Development of EU/MS/REACH mandatory permits and policy support towards improved European regulations and law harmonization for biochar industrial production, safe products and placing on the market.
REFERTIL FOCUS

- DEVELOPING BIOCHAR science, proven industrial technology, products and applications for safe & economical transformation of the organic by-product/waste streams from agri/food industries,
- Recycling of byproducts and bio-wastes into safe biochar that reduce the dependence on mined, non-renewable & imported Phosphorus supply,
- Tests in 7 countries, 2000 tons compost + 100 tons biochar. Over 500 different biochar samples examined/tested in 4 years.
- Contributing to the international standardization and legal permitting of biochar products, and
- BIOCHAR POLICY SUPPORT to the European Commission DG GROW + other DG’s for FERTILIZER REGULATION REVISION and EU28 law harmonization.

Converting science into legalized industrial practice
Background

- Biochar & carbon bio-refinery specialization since +30 years.
- Coordinator/key tech designer for large scale EU biochar S&T research projects since 2002.

The 2nd generation 3R biochar pyrolysis pilot for woody material tests. **1990-1995**

The 3rd generation 3R biochar pyrolysis field demo plant. Designed for all type of organic materials. **2004-2015**
**REFERTIL TRL Technology Readiness Level 1-9**

EU COMMUNITY RESEARCH PROGRAMMES – SYSTEM RTD
Commission Decision C(2013)8631

**BASIC RESEARCH**

TRL 1 – basic principles observed
TRL 2 – technology concept formulated
TRL 3 – experimental proof of concept
TRL 4 – technology validated in lab 1980’s

**APPLIED S&T RESEARCH pilot plant**

TRL 5 – technology validated in industrially relevant environment 1990-1995
TRL 6 – technology demonstrated in industrially relevant environment

EU FP5 MULTI FUEL 2002-2005

**APPLIED S&T RESEARCH field demo plant**

TRL 7 – system prototype demonstration in operational environment

EU FP6 PROTECTOR 2005-2009

TRL 8 – system complete and qualified

**APPLIED S&T RESEARCH industrialization 2016**

TRL 9 – actual system proven in operational environment, competitive manufacturing >5k - 20k t/y throughputs.

EU FP7 EFERTIL
Biochar status
Sept 30, 2015

MARKET
Mandatory biochar permits and commercial certificates in the EU

Manufacturing/ import/ placing on the market and using of all types of biochar products in the EU require mandatory Authority permits and certificates:

1. Member State Authority permits for biochar production.
2. Member State Authority permit for biochar applications.
   - Valid for issuing MS only.
   - Mutual Recognition (EC 764/2008) procedure needs to be extended to other MS.
   - Note: EC 2003/2003 Fertilizer Regulation revision is under progress to include biochar, EC BIOCHAR valid for EU28. TIME: VERY SOON.

3. REACH registration (in 2015 >10 t/y, from 2018 >1 t/y).
4. Extended Producer Responsibility certificate.

Voluntarily biochar certifications: no any legal effects!
FERTILISER REGULATION (EC. NO. 2003/2003)
BACKGROUND

• Lays down rules relating to the placing on the market of mineral fertilisers (as of EC fertilisers).
• EC fertilisers can be produced and sold in Europe 28 (including Switzerland).
• **Only mineral fertilisers have been regulated** at the EU 28 level.
• Did **not set rules relating to organic fertilisers and soil improver** products.
• In current form it is **not applicable for biochar products**.
• Does not affect the 'national fertilisers’.
• The producers can chose between 'EC fertilisers' or 'National fertilisers'.
• **Mutual Recognition** (Reg. (EC) No 764/2008) for intracommunity movement of national registered fertilisers. Barrier for Mutual Recognition: **The MS legislations are not identical.**
## CURRENT LEGISLATIONS

<table>
<thead>
<tr>
<th>REGULATION LEVEL</th>
<th>EC - FERTILISER</th>
<th>NATIONAL FERTILISERS</th>
<th>ORGANIC soil improvers and FERTILISERS (compost and biochar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU level</td>
<td>EU level</td>
<td>National level</td>
<td>National level</td>
</tr>
<tr>
<td>CONTENT</td>
<td>ONLY quality specification</td>
<td>Quality specification, maximal level of contaminants (not identical in all MS)</td>
<td>Quality specification, maximal level of contaminants (not identical in all MS)</td>
</tr>
<tr>
<td>PERMIT AREA</td>
<td>EU28 Permit</td>
<td>National Permit</td>
<td>National Permit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mutual Recognition</td>
<td>Mutual Recognition</td>
</tr>
</tbody>
</table>

**OBJECTIVE: FULL HARMONISATION**

REFERTIL is providing a strong policy support.
REFERTIL provided a strong policy support for the EU Commission in revision of the Fertiliser Regulation for inclusion of biochar - as safe organic fertiliser and soil additive:

- **DEVELOPMENT OF S&T KNOWLEDGE**: REFERTIL biochar applied scientific research, industrial engineering, legal and economical aspects under market based commercial conditions.

- **SETTING UP QUALITY AND SAFETY CRITERIA FOR BIOCHAR** (plant based, bone based, waste derived):
  - Includes mandatory elements with limit values
  - Declaration based elements for self validation
  - Includes risk assessment (soil and groundwater)
  - Development of harmonized and standardized analytical measurements for determination of the physical-chemical properties, potentially toxic element content and organic pollutants in the biochar materials.

REFERTIL biochar policy support detailed report submitted
Animal Bone bioChar (ABC)
Organic Phosphorus fertiliser, soil improver, growing media

Plant based biochar (PBC)
Soil improver, growing media

Member States can define more strict limit.

Soil improver permit PAH19<1mg/kg criteria already used since 2006.

The REFERTIL partner “The Environmental Testing Laboratory of WESSLING” is the first laboratory in Europe who obtained accredited status for comprehensive analyses of biochar samples.
Refertil harmonized and standardized biochar analytical measurements

- To determine quality & safety performance of biochar, internationally accredited methods and standards are needed.
- The accreditation of the analytical activities related to the REFERTIL project was an important step.
- Supporting the legal standardization and mandatory permit process of biochar industrial production.
- Most of the standards selected for biochar qualification were chosen from among currently valid CEN/ISO standards.
- Biochar is a new product, for a number of parameters it was necessary to adopt soil or waste analytical methods, which were validated to assess their analytical performance.
- The Environmental Testing Laboratory of WESSLING is the first laboratory in Europe who OBTAINED ACCREDITED STATUS, under Wessling-NAT-1-1398/2012 (2014.10.08) for comprehensive analyses of biochar samples.

There is one fit for all biochar technology and product.
RATIONALE FOR REFERTIL RECOMMENDED LIMIT VALUES AND QUALITY CRITERIA FOR BIOCHAR PRODUCTS

1. SAFETY & QUALITY: There should be no overall adverse environmental, ecological and human health impact from the use of biochar products in the open soil environment:
   • Clear and strict definition of the biochar product quality. → **N-P-K minimum nutrient content key indicator.**
   • Clear and strict definition of the limit values for contaminants:
     • **PAHs**: Target pollutants - key indicator.
     • **Potential toxic elements**: target pollutants key indicator.
     • **PCB$_7$**: indicator also for PCDD/F.

2. MARKET REGULATION: poor quality biochar products must exclude from the market.

3. AUTHORITY CONTROL: Authority permits (according to EU/MS regulations) + REACH for production and use biochar over 1 t/y capacity.

4. BIOCHAR PRODUCTION criteria for safe biochar production.

5. BIOCHAR ECONOMY: realistic, commercial market demanded and competitive economical scenario.

For the interest and benefits of the SME farmers and Users
PAH<sub>16</sub> vs. PAH<sub>19</sub>

- During the REFERTIL project PAH<sub>16</sub> limit value was defined <6 mg/kg *
- Large number of biochar samples were examined (Denmark, Italy, France, UK, Spain, Hungary). In some cases high PAH content was detected.
- The occurrence of PAHs in biochar primarily derive from obsolete, low grade and inefficient pyrolysis condition.
- Safe biochar samples (measured by accredited methods) all contained <1 mg/kg PAH<sub>16</sub>.
- Typical PAH<sub>16</sub> components in biochars: mostly naphthalene and phenanthrene, in some samples: anthracene.
- PAH<sub>19</sub> concentration can be twice as much as PAH<sub>16</sub>. 1- and 2-methylnaphthalenes (measured only under PAH<sub>19</sub>) are dominant.

PAH19 is key indicator for biochar safety, stability and qualified production performance conditions.
Methods for analysis:

- The concentration of PAHs in biochar was determined by **CEN/TS 16181:2013** standard with a GC-MS method after carbon disulfide extraction.
- The use of carbon disulfide during sample preparation was selected and proved by WESSLING.
Comparison of the criteria for PTEs and organic pollutants

<table>
<thead>
<tr>
<th>Contaminants (mg/kg)</th>
<th>EU Legislation</th>
<th>EU proposal</th>
<th>Biochar Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Eco Labels Soil improvers</td>
<td>EoW</td>
<td>IBI (USA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High grade</td>
</tr>
<tr>
<td>As</td>
<td>10</td>
<td>na</td>
<td>12-100</td>
</tr>
<tr>
<td>Cd</td>
<td>1</td>
<td>1.5</td>
<td>1.4-39</td>
</tr>
<tr>
<td>Cr (total)</td>
<td>100</td>
<td>100</td>
<td>64-1.2k</td>
</tr>
<tr>
<td>Cr (VI)</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Cu</td>
<td>100</td>
<td>200</td>
<td>63-1.5k</td>
</tr>
<tr>
<td>Hg</td>
<td>1</td>
<td>1</td>
<td>1-17</td>
</tr>
<tr>
<td>Ni</td>
<td>50</td>
<td>50</td>
<td>47-600</td>
</tr>
<tr>
<td>Pb</td>
<td>100</td>
<td>120</td>
<td>70-500</td>
</tr>
<tr>
<td>Zn</td>
<td>300</td>
<td>600</td>
<td>2k -7k</td>
</tr>
<tr>
<td>PAH</td>
<td>na</td>
<td>6</td>
<td>6-20</td>
</tr>
<tr>
<td>PCB</td>
<td>na</td>
<td>-</td>
<td>0.2-0.5</td>
</tr>
<tr>
<td>PCDD/F (ng/ITEQ/kg)</td>
<td>na</td>
<td>-</td>
<td>9</td>
</tr>
</tbody>
</table>
BIOCHAR and the REACH


• Biochar is also subject to REACH registration (under Article 6) for manufacturing, importing, using and/or placing on the market in quantities of 1 ton/year or more.

✓ < 1 ton/year = research quantity.
✓ > 1 ton/year = commercial quantity. REACH/permit mandatory.
✓ Biochar economical industrial scales in throughputs /year:
  ✓ Small scale: >2,000-3,000 t/y
  ✓ Medium scale: >3,000-10,000 t/y
  ✓ Large scale: >10,000 t/y usually 20,000 t/y
Extended Producer Responsibility (EPR)

- OECD: EPR is “an environmental policy approach in which a producer’s responsibility for a product is extended to the post consumer stage of a product’s life cycle”.

- Biochar is irrevocably applied to soil. Therefore, legal and economical integration of the environmental costs of biochar use and biochar market price needed vs biochar quality/safety.

- Producers/actors in the distribution chain having EPR.

- In practice, EPR implies that biochar producers (and/or distributors) having responsibility for the environmental and product safety of the product with “take back” and remediation responsibility of error product.

- Biochar product safety and application conditions are specified in the mandatory MS / EU Authority permits and sufficiently specified in the product labeling information towards user.

EU priorities for prevention, reuse, recycling and resource efficiency
Installation and biochar production PERMITS:

LOCAL PERMITS – HU CASE STUDY:

1) Industrial Safety Authority. MAIN AUTHORITY
2) Environmental and Water Protection Agency.
3) Human Health Inspection.
4) Regional Building Construction Office.
5) Fire Protection Authority.
6) Soil and Plant Protection Authority.
7) Animal Health Inspection.
8) Workers Safety Authority.
9) Electric Power Supply Authority.
10) Road Inspection.
11) Forest and Natural Conservation Inspection.
12) Local Municipality and public acceptance.
13) aso……………

+ REACH (>1t/y, mandatory from 2018).

Challenging but mandatory permits
BIOCHAR PRODUCT APPLICATION AUTHORITY PERMIT
HUNGARY CASE STUDY

- National Authority in Hungary: National Food Chan Safety Office
- HU biochar permit number: 02.5/67/7/2009, upgraded in 2015: meets the past 5 years EU regulation changes.
- Applicant: Terra Humana Ltd.,
- Product: Animal Bone bioChar + fungus, yield enhancing substance.
- The permit sets the quality and safety requirements: minimum nutrient content, maximum level of contaminants and product labelling conditions in line with CLP Regulation.
- The permit and test procedure has been executed in the accredited test fields and accredited laboratories of the Government Authority between 2005-2009.
- HU permit extension to other MS: by Mutual Recognition (EC 764/2008).
ABC biochar quality and safety parameters in the permit (FVM decree 36/2006 V.18. HU)

**PAH$_{19}$ = key quality indicator for biochar safety and processing technology performance qualification/conditions.**

The occurrence of PAHs in biochar derive from obsolete, low grade and inefficient pyrolysis technology design and conditions.
THANK YOU!

CONTACT:

Edward Someus
Coordinator, biochar S&T key tech designer
E-mail: biochar@3ragrocarbon.com

http://www.refertil.info
http://www.agrocarbon.com

Progressive biochar cooperation welcome in any S&T, product/application fields.