



REFERTIL

Recycling for sustainable resource management

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REFERTIL PROJECT CLOSING SUMMARY September 30, 2015

Reducing mineral fertilisers and chemicals use in agriculture by recycling treated organic waste as compost and bio-char products

Improvement of comprehensive bio-waste transformation and nutrient recovery treatment processes for production of combined biochar and compost natural products



Intensive farming practices and human activities have disturbed the natural cycles of nitrogen and phosphorus. Industrial agriculture relies on continual inputs of mined and non-renewable phosphorus and energy-intensive nitrogen supply.



Food grade bone meal input for ABC



3R zero emission biochar production unit



ABC: Animal Bone bioChar product

Summary of the REFERTIL results and main findings

1. The main organic by-product and waste streams from EU agriculture and food industries identified, quantified and qualified.
2. 7 different types of biochar and 15 compost technologies evaluated and ranked from market competitive industrial efficiency point of view.
3. The currently used biochar production processes, quality and safety of the final biochar products improved, “eco-safe” product and **high quality biochar criterion systems established**.
4. The 3R biochar technology completed and qualified according to the Commission Decision C(2013)8631 **Technology Readiness Level TRL8** and prepared for competitive manufacturing of biochar with **TRL9 industrial replication model implementation in 2016**.
5. Comprehensive and detailed **biochar policy, law harmonization system and common quality standard requirements** and recommendations worked out for the European Commission related to the **revision of the Fertiliser Regulation** (Reg. (EC) No 2003/2003).
6. Biochar production/applications **EU/MS Authority permits with REACH** interlink, and consideration of Extended Producer Responsibility developed.
7. Comprehensive and **accredited laboratory evaluations** made for all the material streams by Wessling laboratories.
8. The currently used compost production processes, quality and safety of the final compost products improved, compost criterion systems established.
9. **34 tons of different types of biochar and 600 tons of compost samples produced** under optimized process conditions as best available technology (BAT) demonstration.
10. Biochar / compost products successfully **tested, demonstrated and validated** in six countries. Validation of the recycled products against ‘end-of-waste’ criteria with compost and biochar in field crop trials under different conditions, incl. environmental feasibility and safety evaluations.
11. **Biochar formulation systems** and microbiological strategy for fungi, bacteria and mycorrhizal fungi developed.
12. Biochar technical, economical, carbon cost, environmental, social and climate mitigation analysis for benefits and risks made, - including **biochar business plan and industrial implementation feasibility** for Europe and Australia under market competitive industrial/commercial conditions.
13. EU-wide **information, dissemination and preparation of exploitation** of the results made, for the interest and benefits of the SME farmers with interlink to wide range of stakeholders.



REFERTIL biochar recommendations

Biochar is specifically manufactured with specific carbon quality and specific goal for irrevocable application in open soil ecological environment, related to agricultural productions, carbon sequestration purposes and soil remediation. For all biochar applications specific product quality, safety and legal aspects related. **ABC Animal Bone bioChar is organic fertilizer** with 30% concentrated P₂O₅ nutrient content and **plant based biochar is soil improver** with high carbon content. Plant based biochar does not supply nutrients with economical interest.

1. **There is no one fit for all biochar technology and product** to be applied in different soil, climatic and cultivation conditions.
2. **Biochar always works;** if not than the selected product quality or type and/or the application method is wrong.
3. **ABC** dose is usually from **200 kg/ha to 1000 kg/ha. Plant based biochar** dose is usually from **5 tons/ha to 20 tons/ha.**
4. Biochar product is always to be purchased from EU/MS Authority permitted producer/supplier only with Extended Producer Responsibility certificate. **The quality/performance of the biochar production technology is the key definition factor for the biochar quality and safety.**
5. Before purchase of biochar **define your application strategy**, collect soil and cultivation info than thereafter consult the producer's experts to jointly define which type of biochar product would be optimal and how to apply.
6. All biochar manufacturing, importing, placing on the market and use **above 1 t/y capacity must be mandatory EU/MS Authority permitted** and have Extended Producer Responsibility certificate as well. Voluntarily biochar certificates having no any legal effects and validity in the EU.
The following biochar permits and certifications needed in the EU:
 - a) **Member State Authority permits for biochar production.**
 - b) **Member State Authority permits for biochar applications.** Valid for issuing MS only. EC 2003/2003 Fertilizer Regulation revision is under progress to include biochar, EC BIOCHAR valid for EU28.
 - c) **REACH registration** (in 2015 >10 t/y, from 2018 >1 t/y).
 - d) **Extended Producer Responsibility** certificate.
7. Formulations of the biochar is significantly improving the application value.
8. If formulation is made with additive of organic certified products and/or soil microbiological adaptation, than the biochar remaining certified organic.
9. **No biochar should be used above 6 mg/kg PAH16** and in some MS cases < 1 mg/kg PAH19. PAHs are target contaminations and total PAH is biochar quality performance key indicator.
10. Biochar application to soil is irreversible; therefore, **careful** consideration and **application strategy** need to be made.

About the REFERTIL project

REFERTIL provided EU-28 standardized, advanced, and comprehensive bio-waste treatment and nutrient recovery process improvements towards zero emission performance with eco-safe output compost and biochar products. The REFERTIL development works covered fields from applied science to economical industrial scale ups, including industrial technology engineering for the benefits and interest of the SME farmers. The improved output products were safe, economical and standardized compost and biochar products containing phosphorous and nitrogen that can be economically and beneficially used by SME farmers. As a result, both food and environmental safety is improved, while a new circular bio-economy has been generated.

The REFERTIL consortium



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The REFERTIL project is co-funded by the European Union, Seventh Framework Programme under Grant Agreement number 289785. 2011-2015.

Disclaimer - The views and opinions expressed are purely those of the writers and may not in any circumstances be regarded as stating an official position of the European Commission.



REFERTIL compost product



REFERTIL field trial programme



Compost and biochar quality control