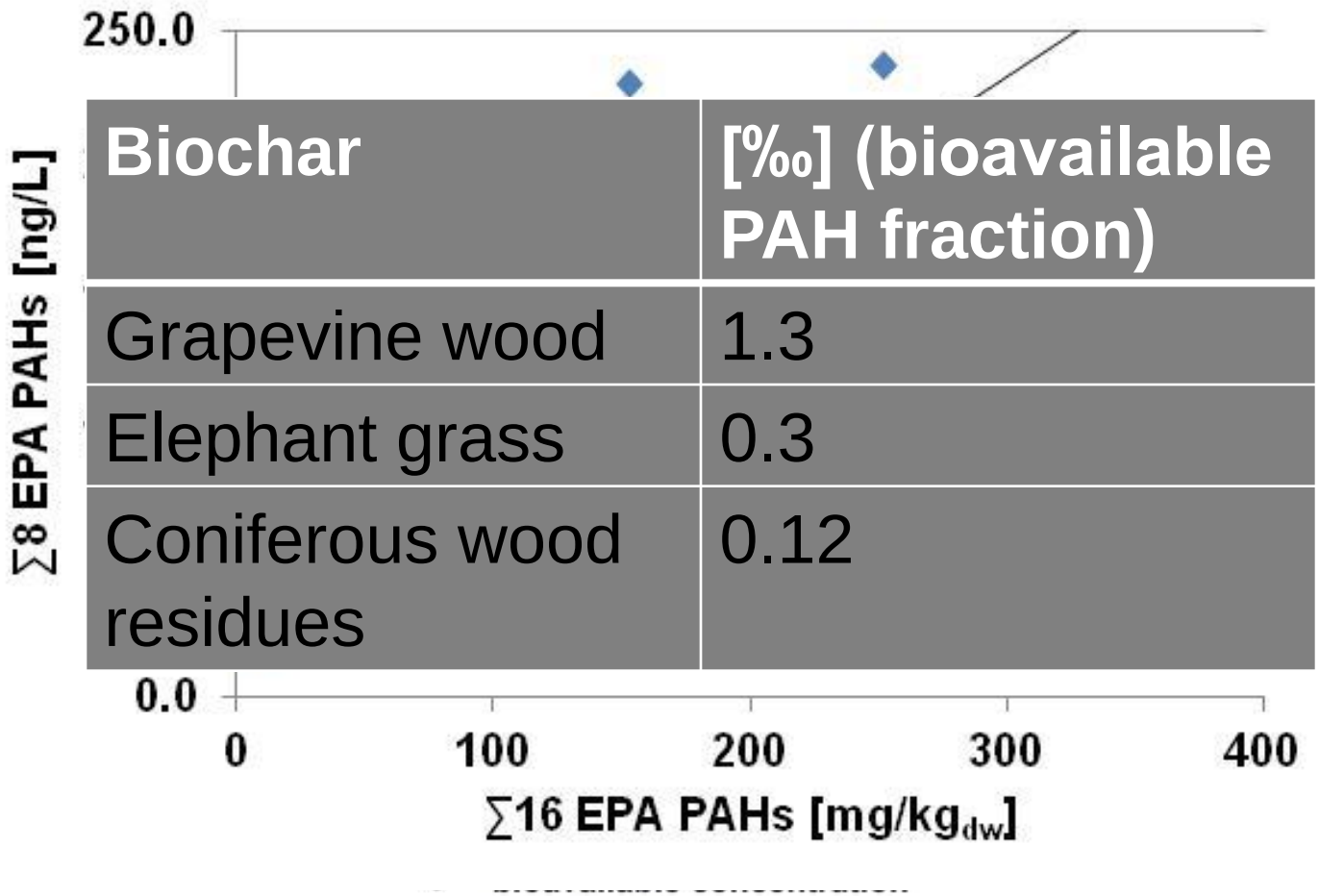
Technical Definition of Biochar

	EBC	IBI
C-content	> 50 %	> 60% / > 40 / > 10
H/Corg	< 0.7	< 0.7
Contaminents (HM)	Pb, Ni, Cr, Hg, Zn, Cu, Cd	Pb, Ni, Cr, Hg, Zn, Cu, Cd
Org. Contaminents	PAH, PCB, Dioxines, Furanes	PAH, PCB, Dioxines, Furanes
nutrients	declaration	declaration
BC, VOC, pH, BET, WHC	declaration	declaration
feedstock	positive liste	any
production	positive energy balance	any

Just an example: PAH threshold

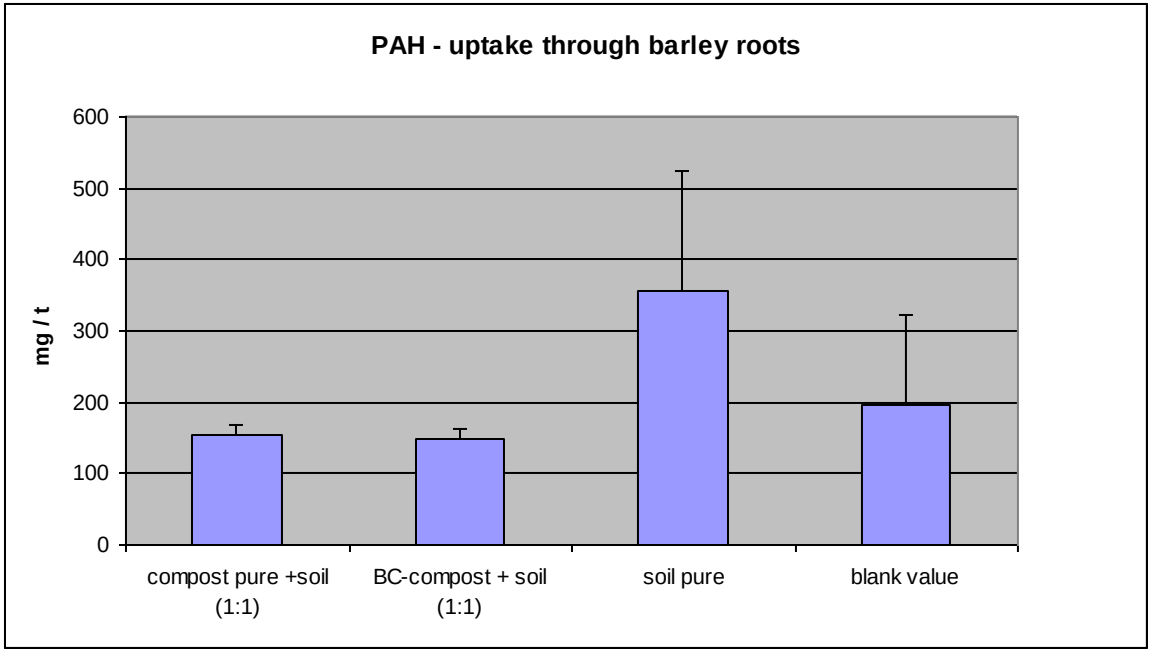
5.8 The biochar's PAH content (sum of the EPA's 16 priority pollutants) must be under 12 mg/kg DM for *basic* grade and under 4 mg/kg DM for *premium* grade biochar.

Total and bioavailable PAHs



Biochar	[‰] (bioavailable PAH fraction)
Grapevine wood	1.3
Elephant grass	0.3
Coniferous wood residues	0.12

PAH uptake by plant roots

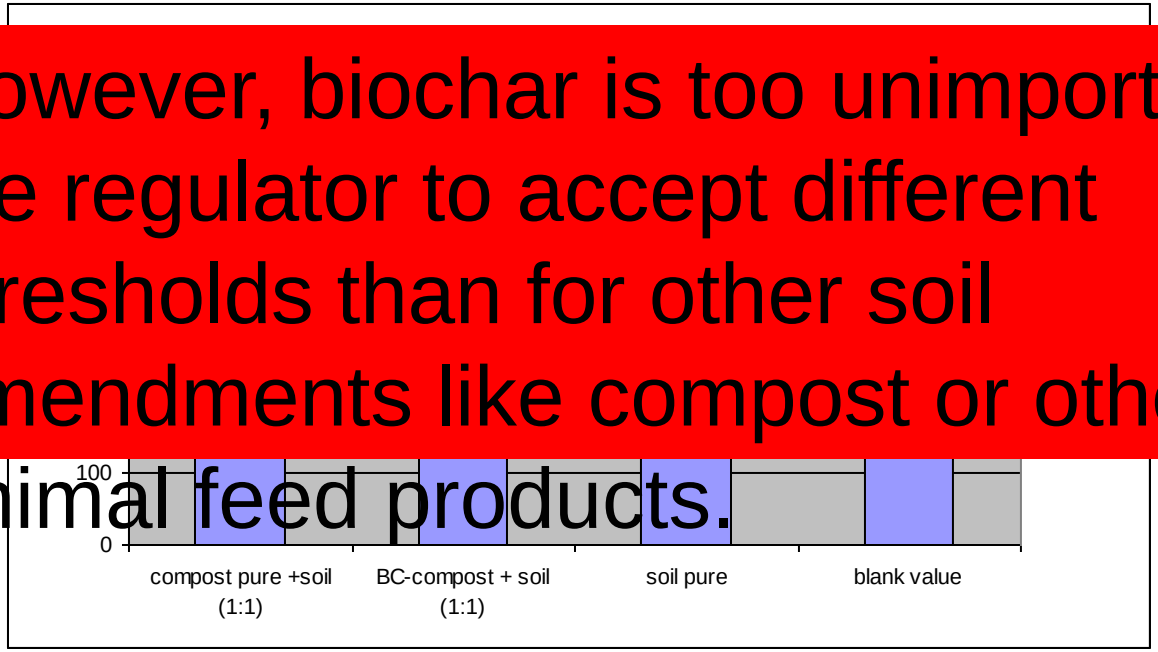


30% biochar in compost

equivalent to 900 t biochar / ha

PAH in biochar 9100 mg / t

PAH uptake by plant roots



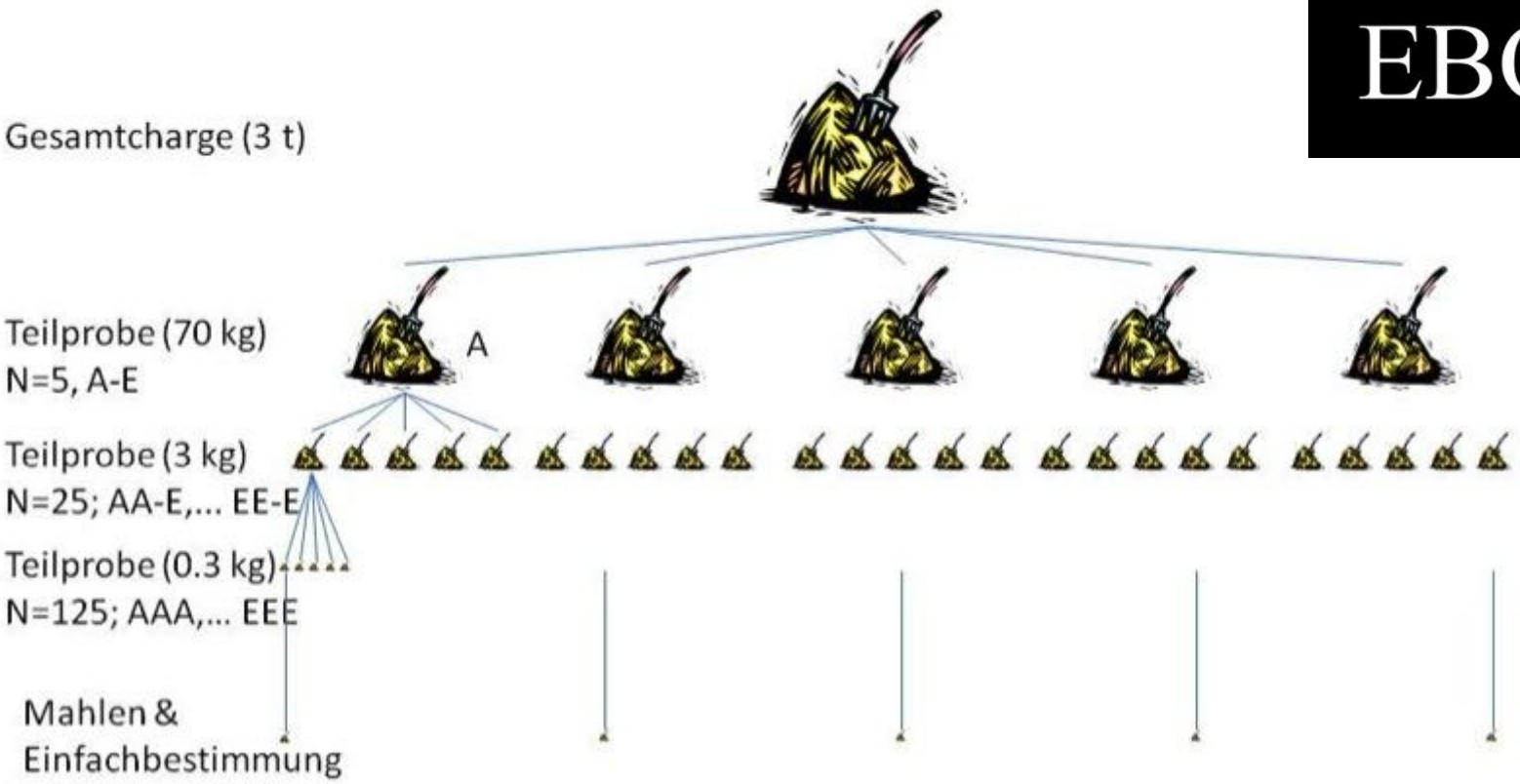
However, biochar is too unimportant for the regulator to accept different thresholds than for other soil amendments like compost or other animal feed products.

30% biochar in compost

equivalent to 900 t biochar / ha

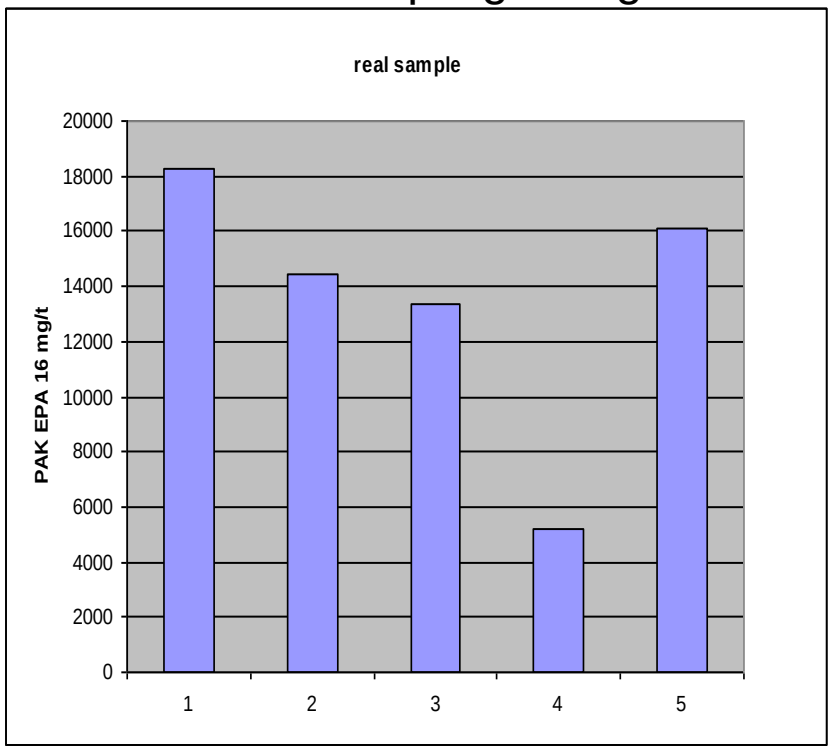
PAH in biochar 9100 mg / t

How to take samples ?

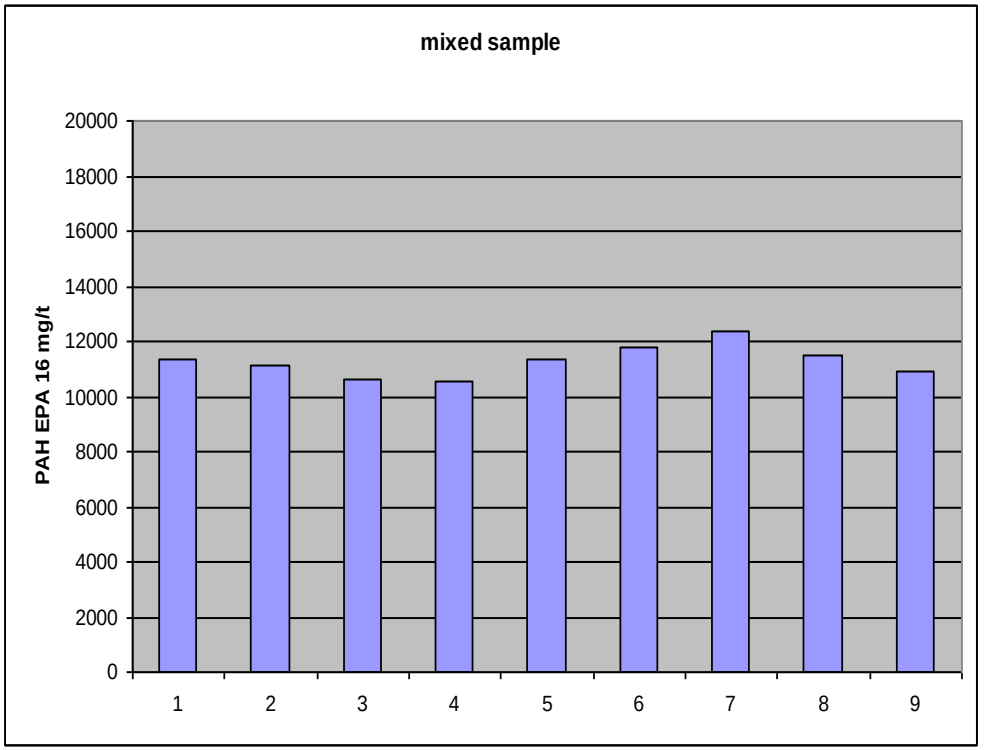


PAH values in real and mixed samples

Random sampling 120 g



Mixed sampling AAA - 3kg



Sample precision: 0.041

Pillars of the EBC-Certificate

Independent on-site control (governmental accredited: q.inspecta)

Independent sampling

Unified analytical methods (accredited labs)

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EUROFINS Umwelt Ost GmbH
Ndl. Freiberg

Prüfverfahren:	**Bestimmung:**
der Schüttdichte	DIN 51705
Probenvorbereitung - Probenteilung fester Brennstoffe	DIN 51701-3
des Wassergehaltes und der Analysenfeuchtigkeit (thermisches Verfahren)	DIN 51718; TGA 701 D4C
des Aschegehaltes	analog DIN 51719; TGA 701 D4C
des Brennwertes und Berechnung des Heizwertes Verfahren mit adiabatischem Mantel	DIN 51900, Teil 1 und Teil 3; Kalorimetersystem C 4000 A/ C 5000 DUO
des Gesamtgehaltes an Kohlenstoff, Wasserstoff und Stickstoff instrumentelle Methoden	DIN 51732; Analysenautomat Leco TRU SPEC CHN
des Schwefelgehaltes (Gesamtschwefel) instrumentelle Methoden	DIN 51724 Teil 3; Analysenautomat SC-144 DR
der Elementarzusammensetzung und Berechnung des Sauerstoffgehaltes	DIN 51733
des Gehaltes an Carbonat-Kohlenstoffdioxid	DIN 51726
der polyzyklischen aromatischen Kohlenwasserstoffe (PAK) mittels GC/MS	DIN EN 15527
von Polychlorierten Dibenzodioxinen (PCDD) und Dibenzofuranen (PCDF) und von polychlorierten Biphenylen (PCB) (FF)	AIR DF 100, HRMS
des pH-Wertes	analog DIN ISO 10390
der spezifischen elektrischen Leitfähigkeit	DIN ISO 11265
Salzgehalt - Leitfähigkeit des wässrigen Auszugs (N)	nach VDLUFA-Methodenbuch Bd. I, A 10.1.1
Probenahme und Probenvorbereitung an festen Brennstoffen zur Bestimmung der Gehalte an Spurenelementen	DIN 22022-1
von 62 Elementen durch Anwendung induktiv gekoppelter Plasma-Massenspektrometrie (ICP-MS)	DIN EN ISO 17294-2 (E 29)
von Quecksilber (Hg)	DIN EN 1483 (E 12)
der chemischen Zusammensetzung von Brennstoffaschen [und Schlacken]	DIN 51729, Teil 1, Teil 11 (Aufschluss, Messung: ICP)
von Ag, As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Se, Si, Sn, Sr, Ti, W, Zn, Zr	DIN EN ISO 11885 (E 22)

Methodes

ring trials

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Pillars of the EBC-Certificate

Independent on-site control (governmental approved: q.inspecta)

Independent sampling

Unified analytical methods (authorized labs)

Regular revision of standard by the scientific board of the EBC

Legally backed-up

Economical viable

Close to practice, understandable

Voluntary industrial standard

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Safeguarding Biochar quality

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- Ithaka Journal

The European Biochar Foundation

The European biochar foundation has the objective to promote sustainable biochar production and sustainable biochar application for environmental, agricultural and industrial use in Europe and the rest of the world.

The European biochar foundation achieves its objective by

1. Supporting and stimulating Biochar applied research and development in the domains of environment, agriculture, industrial applications, biochar production technologies and biochar feedstocks.
2. Promoting sustainable production and application of biochar by biochar knowledge dissemination by organising conferences, courses, masterclasses, summer schools workshops, and by the use of media (print and digital media) and any other means
3. Advising authorities, enterprises, non-governmental organizations, educational institutes and biochar feedstock producers, biochar producers and biochar end-users
4. Developing and implementing biochar certification schemes for sustainable biochar production and biochar application
5. Developing best practice advices and directives for the use of biochar in agriculture, for climate mitigation and optimising nutrient cycles
6. Controlling biochar certification schemes by auditing and certification and by authorizing organizations to certify biochar feedstock, biochar production and biochar application.
7. Participating in (inter)national cooperations, enterprises, foundations and other organizations
8. Taking and protecting Intellectual Property
9. And any other legal means

The European Biochar Foundation will be founded on 29th of August 2012.

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European Biochar Foundation

non for profit foundation

Supported by

- **EU-INTERREG IVb NSR Biochar and**
- **EU COST ACTION TD 1107**

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The Foundation has as its object:

Promoting sustainable biochar production and sustainable biochar applications for environmental, agricultural and industrial use in Europe and the rest of the world;