

COST Action TD1107 “Biochar as an Option for Sustainable Resource Management”



Welcome to COST Action TD1107 ‘Biochar as option for sustainable resource management’. We present to you today our 1st Newsletter.

The European Biochar Research Network (eBRN) & COST Action TD1107 “Biochar as an Option for Sustainable Resource Management” aims to interconnect knowledge in Biochar systems all over Europe. The aim is to connect researchers along with those involved with Biochar production, consulting, developing engineers and any other developments in Biochar with a European focus.

For more information on this COST Action and on Biochar research please visit our website: <http://cost.european-Biochar.org/en/home>

This Action aims at coordinating European Biochar research, bringing together researchers, stakeholders, and potential users from EU and candidate countries. This will be accomplished by annual Biochar Workshops, Short-Term Missions among young and senior researchers, Training Schools,

and an internet platform to monitor and streamline biochar research and development. Please have a look further in this newsletter about the Short Term Scientific Missions (STSM). The Action is subdivided into four working groups that focus on (i) biochar production and characterization (WG 1), (ii) land use implementation (WG 2), (iii) economic analysis including life cycle assessment (WG 3), and (iv) environmental impact assessment (WG 4). The diagram on page 2 shows the relationships between the different management and research instruments of the Action:

In our first newsletter we report on progress in individual working groups (WGs), on current Short Term Scientific Missions (STSM), and the 1st International Summer School Biochar “bio:char crossroads” that took place in 2012 in Germany. We also provide a short guide to our website: <http://cost.european-Biochar.org/en/home>

We are excited to share with you our efforts in discovering biochar during the course of this past year. This fascinating soil amendment was first used as part of terra preta, a type of very dark, fertile anthropogenic soil found in the Amazon basin. Terra preta owes its name to its very high charcoal content. This charcoal content has been looked at intensively by Action Chair Prof. Dr. Bruno Glaser at original sites in the remote jungles of South America.

Thank you for joining us in discovering Biochar!

Upcoming Events Not To Miss In Biochar!

2nd European Biochar Summer School

1 - 7 September 2013
Valais, Switzerland

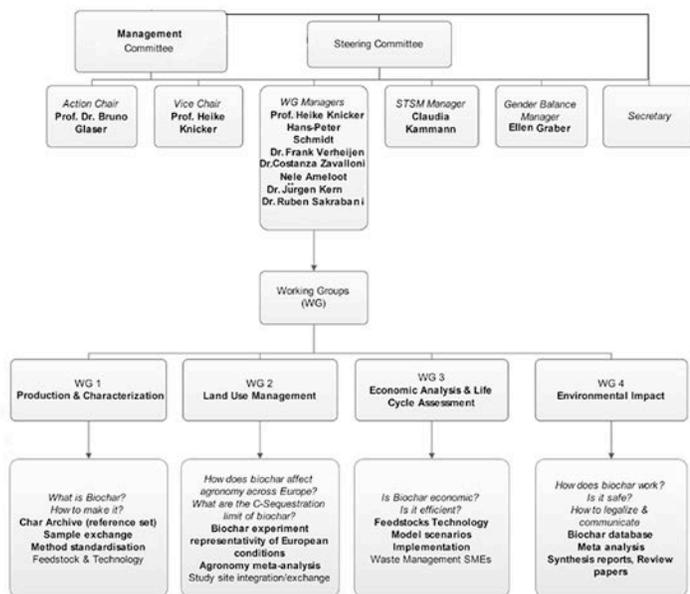
Biochars, Composts and Digestates. Production, Characterization, Regulation, Marketing, Uses and Environmental Impact (BCD 2013)

17 - 20 October 2013
Bari, Italy

EU COST Action Biochar and European Biochar Research Network: Working Groups, Management Committee and Stakeholder Meetings

21 - 24 October 2013
Near Budapest, Hungary





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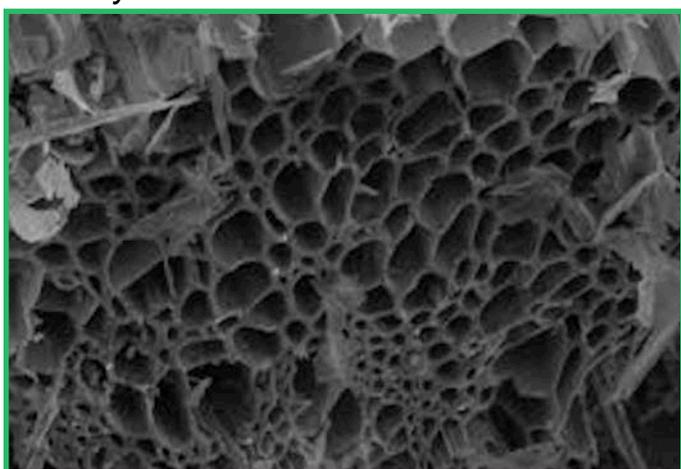
*STSM Candidates:
Aoife Brennan, Tiziana Pirelli and Ulrich Hanke*

Summer School Report: Valeria Zwart

Dr. Simon Shackley has left the COST Action and we wish him all the best. A new Manager for Working Group 3 will be chosen in October.



*Original terra preta soil in the Amazon region.
Photo by Matt Pike*



*SEM (Scanning electron microscopy)
photo of biochar, University of Limerick,
Ireland*

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Upcoming Events

British Biochar Foundation Conference : Sustainable Use and Production of Biochar in the UK

20 - 21 June 2013 in Oxford, UK

The conference is a unique event that aims to broaden the Biochar spectrum, bring together all those that will benefit, and launch an innovative industry at the same time. This low carbon, community economy event is being held at the Oxford Town Hall in Oxford, UK.

http://www.britishBiocharfoundation.org/?page_id=287

2nd European Biochar Summer School

1 - 7 September 2013 in Valais, Switzerland

The 2nd Annuald European Biochar Summer School will bring together 16 excellent young scientists with internationally recognized speakers from all sections of the international Biochar community in a workshop-seminar. Strong interaction with the students is a priority in the workshops, with Biochar characterization, Biochar production and environmental interaction of Biochar being among the major learning objectives.

www.delinat-institut.org/en/summerschool

Biochars, Composts and Digestates. Production, Characterization, Regulation, Marketing, Uses and Environmental Impact (BCD 2013)

17 - 20 October 2013 in Bari, Italy

The Conference aims to encompass several aspects and offer ample opportunity to explore many current and relevant issues of Biochar, Compost and Digestate Sciences and Applications by providing an interactive forum for exchange of ideas and joint discussion on recent scientific and practical results and current issues related to technological processes, analysis and characterization, sustainable uses and certification, regulation and marketing aspects.

<http://www.bcd2013.eu/>

Waste management meets Biochar - Perspectives for Climate Protection?

1 - 2 October 2013 in PIK Potsdam, Germany

3rd INTERREG NSR Biochar Conference & 74th ANS Symposium - For the 3rd time INTERREG and ANS e.V. (Germany) organize a joint conference with focus on Biochar. This year's idea is to bring together latest developments and practical implications from both fields - waste management and Biochar research. Experts from both fields have been working seperately until now, although their common aim is to foster sustainable waste management practices, material flow management, nutrient recycling and climate protection. The conference will bring together stakeholders from both fields, illustrate recent developments, identify synergistic effects and discuss practical examples.

<http://cost.european-biochar.org/en/ct/81-Waste-management-meets-Biochar---Perspectives-for--Climate-Protection%3F>

EU COST Action Biochar and European Biochar Research Network: Working Groups, Management Committee and Stakeholder Meetings

Joint Meeting & Workshops

21 - 24 October 2013 near Budapest, Hungary

The COST Action members and stakeholders will gather at the Biofarm conference center near Budapest for a joint meeting including individual Working Group meetings, a stakeholder meeting, an MC member meeting and an excursion to the 3R Agrocarbon Biochar production and test site.

<http://cost.european-Biochar.org/>

Table 1: Schedule for Hungary Meeting October 2013

Date	21 October Monday	22 October Tuesday	23 October Wednesday	24 October Thursday
Time				
9-11	WG1	WG2 & 4	MC Member meeting	Excursion 1
11-13	Discussion	Discussions		3R Technology
13-14	Lunch	Lunch	Lunch	Biofarm
14-16	WG1	WG3	Stakeholder	Budapest
16-18	Discussion	Discussion	meeting	Free time
	COST Conference			
	MC member meeting (COST MC members only)			
	Excursion: Optional			

Report/statements from the Working Groups (WG)

WG 1 - Biochar production and characterization

Working Group 1 is focusing on the relationship between production parameters, material properties, and the generalization of effects after soil application that can be deduced from the respective properties.

At the working group meeting in London (14th, 15th March 2013) we discussed the first analytical results of the three biochars that were mailed to and analyzed by various interested groups. Some statistical approaches of first analytical results of three Biochar types as well as procedures and tools for future analysis of Biochar characterization were evaluated. No absolute analytical values were considered, rather, only relative deviations from the mean. We discussed statistical methods for analyzing the final results, and Thomas Bucheli explained the Horwitz function (Horwitz 1982). Next steps for the ring trial include further analysis of the three COST Biochars until June 30 and statistical data evaluation. Results of this evaluation will be presented during the next WG meeting in Budapest.

WG 2 - Land Use Management

The aim of Working Group 2 (WG2) is to assess the potential of biochar to sequester carbon, enhance soil fertility and reduce soil erosion. In close collaboration with working group 4, WG2 is developing a survey of ongoing and concluded biochar experiments in Europe, and is analyzing how representative these experiments are of environmental, management and biochar factors. This work is expected to identify gaps and make recommendations for future research. In addition, this survey is expected to facilitate collaboration

between biochar researchers in Europe, while preventing duplication beyond what is required for scientific rigor.

At the working group meeting in London (14th, 15th March 2013) we discussed meta-analysis (analysis of several separate but similar experiments) tools for statistical evaluation of inhomogeneous data. WG2 discussed the best agronomic practice for biochar application and how to establish experimental field trials. For this purpose, it was decided to establish a FAQ (frequently asked questions) folder on the Action's internet site: <http://cost.european-biochar.org/en/home>, with a list of practical questions and answers to such inquiries as: What type of biochar do you use and why? What amount do you use and why? How to move forward was also discussed along with what could be analyzed and is of interest such as: 1) biochar and carbon stability, 2) effects on water retention, 3) effects on nutrients, and 4) albedo. In addition, there is a survey going on among COST participants to provide data for a meta-analysis. First results shall be presented at the next WG meeting in Budapest.

A further topic in WG 2 is the competition between biomass for soil vs. biomass for Biochar, or in other words, trade-offs between agronomic carbon vs. carbon sequestration units. A lot of carbon pools are changing in the soil after biochar application but we don't know how this will impact soil organic matter cycles in the future. The analysis could be done considering the impact on Europe using a similar approach as Woolf et al., 2010 (Nature Communication).

WG 3 - Economic analysis including life cycle assessment

The main goal of Working Group 3 is to exchange methodological approaches to estimate the economic effects and CO₂ mitigation potential of Biochars applied to agricultural soils as part of a life cycle assessment (LCA).

WG3 had an extended session during the London meeting of 14 and 15th March 2013. The main focus was on LCA and a review of main LCA studies on Biochar to date. This led to a fascinating discussion on the differences between 'attributorial' and 'consequential' LCA and the pros and cons of each approach and methodology. Food, land, climate change and energy were identified as important criteria for assessing Biochar projects. WG3 compiled a table of existing LCA studies amongst the COST Action partners. Little effort was spent so far on economic aspects of Biochar, though the need for revenue from feedstock gate-fees was mentioned.

WG 4 - Environmental impact assessment

Working Group 4 is expected to deliver the scientific basis for Biochar application across Europe. For this purpose, meta-analysis tools shall be applied to compare the effects of different Biochar systems across Europe's soil types, agro-ecosystems and climate regimes. In detail, the following topics are relevant:

How does BC impact soil physical, chemical, biological properties under controlled conditions?

How can we upscale from controlled experiments to the field scale (link to WG 2)?

Establishment of a Biochar database regarding ongoing controlled experiments across Europe and major highlights of their findings so far (link with WG 2).

Methods of analysis? How can we be sure that a soil method will be suitable for Biochar? How can we adapt existing soil methods for soils? How do we do this for soil physical, chemical and biological parameters? (Link with WG 1).

Carbon stability assessment and C sequestration potential (link to WG 3).

Ecological risk assessment: (i) prospective assessment, bioassays (biological standardization), pre-use assessment; (ii) retrospective assessment.

At the recent meeting in March 2013 in London, WG4 members discussed the following points:

- Linking mechanisms that influence Biochar on soil processes (physical, chemical and biological) in a controlled environment and up-scaling it to field conditions
- What challenges does this pose? Can they be linked to WG2?
- Meta-analysis tools to compare effects of Biochar on different systems across Europe.
- Report on findings from a representative survey relevant to WG4 based on questionnaire sent to EU COST Action colleagues
- Ecotoxicology – availability of tools and bioassays; link to risk assessment.
- Biochar as a potential substitute to culture media deriving from peatlands.
- Cross linkages between WGs.

The action from this discussion is a formulation of a review paper that considers how the scaling of experiments influences Biochar effects on various soil and plant parameters that are being monitored. Ruben Sakrabani has given a set of tasks for each member of WG4 to report back to help formulate this paper. We hope to discuss the progress of this during our next meeting in Budapest in October 2013.

Reports from the conferences in Chania and London

1st Biochar COST Action Workshop and Management Committee Meeting, 24 September 2012 Chania, Crete, Greece



The first Biochar COST Action meeting was organized by Prof. Dimitris Kalderis from the Technological Institute of Education of Crete and Prof. Evan Diamadopoulos from the Technical University of Crete. The excellent organization and pleasant atmosphere enabled an inspiring meeting. The participants were welcomed by Prof. Dr. Bruno Glaser from the Martin-Luther-University Halle-Wittenberg, the Chair of this Action. Dr. Michael Mente (German Geological Survey BGR) also introduced himself as COST Rapporteur for the ESSEM Domain, accompanying and observing the advances of the Action. Dr. Michael Mente gave some advice at the end of the meeting, emphasizing the importance of the involvement of researchers, commercial producers and potential users all at the same time.

The conference in the beautiful port city of Chania also included a range of fascinating and cutting-edge presentations on current Biochar research in Europe. The topics included Biochar characterization, its

climate change mitigation potential, and its interactions with soil, water and nitrogen. The Action Chair Prof. Dr. Bruno Glaser presented field trials in Germany. CO2 certificate trading and Biochar production were also discussed.

Joint Working Group Meeting, 14 & 15 March 2013 London, UK

Meeting in London, one of the world's leading global cities, was appropriate for a topic with such wide-reaching potential such as Biochar. The Working Groups discussed their progress, which has been summarized elsewhere in newsletter.

Exciting and important topics were discussed such as Biochar use on contaminated land, Biochar use in urban soils, the use of specifically local waste-derived Biochars. Other topics included Pyrolytic Stoves and Biochar, how to evaluate the safety and

quality of Biochar, and the aging process, i.e., how Biochar changes over time in the soil. There was also a glimpse in to the future with an introduction to

the the Horizon 2020 Proposal and the Knowledge-based bioeconomy.



Special Report on Research:

Ms. Nele Ameloot, Department of Soil Management, Ghent University, Belgium

Interaction Between Biochar Stability and Soil Micro-organisms

Biochar is more recalcitrant, or “uncooperative” in soil than its original feedstock. An increasing number of studies report appreciably greater C-mineralization from soils amended with Biochar than in unamended soils. Mineralization is the process through which an organic substance becomes impregnated by inorganic substances. Soil organisms are believed to play a central role in this process. Indirect and direct effects determine the interaction between Biochar and soil organisms. Indirectly, Biochar changes soil chemical and physical properties. In a direct way, volatile Biochar compounds can be used as a food source by microorganisms.

Nele's research included both short term and long term effects of Biochar additions on soil organisms were studied. Analysis of microbial properties of

several field trials suggested that in the long term Biochar amended plots tended to have lower emissions than unamended control plots. Surprisingly, these lower emissions were not accompanied by major shifts in microbial community composition, but microbial activity decreased in the Biochar plots.

Nele also conducted research on the molecular-level biochemical composition of Biochar in relation to its stability, the compatibility of soil microbial assays with Biochar amended soils, the interaction between Biochar, soil organisms and native soil organic matter and the mechanisms of N₂O emission reductions from Biochar amended soils.



Short Term Scientific Missions (STSMs)

Aims and purposes of STSMs in this Biochar COST Action

Short Term Scientific Missions (STSMs) are exchange visits for young scientists (< PhD + 8 years) within COST countries that aim at strengthening existing research networks by allowing scientists to go to an institution or laboratory in another COST Country. Once there, these young scientists learn a myriad number of things, some of which include:

- Fostering collaboration
- Learning new techniques
- Making measurements using instruments and/or methods not available in their own institution/laboratory

For detailed information on STSMs and application procedures visit our website at <http://cost.european-biochar.org/en/stsms>.

STSM Profile: Aoife Brennan



University of Strathclyde, Glasgow

Aoife Brennan from the University of Strathclyde, UK, was awarded a three month STSM to collaborate with Dr. Eduardo Moreno Jimenez at the Universidad Autónoma de Madrid, Spain. The STSM investigated plant responses to amending field contaminated soils with different Biochars through a series of growth chamber experiments using maize.

Their experimental findings that char addition to contaminated soils leads to improved plant health and reduced contaminant uptake. This further highlights the potential beneficial effects of Biochar amendment in contaminated soils in the context of re-establishing plant cover in otherwise harsh conditions.

STSM Profile: Tiziana Pirelli

University of Udine, Italy

The STSM allowed for the establishment of a new research collaboration between the Department of Agriculture and Environmental Sciences of the University of Udine (Italy) and the Institute of Soil, Water and Environmental Sciences of the Volcani Center, ARO, in Israel.

Nitrogen is a very important part of agriculture, as is the issue of nitrogen retention in soils. If Biochar could aid in reducing Nitrogen fertilizer depletion in soils then research would be compelling.

The purpose of this Short Term Scientific Mission was to learn techniques for studying interactions between compounds in a liquid phase and a solid adsorbent, and to learn to interpret the results. The specific goal was to concentrate on Biochar and nitrogen (N) forms, in particular investigating the phenomena of adsorption of various N species on Biochar and the availability of the adsorbed forms. Ultimately, the work begun during the STSM will help to clarify if Biochar could contribute to reducing N fertilizer losses in agricultural soil, defining some of the mechanisms involved in the capability of Biochar to retain N fertilizer, and developing Biochar-based fertilizers.



STSM Profile: Ulrich Hanke

Martin-Luther-University Halle-Wittenberg, Germany

The focus of Ulrich Hanke's STSM is to study Biochar with Fast Field Cycling Nuclear Magnetic Resonance Relaxation (FFC NMRR) at Università degli Studi di Palermo in Italy. Pellegrino Conte is an expert for NMRR on natural porous materials and is hosting the research.

Ulrich is conducting experiments to investigate the physico-chemical properties of Hydrochars and Pyrochars from various feedstocks. The city of Palermo is located at the north coast of Sicily and the Mediterranean lifestyle there is a delightful place for research. Ulrich Hanke is greatly appreciating the opportunity to participate in COST Action TD1107 both professionally and personally.



Report on the “bio : char crossroads” Summer School, Potsdam, Germany

One of the key components of the COST Action is cooperation and one of our strategies for this is training sessions and workshops. At training schools, there is a chance to trade information, learn new techniques and connect with other scientists. The 1st International Summer School Biochar “bio: char crossroads” took place in Potsdam, Germany on September 9-16, 2012. Organized by the Leibniz Institute for Agricultural Engineering in the framework of COST Action, it was also supported by PEARLS - Potsdam Research Network and Martin-Luther-Universität Halle-Wittenberg. The goal of this summer school was to enhance Biochar research worldwide and to contribute to the sustainable development of this research field.

This intensive September week offered twenty-three young scientists and researchers from all over the world a unique platform for training, information sharing, and networking. The participants were PhD students who came from countries including: Germany, Spain, Denmark, United Kingdom, Italy, Norway, China, India, and Malaysia. Over twenty international and national experts presented the latest results of different research fields and discussed the future research needs, among them were : Bruno

Glaser from the Department of Soil Biogeochemistry of the University of Halle, Germany, Claudia Kammann from the Institute for Plant Ecology, University of Giessen, Germany , Peter Kuikman from Alterra, Wageningen University, Netherlands, Hermann Lotze-Campen from the Potsdam Institute for Climate Impact Research (PIK), Germany, David Wayne, Board member of the International Biochar Initiative, UK, Heike Knicker from the Institute of Natural Resources and Agrobiolology of Sevilla, Spain, Ellen Graber from the Volcani Center of the Agricultural Research Organization, Israel and many others.

The integrated evaluation of the summer school, which took place every day and at the end of the week, showed that the participants acquired a great deal of new information and skills. Although they wished for more extended discussions and wider possibilities to work on their personal research topics with others, the participants were content with the learning and networking opportunities as well as the atmosphere as a whole and were inspired to come back to their research work with renewed sense of vigor and encouragement.



Paul Anderson demonstrating a homemade stove for Biochar production.

Brief Guide to the COST Action TD 1107 Website

[Interactive map of Biochar field trials in Europe](#)



The Biochar COST Action website aims at displaying and interconnecting the existing and emerging European Biochar Research Network (eBRN). Our online resource features an interactive map which allows stakeholders to spot and enter locations of Biochar field trials. The news section provides updates on recent developments and announces Biochar events. Reports from Management Committee and Working Group meetings as well as publications can be downloaded.

We are currently focusing on an extensive database that displays publications, resources, institutions, skills, research interests and projects as well as field trials with coordinates. This database will enable stakeholders such as Biochar producers, researchers, applicants and partners to connect with the persons that match their interests or needs. STSM candidates will be able to find host institutions offering the best environment for their projects.