

Project title

**ENVIRONMENTAL AND ECONOMIC BENEFITS FROM BIOCHAR  
CLUSTERS IN THE CENTRAL AREA**

project number

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**BIOCHAR STATUS UNDER INTERNATIONAL LAW AND  
REGULATORY ISSUES FOR THE PRACTICAL  
APPLICATION**



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## Abstract

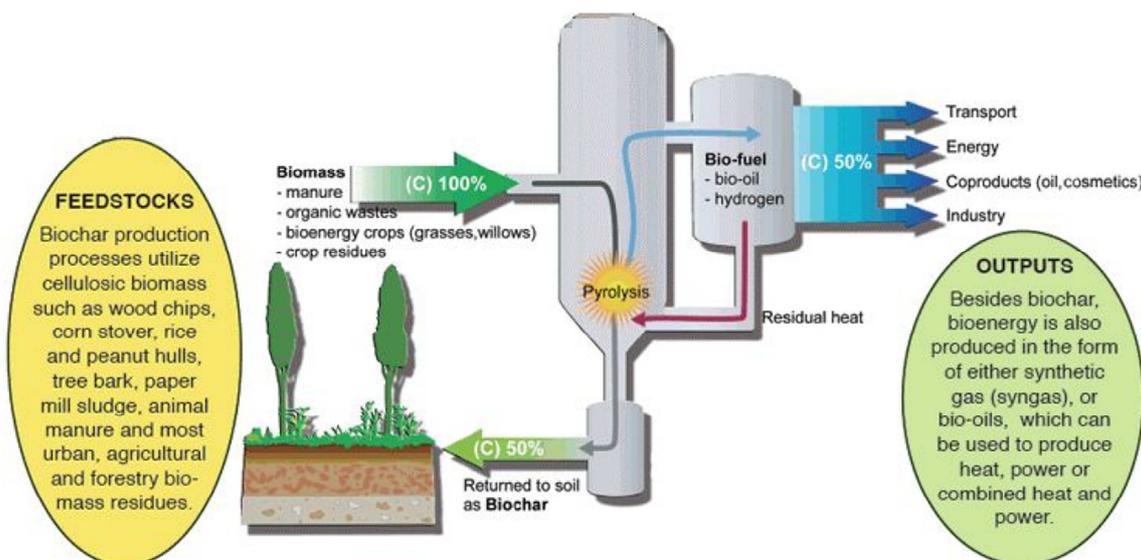
Biochar has the potential to make a major contribution to the mitigation of climate change, and enhancement of plant production. However, in order for biochar to fulfill this promise, the industry and regulating bodies must take steps to manage potential environmental threats and address negative perceptions. Biochar has a relatively long half-life in soil and can fundamentally alter soil properties, processes, and ecosystem services. The prospect of global-scale biochar application to soils highlights the importance of a sophisticated and rigorous certification procedure. We propose that a sustainability framework for biochar could be adapted from existing frameworks developed for bioenergy. Sustainable land use policies, combined with effective regulation of biochar production facilities and incentives for efficient utilization of energy, and improved knowledge of biochar impacts on ecosystem health and productivity could provide a strong framework for the development of a robust sustainable biochar industry. Sustainability certification could be introduced to provide confidence to consumers that sustainable practices have been employed along the production chain, particularly where biochar is traded internationally. The objective of this work was to discuss the concept of integrating biochar properties with environmental and socioeconomic factors, in a sustainable biochar certification procedure that optimizes complementarity and compatibility between these factors over relevant time periods.

## 1 INTRODUCTION

Biochar is a fine-grained charcoal-like material, which is generated by heating biomass in air-deprived conditions – this process is called pyrolysis. A feedstock for biochar production can be purpose-grown biomass as well as the residual material from forestry or agriculture. Chemical properties of carbon bound in the biomass are changed by the pyrolysis into a form which is more resistant to microbial decomposition in comparison with the original material. Such thermally transformed material has a mean residence time in soil up to several thousand years, which offers a potential method for **carbon sequestration**, since biochar decomposition into CO<sub>2</sub> and other greenhouse gases (such as methane) is very slow.

Biochar production and its application to soil, in addition to climate change mitigation, provide economical benefits in several other important areas such as waste management, energy production and soil improvement. As a waste management strategy, biochar can be produced from a variety of feedstocks that would otherwise constitute a financial and environmental liability. For example, in agricultural regions with high phosphorus and nitrogen levels in the soils and water, animal manures could be pyrolysed in order to prevent eutrophication.

Another value is the utilization of energy that is released during pyrolysis process. Production of biochar can be linked with local heat generation. An example of the system is being practiced on a poultry farm where the manure is pyrolysed on the spot to heat barns and resulting biochar (rich in nitrogen and phosphorus) is applied to fields.



**Figure 1.** Biochar production

The third benefit is to **improve the soil quality** by enriching it with biochar. On soils with productivity constraints, it is possible to significantly increase crop yields. Losses of agrochemicals such as fertilizer nutrients, herbicides and pesticides can be mitigated by biochar's ability to retain these compounds. Biochar improves several key soil properties (e.g. water retention in sandy soils, aerate and lighten clay soils) and is not only more stable and longer-acting than the original decaying organic matter, but also exhibits higher efficiency per unit of carbon added to soil.

Measurement and verification of biochar sequestration is facilitated by the fact that the amount of added carbon can easily be calculated at any time and need not be measured continuously. Verification of durability is possible because biochar is chemically distinguishable from other organic matter in soils. Furthermore, sequestered biochar carbon would not be released to the atmosphere due to changes in land management, fires, or deforestation, making it a strong candidate as a reliable carbon sequestration agent.

The national or global potential of biochar to help mitigate climate change is only theoretical at this point, because too few biochar systems exist at scale of implementation. Wide adoption of systems based on biochar will require ensuring sustainability criteria, because the benefits of biochar stems from several related sources, including energy and agriculture. The potential for mitigation is highly variable from system to system due to different feedstock, scales and different methods of production applications that require careful evaluation. Biochar must be integrated into existing food production systems and not become an alternative to food production.

Current barriers to implementation are, in spite of sufficient engineering and scientific background, lack of development of best biochar practice at operational scale; of demonstrated carbon trading activities; of demonstration of soil health benefits for the full spectrum of agro ecosystems; and financial viability and limitations of current legislation. **To remove obstacles in the implementation of biochar systems, establishment of appropriate policies at national and international levels is required.** It is also necessary to bring to life such mechanisms for carbon trading, which recognize carbon sequestration in soils, including the carbon sequestration. Biochar must not be an alternative to making dramatic reductions in greenhouse gas emissions, but may be an important tool in the equipment for combating climate change.

## **1.1 Feedstock acquisition**

The source of biomass used for biochar production is a key aspect in the overall sustainability of the system. Biomass is a renewable but finite resource that often has many competing uses, and delivers a range of economic, social, and environmental services. Biomass for biochar may be sourced from residues that would otherwise be sent to landfill or incinerated. In such cases, the use of biochar may avoid release of the powerful GHG methane and nitrous oxide, minimize nutrient contamination of groundwater, enhance resource recovery, and reduce the volume of material being sent to landfill, thus delivering multiple environmental benefits. Sourcing biomass from an established alternative use requires scrutiny to ensure that negative impacts are minimized. For example, if biomass is obtained from crop stubbles, dedicated biomass crops or plantation forest harvest residues, there is a risk that their removal will lead to decline in soil fertility, reduction in soil carbon stocks, and increased erosion (Cowie et al., 2006; Janowiak & Webster, 2010; Farine et al., 2011; Werhahn-Mees et al., 2011). Alternatively, if biomass is obtained from native forests, harvesting of this resource must be managed to reduce risk of loss of carbon stock in biomass and soil, and to reduce potential threats to environmental services (water quality, biodiversity conservation) (Biofuelwatch, 2011). Sustainable land management practices that minimize nutrient removal and erosion can reduce these risks (Cowie et al., 2006). Understanding the risks and developing appropriate management systems for the acquisition of biomass feedstocks for biochar is important to ensure that sustainable systems are deployed.

## **1.2 Biochar production**

Biochar is manufactured by heating biomass in oxygen-limited conditions. Traditional charcoal-making processes may utilize pits, mounds or simple kilns, while advanced pyrolysis technologies involve continuous rather than batch processes, operated in complex engineered plants where process conditions are well-controlled. Sustainability concerns in the manufacture of biochar include the potential release of air pollutants, emissions of GHG, and conversion efficiency of biomass resources to biochar and energy products. Biochar production through traditional charcoal-making processes commonly releases particulates and methane. Both of these issues are managed in modern production facilities through capture and use of volatiles in powering the process, and the use of modern emission-control methods. As a minimum, volatiles should be flared to convert methane to the less-powerful GHG CO<sub>2</sub>. Where feedstock materials are derived from waste streams, risk of harmful emissions is increased, due to the presence of contaminants. For example, municipal wastes are likely to contain glass, hard plastic, film plastic, metals and textile contamination. Compost standards regulate for these contaminants, and it will be important to introduce similar regulation for biochar products. A contaminant of particular concern is polyvinyl chloride (PVC), found in products such as pipes, sheets, panels, tiles, toys, adhesives, and paints, which may lead to dioxin formation during thermal treatment, potentially resulting in air quality issues. One of the greatest risks for air quality is feedstock contaminated with treated wood. Waste wood sources may contain painted surfaces, with older paints likely to contain lead compounds. Pyrolysis temperatures around 300–350°C resulted in almost all toxic elements remaining in the biochar. Dioxin, heavy metal and particulate emissions are commonly regulated in air-quality standards. Concerns remain for non-engineered systems that pyrolyze biomass without an appropriate gas emission clean up mechanism, such as those operating in countries with limited enforcement of environmental regulations, or at a small scale where such regulations may not apply.

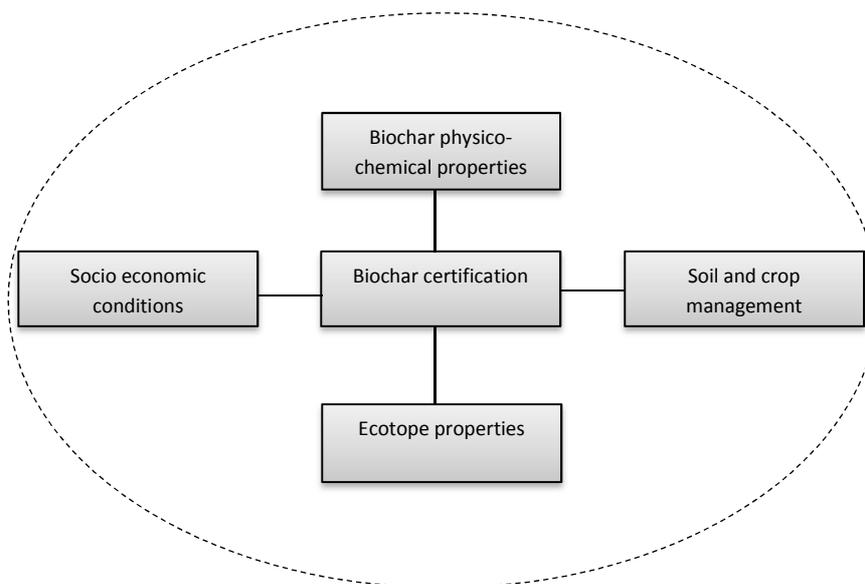
### **1.3 Sustainability certification for biochar**

The development of a sustainability framework for biochar, employing the approaches described above, will facilitate acceptance of biochar by society and individual consumers. Options for implementation of a sustainability framework vary from good practice guidelines, through voluntary certification, to regulation. A sustainability scheme could be supported by regulation that specifies requirements for certification to access particular markets; biochar producers and users will be motivated to develop appropriate management systems and obtain certification to enable them to access these markets. Establishment of a certification scheme will take time, to agree on intent, substance, and to develop the necessary institutional support and governance structures, including verification processes. Multiple schemes may emerge, requiring producers and consumers to choose between them. To support a certification scheme, methods for assessing biochar are required to identify whether biochars have undesirable properties or have been produced in environmentally unsound manner. Recent research into methods for characterizing key properties of biochar (Singh et al., 2010; Cross & Sohi, 2011) could support such assessments. The International Biochar Initiative and European Biochar Certificate prepared guidelines for sustainable application of biochar to soil.

Recognizing that sustainability should consider the whole product life cycle, certification must assess all stages from feedstock production or procurement through processing to utilization. Assembling this information is relatively easy for a vertically-integrated business, but will be particularly challenging where biomass is obtained from multiple small-holders. The biochar producer will need to monitor and report on the systems of feedstock production and biochar processing, which will require resources that may be beyond the capacity of small producers. Thus certification schemes will favor larger producers, who have the capacity to invest, which could result in the displacement of small producers who are unable to access the restricted markets. It has been suggested that sustainability certification could be employed as a barrier to trade. Feeding this perception is the variable application and regulation of schemes across and between nations. Adequate governance to ensure that stated objectives of the respective schemes are addressed may be absent. As has been the experience for timber production, certification may be taken up largely by operators, and in those countries, for which there is less concern, with limited uptake in jurisdictions with weak or ineffective regulatory environment. These issues reduce credibility and acceptance of the value of certification schemes. In some jurisdictions, all aspects of the biochar lifecycle are already regulated by various disconnected but overlapping schemes. The biochar system may also be measured, monitored and verified to meet mandated or voluntary greenhouse gas emissions targets. Where existing systems for monitoring and reporting on sustainability are considered adequate, these systems could be recognized as meeting the requirements for sustainable biochar certification, in much the same way as the EU Renewable Energy Directive accepts biofuels certified under a range of certification schemes. Such a process for mutual recognition of existing and developing sustainability certification schemes would minimize unnecessary burden on participants and encourage adoption.

The International Biochar Initiative in US and the European Biochar Certificate recently has put forward a proposal for guidelines for specification of biochar, with the aim of providing a product definition and specification for quality requirements, while ensuring confidence from the consumers. The initiatives are welcome. However, the view expressed in this paper is that a robust certification framework should extend beyond a technical description and labeling of the biomass feedstock and biochar material to also include the

environmental and socioeconomic context relevant to the site where biochar would be applied to soils (Figure 1).



**Figure 2.** Radial cluster relationship diagram

## 2 LEGAL ASPECTS OF BIOCHAR APPLICATION

Chemicals are widely used in our daily life, almost everywhere and in everything. To control and protect human health from chemical exposures, regulators need scientific input regarding potential harmful impacts of the chemicals on the market and in the environment. Legislative requirements for commercial use of biochar are most often associated with ensuring the safety, health and environment protection. The basic premise is the creation of a legal background that would provide these guarantees and would create general confidence in biochar as a useful product, alternatively as a reliable and cost-effective method for carbon sequestration.

Among the most important sources for the regulation belongs not only the sources with the highest degree of legal force such as constitutions of sovereign states, but also acts of parliament, statutory provisions, government regulations as well as ministerial and local ordinances.

EU directives lay down certain end results that must be achieved in every Member State. Directives are used to bring different national laws into line with each other, and are particularly common in matters that affect the operation of the single market (e.g. product safety standards). National authorities have to adapt their laws to meet these goals, but are free to decide how to do so. Directives may concern one or more EU countries, or all of them. Each directive specifies the date by which the national laws must be adapted - giving national authorities the room for manoeuvre within the deadlines necessary to take account of differing national situations. Every Member State bears full responsibility for the implementation of EU law in accordance with Treaty of Accession and Treaty establishing the European Community.

Assessing and managing cumulative risks from multiple sources and stressors pose a challenge in the regulation of chemicals. International organizations and national governments

have used various risk assessment tools for setting policy goals, analysing cost-benefit aspects, and evaluating substitutes and alternatives.

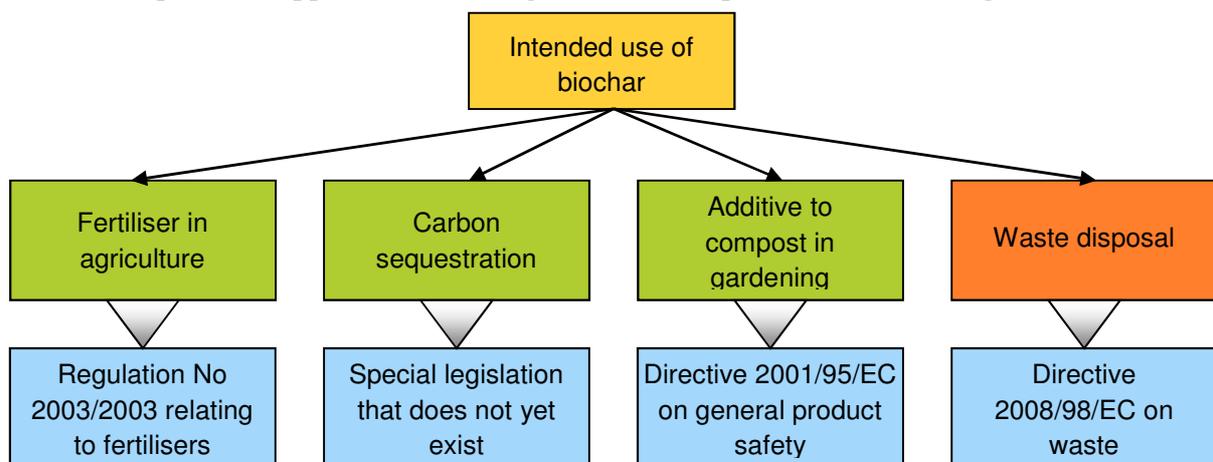
One example is the European Community regulation on chemicals and their safe use, called **REACH (Registration, Evaluation and Authorization of Chemicals)**. When it entered into force in June 2007, REACH was considered the world's strictest regulation on toxic chemicals. The REACH regulation aims to:

- improve the protection of human health and the environment from the risks that can be posed by chemicals;
- enhance the competitiveness of the EU chemicals industry, a key sector for the economy of the EU;
- promote alternative methods for the assessment of hazards of substances, and
- ensure the free circulation of substances on the internal market of the European Union.

The task of legislation is primarily to introduce such measures and to define rules that ensure the highest standard of protection and make undesirable impacts on the environment as small as possible. Application of regulatory measures and restrictions is based on the intended use of biochar. Waste management issues should be considered first. Legislation in this area is relatively new, and although has undergone a great development in the last years, still it is not entirely systematic and comprehensive. The basic EU legislation governing this area is **Waste Framework Directive (2008/98/EC)**, which sets the basic concepts and definitions related to waste management. At the subordinate level, the implementing rules and regulations governing the details in individual areas, which the law addresses only in general terms, are in competence of every Member State.

If biochar is to be removed from the scope of national waste regulations that implement WFD principles in legislations of all Member States, then criteria defining under which conditions biochar is not considered as a waste, but as a by-product, must be met. One of these criteria can be existence of special legislation, which governs use of biochar.

When considering the application in agriculture as fertilisers or substrates, this is covered by **Regulation (EC) No 2003/2003 relating to fertilisers**. The regulation sets rules for the placing of fertilisers on the market, i.e. the conditions for designating "EC fertilisers", as well as the provisions regarding their labelling and packaging. Member States determine the rules on penalties applicable to infringements of the provisions of the Regulation.



Biochar as a product placed on the market must comply with **Directive 2001/95/EC on general product safety**, which introduced requirements for high level protection and safety of consumers. A product is deemed safe once it conforms to the safety provisions provided in

European legislation, or, in the absence of such rules, if it complies with the specific national regulations of the Member State in which it is being marketed or sold.

In case of application of biochar in agricultural land solely for the purpose of carbon sequestration, this is not treated by any particular regulation, as is the case for carbon sequestration in natural rock structures – **Directive 2009/31/EC on the geological storage of carbon dioxide**. Injecting biochar in agricultural land according to other principles than those referred to in the national Act on fertilizers is not possible, since biochar is a personal property, whose disposal must comply with the national Waste Act. Exemption could be granted by special local regulations which would define specific conditions for biochar application. This process, for example, has been applied in case of application of river sediments on agriculture land in some Member States.

### 3 BIOCHAR AS A WASTE OR PRODUCTION RESIDUE

Approximately 120 to 140 million tons of bio-waste are produced every year in the EU. This corresponds to approximately 300 kg of bio-waste produced per EU citizen per year. The definition of bio-waste is provided by the **WFD (2008/98/EC)**: “Bio-waste includes garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises as well as comparable waste from food processing plants. It does not cover forestry or agricultural residue.” Bio-waste should not be confused with the broader category of “biodegradable waste”. Biodegradable waste, as defined by the **Landfill Directive (1999/31/EC)**, includes “any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, and paper and paperboard.”

Throughout Europe, *ca.* 40% of bio-waste is still landfilled (up to 100% in some Member States). This is not in line with the guiding principles of EU waste and sustainable resource management policy, notably the “waste hierarchy” that should underlie all national waste policies. According to the waste hierarchy as defined in the WFD, waste prevention is the preferable option, followed by preparing for re-use, recycling and other recovery (e.g., energy recovery). Disposal (e.g., landfilling) is seen as the least desirable option.

Waste streams with high organic carbon content are potentially a feedstock for pyrolysis plants producing biochar. As an alternative to composting, there is a potential for biochar to overcome some of the limitations of composting, such as reduced CO<sub>2</sub> and other gas emissions, stabilization of the output material, facilitated handling, shipping, and distribution. The fully sterile material also eliminates the threat of biohazards. The pyrolysis process, in contrast, depending on the type of feedstock and pyrolysis conditions, may generate chemical hazards to human health, e.g., PAH and others, that need to be carefully screened. In any case, biochar is an appealing technology for the waste industry, given the possibility of large scale installations and the related economies of scale that can be generated compared to traditional composting and disposal of bio-waste. It also has clear advantages to incineration, given the other benefits of biochar as soil improver and carbon storage. In the EU, between 118 and 138 million tons of bio-waste are produced every year, *ca.* 88 million tons of which is municipal waste. This amount is projected to increase, on average, by 10% by 2020 (European Commission, 2010). Transforming this large mass of biomass into stable biochar would clearly be very appealing, given the well documented positive fall-outs of such a waste disposal technology: climate change mitigation, increased soil fertility, improved soil carbon levels, *etc.* The question of distinguishing between ‘waste’ and ‘product’ has been raised in particular in the framework of European Union law and the results of this process are undoubtedly of great importance for national decision-making bodies in all Member States. In

practice, there were contradictory decisions of administrative bodies, which led to economic disadvantages faced by some commercial subjects. The problem involved mainly the distinction between waste and usable materials produced in the manufacturing process, whose main objective was to produce different material.

The numerous decisions of the Court of Justice of the European Union (CJEU) were dedicated to this issue, which resulted in the Communication from the Commission to the Council and the European Parliament on the **Interpretative Communication on waste and by-products**, which unifies the interpretation of waste in industrial sectors, in order to clarify situation of economic operators and competent authorities. The present situation is such that the law does not distinguish between products, production residues or non-waste by-products. Relevant is only determination whether the material is a waste or not. Important factors which may lead to the decision that the material is not a waste are the following:

**1) Is the material concerned a production residue or a product?**

The first question is whether the manufacturer deliberately decided to produce the material. If the manufacturer could produce a primary product without producing the material, but decided to do so, then this is evidence that the material concerned is not a production residue. Further evidence that the production of the material concerned was a technical choice may involve modification of the manufacturing process in order to give the material concerned specific technical characteristics.

*Relation to biochar: The pyrolysis process is intentionally conducted in such a way to produce a solid fraction of required properties (e.g. carbon content), thus biochar would not be considered as a production residue.*

**2) Conditions where a production residue would not be a waste**

Even where a material is considered to be a production residue, it is not necessarily a waste, if its properties permit further use in the economy. If the further use of the material is not mere possibility but a certainty, without further processing prior to reuse and as part of a continuous process, then the material would not be a waste provided that the use for which the by-product is destined must also be lawful - in other words that the by-product is not something that the manufacturer is obliged to discard or for which the intended use is forbidden under EU or national law.

**3) Is the further use of the material a certainty not a mere possibility?**

If there is a possibility that the material is in fact useless, does not meet the technical conditions required for its usability, or there is no market for the material, then it should continue to be considered as a waste. If it subsequently turns out that the waste can in fact serve a useful purpose, then the material will lose its waste status when it is ready for use as a recovered product.

*Relation to biochar: If an amount of potentially toxic elements does not exceed prescribed limits, then biochar after processing (crushing, etc.) can serve a useful purpose. The question is when biochar is ready for use - apparently it is after registration as a soil amendment, since a separate special law on the use of biochar on agricultural land does not yet exist.*

**4) Can the material be used again without any further processing?**

In some cases, this may be a difficult test to perform. Often, there are a number of tasks that must be undertaken prior to further use: material can be washed, dried, refined or

homogenized, features can be added, or other materials, to check its quality, etc. If these operations are integral part of the production process, material can be considered a by-product.

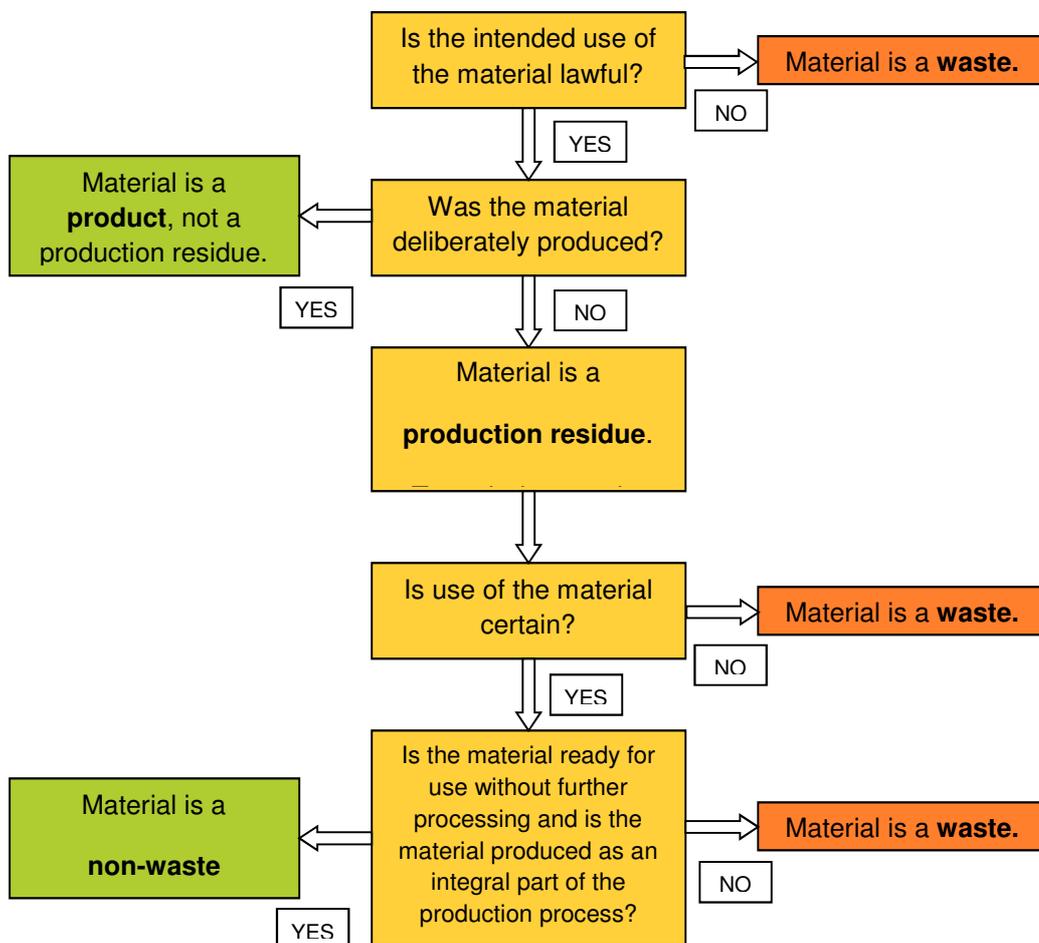
*Relation to biochar:* If biochar properties need to be adapted before the intended use, then probably tasks, which are not an integral part of the pyrolysis process, have to be done. In that case, biochar is a waste until the desired properties have been achieved.

**5) No other use then disposal can be envisaged, or the use has high environmental impact or requires special protection measures**

If a given material has no possible use, and therefore will have to be disposed of, it would seem normal that such a material would be considered waste from the moment of production. In some cases further use of the material is prohibited, or the material must be disposed of or recovered as a waste in an obligatory procedure.

*Relation to biochar:* If biochar does not meet the rules for placing on the market (e.g. heavy metals content of soil amendments) and its use for the purpose of carbon sequestration is not governed by a special regulation, then biochar is a waste.

**A decision tree for waste versus by-product decisions**



### 3.1 Example of evaluation of slugs and dust from iron and steel production

Blast furnace slag is produced in parallel with hot iron in a blast furnace. The production process of the iron is adapted to ensure that the slag has the requisite technical qualities. A technical choice is made at the start of the production process that determines the type of slag that is produced. Moreover, use of the slag is certain in a number of clearly defined end uses, and demand is high. Blast furnace slag can be used directly at the end of the production process, without further processing that is not an integral part of this production process (such as crushing to get the appropriate particle size). This material can therefore be considered to fall outside of the definition of waste.

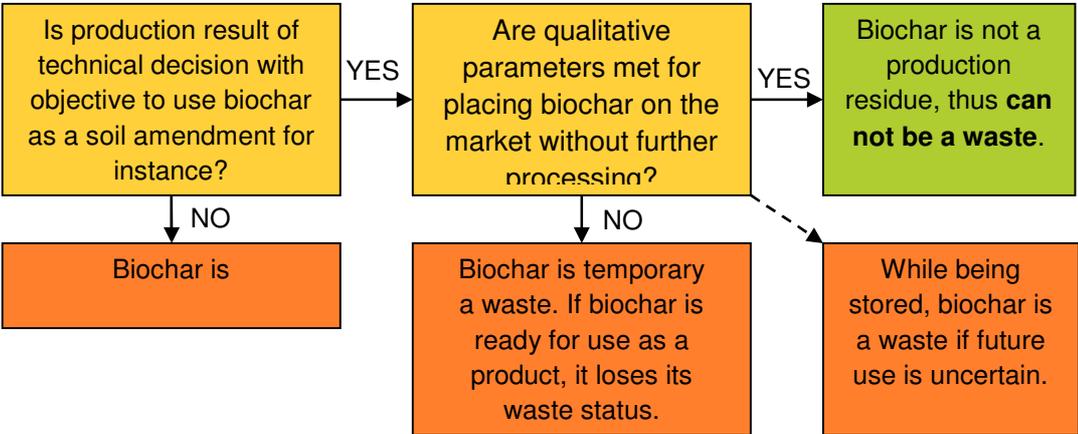
In contrast, de-sulphurisation slag is produced due to the need to remove sulphur prior to the processing of iron into steel. The resulting slag is rich in sulphur, cannot be used or recycled in the metallurgical circuit and is therefore usually disposed of in a landfill. Another type of example is dust extracted from the steel production process when cleaning the air inside the plant. This is captured in filters via an extraction process. These filters can be cleaned and the metallic content returned to the economic cycle via a recycling operation. Both of these production residues are therefore wastes from the point of production with the iron content extracted from the filters ceasing to be waste once it has been recycled.

This example may vary across the EU under some conditions, notably if there is no certainty of use for a given by-product, or on the contrary, if use is certain for a material in a region or Member State, where this is not the case across the whole EU.

It should be noted that even where a particular material satisfies the tests set by the CJEU not to be considered a waste, if it is in fact discarded, it must clearly be considered as a waste and will be treated like that.

### 3.2 Analogy with biochar

Biochar is produced simultaneously with the syngas in a reactor. The pyrolysis process is adapted to ensure that biochar will have the necessary technical quality. At the beginning of the process, technical decision was made in order to get desired type of biochar. The further use of biochar is certain in agriculture and gardening. Biochar can be used directly without processing, such as mixing with other substances, which is not an integral part of the manufacturing process. Under these circumstances, biochar should not be considered as a waste.



Member States should have brought into force the laws, regulations and administrative provisions necessary to comply with Waste Framework Directive by 12 December 2010. Thus European law and above mentioned principles should have been implemented into national legislations across the whole EU.

## 4 BIOCHAR AS A CARBON SEQUESTRATION METHOD

Currently, carbon sequestration by any other method than injection of CO<sub>2</sub> into geological formations for the purpos of permanent storage is out of the scope of EU law. The relevant and only one legislative instrument related to carbon storage is **Directive 2009/31/EC on the geological storage of carbon dioxide**, which establishes a legal framework for safe containment of CO<sub>2</sub> in such a way as to prevent and eliminate possible negative effects and any risk to the environment and human health.

Member States have the right to determine the areas from which storage sites may be selected and not to allow for any storage in parts or in the whole of territory. The steps in the site selection assessment process include components such as data collection and analysis, 3D geological modelling, dynamic modelling, sensitivity characterisation, and risk assessment.

Member States must ensure that no storage site is operated without a storage permit, that there must be only one operator for each storage site, and that no conflicting uses are permitted on the site. Applications to the competent authority for storage permits must include at least the following information:

- 1) the name and address of the potential operator;
- 2) proof of the technical competence of the potential operator;
- 3) the characterisation of the storage site and storage complex and an assessment of the expected security of the storage;
- 4) the total quantity of CO<sub>2</sub> to be injected and stored, as well as the prospective sources and transport methods, the composition of CO<sub>2</sub> streams, the injection rates and pressures, and the location of injection facilities;
- 5) a description of measures to prevent significant irregularities;
- 6) a proposed monitoring plan;
- 7) a proposed corrective measures plan.

The Directive also notes that Member States must establish or designate the competent authorities responsible for fulfilling the duties established in the Directive.

It is possible that future legislative development in carbon sequestration by biochar application into agriculture land will follow principles laid down in the Directive on the geological storage. However, more probably a new legislative instrument might be provisions similar to **Directive 86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture**.

The purpos of the Directive is to promote the correct use of sewage sludge on agriculture land; and to ensure that human beings, animals, plants and environment are fully safeguarded against harmful effects from the uncontrolled spreading of sewage sludge on such land.

The main provisions of the Directive for Member States are:

- Conditions for the protection of human health and nature

- Concentration **limit values for heavy metals** in soils, sludge and maximum annual loads
- **Maximum quantities** of sludge applicable to soil
- Conditions under which less stringent concentrations of heavy metals are permitted
- Use of sludge treatment technologies
- Frequency of analysis of sludge
- Authorisations for the use of untreated sludge on soil
- Minimum frequency of soil analyses
- Exemptions granted to small sewage treatment plants

All reporting Member States, apart from Greece and Latvia, have notified the Commission of measures adopted to ensure that sewage sludge may not be used in soils with concentrations of one or more heavy metals that exceed the agreed limit values. The same apply for heavy metal concentrations in sludge. A majority of Member States have set limit values that are considerably below those allowed by the Directive.

**Tab. 1** Limit values for sewage sludge

	<b>Cd</b>	<b>Cu</b>	<b>Ni</b>	<b>Pb</b>	<b>Zn</b>	<b>Hg</b>	<b>Cr</b>
Directive Annex IA	20-40	1000-1750	300-400	750-1200	2500-4000	16-25	-
Czech Republic	5	500	100	200	2500	4	200
Italy	20	1000	300	750	2500	16	-
Poland	10	800	100	500	2500	5	-
Slovakia	10	1000	300	750	2500	10	1000
Slovenia	2	300	70	100	1200	2	150

There are usually two techniques of regulated application into agricultural land:

- 1) Direct application according to a local act (e.g. Act on Sewage Sludge Application into Agricultural Land), determining the conditions for sewage sludge application into agricultural and forest land without affecting soil properties, plants, water, health of humans and animals.
- 2) Application as compost, soil supporting substance or growing medium in line with a local act (e.g. Act on Fertilizers). In this case, the product made on the basis of sludge is subject to certification and assessment whether properties of such fertilizer and its technical documentation are in line with related technical standards and generally binding legal regulations.

## **5 BIOCHAR AS ENERGY PRODUCER**

Integration of biochar in heat and renewable-energy production is an opportunity to be explored. Currently, there is no reference to biochar in any of the existing EU legislations related to energy apart from the fact that, as resulting material of an energy process (e.g., pyrolysis, gasification), it is treated as a waste. Plants producing biochar are generally broadly classified in pyrolysis and gasification systems: in the former the biomass is heated in the absence of oxygen while, in the latter, biomass is partially oxidized at high temperatures

(>800 °C). However, both processes produce noncondensable gases (syngas), condensable vapors/liquids (bio-oil, tar) and solids (char, ash). Depending on the feedstock and process, syngas is a variable mixture of CO and CO<sub>2</sub>, H<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>, which, if upgraded, can be used in combustive engines to generate electricity. From this perspective, biochar is only a co-product of an energy-supply chain that primarily generates energy. The associated risk of depleting SOC exporting biomass (and hence C), rather than incorporated or returned to the field, may be offset by the same biochar application. In that case, even if C yield of biochar is lower than the original feedstock, the net C sequestration effect is guaranteed by its recalcitrant to decomposition.

## **6 BIOCHAR AS SOIL IMPROVER**

Given that by definition biochar should be considered a soil improver, its use should be viewed from the EU Soil Thematic Strategy (COM (2006) 231) and the related proposed Soil Framework Directive (COM (2006) 232) perspective. The Thematic Strategy explicitly mentions the constant decline in organic carbon content as one of the major threats to European soil and therefore, the application of biochar could seem a valuable solution to reverse this negative trend. In addition, the strategy singles out the specific soil functions that EU legislation should protect. One of the main functions identified is the role of soil to act as a carbon sink and therefore contribute to climate change mitigation. Biochar is certainly a valid technology for long-term carbon storage in soils and therefore perfectly consistent with these strategy specifications. In addition to this aspect, some co-benefits may result from the use of biochar as a soil amendment. Due to its porous structure and large surface area, biochar applications showed to positively influence soil field capacity, nutrient availability, fertilizer use efficiency, pH (“liming effect”), and cation exchange capacity-CEC. However, the interaction between the soil and biochar type (in terms of feedstock and process conditions) needs to be further investigated, in particular for certain important issues, such as change in heavy metal availability, pesticides sorption, and introduction of metal contaminants. Some positive indications can be found in the extensive review by Beesley *et al.*, who demonstrated clear potential for the reduction of a variety of organic and inorganic contaminants present in soils in their most mobile forms. Moreover, in an experiment testing the use of biochar in contaminated soils, Beesley and Marmiroli reported a marked reduction of Cd and Zn leachate concentrations. Sorption was indicated as the main mechanism of retention for those metals, while no significant decrease in concentration was detected for As. In contrast, as biochar may be produced from a wide range of organic feedstocks, it also contains potentially toxic elements (PTEs) such as Cu, Pb, and As. This raises the issue of how to define concentration limits, for which legislative standards are inexistent at national level for this amendment.

Part of this gap is filled by two main voluntary initiatives: The European Biochar Certificate (EBC) and the International Biochar Initiative (IBI). These initiatives are trying to define production criteria and biochar properties and quality, but are not recognized by any national legislation as official methods within EU.

### **6.1 European Biochar Certificate**

The European Biochar Certificate (EBC) has been developed by biochar scientists to become the voluntary European industrial standard. The EBC ensures a sustainable biochar production and low hazard use in agronomic systems. It is based on the latest scientific data,

it's economically viable and close to technical and agricultural practice. Users of biochar and biochar-based products will benefit from a transparent and verifiable monitoring and independent quality control.

Biochar produced in accordance with the standards of the EBC fulfils all the requirements of sustainable production and a positive carbon footprint. These standards guarantee ecologically sustainable procurement and production of biomass feedstock for biochar production, compliance with emission standards and environmentally safe storage. Biochar quality is comprehensively monitored and documented. All threshold values, corresponding to those of the Ordinance on Soil Protection are complied with.

For gaining the European biochar certificate, the following criteria regarding the biomass feedstock, the production method, the properties of the biochar and the way it is applied have to be met.

### **6.1.1 Feedstock**

- Only organic wastes listed in the positive list (Appendix 1, see below) may be used in the production of biochar.
- It must be ensured that all non-organic waste such as plastic, rubber, electronic scrap has been removed.
- Feedstocks must be free of paint, solvents and other non-organic contaminants.
- When using primary agricultural products, it must be guaranteed that these were grown in a sustainable manner.
- Biochar may only be produced from wood from forests or short rotation forestry plantations if their sustainable management, for example through appropriate PEFC or FSC certification, can be proven.
- Feedstocks used for the production of biochar must not be transported over distances greater than 80 km. An exception is made for pyrolysis additives or special biomasses for use in production tests. [Since the current network of pyrolysis facilities is not yet extensive an exemption to this transport distance requirement can be granted as long as such exemption is only a temporary measure.]
- Complete records of feedstocks must be kept.

### **6.1.2 General requirements for biochar production records**

Each biochar batch must be clearly labelled and be given a unique identification number for reconstructing the circumstances of production and guaranteeing the quality of the biomasses used. For each biochar batch, separate production records are to be kept. Each batch must be tested to ensure compliance with the required threshold values.

A uniform biochar batch is deemed to exist when the following criteria are met:

- The temperature in °C and the sojourn time of the biomass in the pyrolysis reactor during production do not fluctuate more than 15%
- The composition of the pyrolysed biomasses does not fluctuate more than 20%

- The production period of the batch does not exceed 4 months
- Complete production records must be kept, providing detailed descriptions and dates of any production problems or halts.

### 6.1.3 Quality assurance and certification

Biochar producers compliance with European Biochar Certificate requirements is coordinated throughout Europe by the independent quality assurance agency *q.inspecta*, with inspections of production plants in individual countries carried out by independent national inspection agencies. Inspections take place once a year. Producers confirm that they will keep up-to-date production records.

Producers may submit applications to q.inspecta to take part in the certification programme once their production starts. They are recommended to contact q.inspecta beforehand, enabling them to integrate the necessary recording into their production process.

## 6.2 International Biochar Initiative

IBI is currently developing an *IBI Biochar Certification* program that will enable manufacturers whose biochar materials have passed the *IBI Biochar Standards* to apply for certification through IBI, and to place an “IBI Certified Biochar” seal on their product. As a global leader in providing credible, science-based information on biochar, it is IBI’s goal that the seal provide assurances to consumers regarding the safety and efficacy of biochar products. The Program is initially slated for roll-out in the US and Canada before expanding to other countries.

## 6.3 IBI vs. EBC discussion

The EBC and IBI collaborate since 2012 on the issue of biochar certification and guidelines. We have the common objective of a harmonized international certification scheme that takes the national (and continental) differences into consideration. The following comparison was made to articulate the few differences between the two standards.

<b>European Biochar Certificate vs. International Biochar Initiative (EBC vs. IBI)</b>	
<b>EBC (European Biochar Certificate)</b>	<b>IBI (International Biochar Initiative)</b>
<b>Feedstock:</b> Positive list	<b>Feedstock:</b> No contamination
<b>Material properties:</b>	<b>Material properties:</b>
TOC > 50%	TOC > 60/30/10% (C1,2,3)
O/C < 0.4	O/C -
H/C < 0.6	H/C < 0.7
Black carbon 10-40% of TOC	pH, EC, texture etc. report
<b>Contaminants:</b>	<b>Contaminants:</b>
Heavy metal tresholds	Heavy metal tresholds
PAH < 12 mg/kg	PAH < 20 mg/kg
PCB < 0.2 mg/kg	PCB < 0.5 mg/kg
PCDD and PCDF < 20 ng/kg	PCDD and PCDF < 9 ng/kg

In addition, socioeconomic impact assessments (Shackley et al., 2012) should be performed as part of the certification procedure for scenarios of possible combinations of the above-mentioned factors. In many cases, it is expected that current confidence in available soil data will not be sufficient to satisfy the required information of a sustainable biochar certification procedure (from regional to within-field scales). Therefore, in these cases, requirements for soil testing will have to be described as part of the certification procedure. The choice of soil parameters and associated sampling designs for soil testing should be informed by the range of potential biochar properties, for any specific site. For example, if for a catchment the main potential feedstock is organic waste with a moderate to high salt content, it would be a sound precaution to identify and delineate those soils which may be vulnerable to salinization or sodification. However, these tests may be obsolete if all potential feedstocks for the catchment have low salt contents. Any certification/regulation that may be developed for biochar requires sound scientific evidence and recommendations. It will be imperative to provide the scientific evidence to the policy community in a manner that is comprehensive, robust, objective and independent of any conflict of interest. An intergovernmental panel on biochar could potentially provide a mechanism for achieving this. In addition to qualitative assessments, a quantitative meta-analysis of biochar effects on soil functions would provide a useful tool to objectively assess effects and identify gaps, as well as potential clues to causative mechanisms. All data should be made available in a transparent way, with full disclosure of data, statistics and funding – for detailed recommendations see Verheijen et al. (2010). This can imply translation of research papers into English or the posting of experimental results in an online public database. In a sense, the greatest strength of the biochar concept is also its greatest ‘weakness’. Its relatively long mean residence time in soils (hundreds of years) make it a potential instrument of C-sequestration (Woolf et al., 2010). At the same time, it may improve one or more soil functions, while avoiding deleterious effects, if compatibility and complementarity are achieved. However, that same long mean residence time sets biochar apart from more conventional soil amendments that are considered as transient in the soil, with functional lifetimes from one to tens of years.

## 7 BIOCHAR AS FERTILIZER

**Regulation (EC) No 2003/2003** of the European Parliament ensure the free circulation on the internal market of ‘EC fertilisers’ i.e. those mineral fertilisers that meet the requirements of the Regulation for their nutrient content, their safety, and the absence of adverse effects on the environment.

Regulation (EC) No 2003/2003 does not affect the so-called ‘national fertilisers’ placed on the market of the Member States in accordance with national legislation. Some Member States have very detailed national rules whereas others do not. Producers can choose to market a fertiliser as ‘EC fertiliser’ or as ‘national fertiliser’. Furthermore, there are increasing quantities of fertilisers placed on the market in the EU that are not of mineral origin, but are produced from organic waste streams, or are a combination of both, which are not covered by the current Regulation. Other products relevant as inputs for agriculture, such as soil improvers and growing media, are not at all within the scope of Regulation (EC) No 2003/2003.

**Regulation (EC) No 764/2008** on mutual recognition ensures the free movement of goods on the Internal Market in the non-harmonised area through mutual recognition between Member States. It obliges Member States to accept products lawfully marketed in other

Member States unless the Member State of destination can demonstrate that the product poses a risk for human health or the environment.

Regulation (EC) No 2003/2003 (the Fertilisers Regulation) lays down rules relating to the placing on the market of fertilisers, as well as the provisions regarding their labelling and packaging, and reduces existing trade barriers and potential risks for public safety from the use of certain categories of fertilisers.

The current Fertilisers Regulation covers only a part of the inorganic (mineral) fertilisers i.e. 'EC fertilisers' that meet the requirements of the Regulation regarding composition, safety and impacts on the environment and as such may circulate freely on the European market. The other types of fertilisers and fertilising materials are not covered by this European legislation. Therefore, the Commission intends to revise Regulation (EC) No 2003/2003 to extend its scope to other fertilisers and fertilising materials including organic fertilisers, growing media, soil improvers and possibly biostimulants.

The main objective is to propose policy options on how to revise the current regulation according to biochar, to achieve full harmonisation regarding the placing on the market and eventually to assess the socio-economic and environmental impacts of each of these scenarios. A stronger, deeper, extended single market for all types of fertilisers, growing media and soil improvers will be fully in line with the objectives of the Europe 2020 strategy as set out in the Commission Communication COM (2010) 2020.

The complex study identified several problems with the current situation, as follows:

- Only a fraction of the mineral fertilisers sector is harmonised at EU level. There is a high fragmentation of the market for the other categories of fertilising materials;
- Mutual recognition is unsatisfactory;
- Categorisation of fertilising materials becomes problematic since innovation tends to create new blended and mixed products or products on the fringes of usually recognised categories;
- Procedures to introduce a new 'EC fertiliser' type on the market are very lengthy;
- There are diverging opinions amongst MS and amongst stakeholders on acceptable requirements for fertilisers.

Taking into account the problems identified during the evaluation study, the commission services consider that the harmonisation efforts should pursue four specific objectives:

- To harmonise legislation for all fertilising materials (FM) including inorganic fertilisers, organic fertilisers, growing media, soil improvers and biostimulants;
- To guarantee the safety of fertilising materials;
- To ensure agronomic efficacy of fertilising materials; and
- To reduce administrative burden.

## **7.1 Situation of the Member States national fertilisers and fertilising materials regulatory frameworks**

Biochar is not excluded from the scope of the national waste regulation in monitored Member States. Excluded are those kinds of biomass which comply requirements of by-products and/or requirements of end-of-waste status in accordance with Article 5 and Article

6 of Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Waste Directive). There is not existing and allowed technology infrastructure for processing of biochar in MS yet. It means, that biochar is not considered as by-product and biochar do not comply the end-of-waste status requirements in accordance with Waste Directive.

Most Member States (MS) have in place national provisions regarding the placing on the market of fertilising materials. Once a manufacturer has decided to apply for the registration of a new fertiliser type, it must submit a technical dossier to the competent authority of the Member State in which it is established. The dossier must contain scientific evidence that the candidate fertiliser is not harmful to the environment and/or human health and that it provides nutrients efficiently. Then a Member State will examine the dossier and will normally decide to act as the ‘sponsor’ for the application in the Fertiliser Working Group. Member State representatives of the Fertiliser Working Group have then to express their opinion on the candidate fertiliser type. The whole procedure lasts between 18 months and 4 years if additional data are required by the Member States and depending on whether an EN standard must be developed for the determination of the nutrient content.

The Fertilisers Regulation does not affect the so-called ‘national fertilisers’ placed on the market in Member States in accordance with national legislation. Some Member States have established very detailed national rules whereas others have not. Producers can choose to market inorganic fertilisers as ‘EC fertilisers’ or as ‘national fertilisers’.

It is allowed to market only a fertilizer registered in the fertilizer register upon the verification of its efficiency, quality and health harmless and safety as well as farm fertilizers. Provision does not apply for a fertilizer provided in necessary quantities for experimental purposes, research and development. Marketing a fertilizer means their manufactures, import, offer, sale and storing.

Register of fertilizers is a list of registered fertilizers in which data on registered are specified except for data on production method and raw materials used. Register of fertilizers is administered by the Central Control and Testing Institute of Agriculture (hereinafter referred to as “control institute”) as a legal person the establisher of which is the Ministry of Agriculture of MS. The Ministry publicizes regularly the list of registered fertilizers.

### **7.1.1 Registration of fertilizers**

Control Institute carries out the registration of fertilizers based on the application of manufacturer or importer who has the business license in accordance with the special regulation referred to as “applicant”. The applicant lodges the application for fertilizer registration on the form issued by Control Institute. The application must include:

- a) data on given name, family name, permanent residence, personal identification No. if the applicant is a natural person or business name, business address and companies registration No. if the applicant is a legal person,
- b) data on manufacturer or importer,
- c) trade name and type of fertilizer,
- d) data on the content of individual components as well as trace elements in fertilizer including the content of risk elements; in case of nutrients also their form and solubility,
- e) packing and package weight or volume,

- f) scope and method of fertilizer application and storage conditions,
- g) description of production method including specification of raw materials used for the fertilizer production,
- h) opinion of relevant authorities,
- i) statement of the manufacturer that he disposes of a control mechanism securing achieving the fertilizer quality permanently.

The applicant is obliged to provide samples required by Control Institute free of charge or to enable sampling and to provide other details and information required for registration proceedings. Control Institute issues the decision on fertilizer registration within two months from the date of serving the application for fertilizer registration if the fertilizer type specified in the application with the type specified in the generally binding legal regulation and is in compliance with laboratory test results.

If the fertilizer is not in compliance with the fertilizer type specified in the generally binding legal regulation, Control Institute examines its biological efficiency in vegetation tests and decides on the fertilizer registration upon the results

- a) within 18 months from the date of serving the application if vegetation tests are performed in a greenhouse or a vegetation hall,
- b) within 24 months from the date of serving the application if vegetation tests are performed in the field.

Control Institute may acknowledge laboratory and vegetation test result of the fertilizer of other professionally recognized domestic and international natural persons if they are in accordance with provisions of this act. In this case, Control Institute decides on the application without an undue delay. The applicant covers the cost related to action connected with the fertilizer registration.

#### **7.1.2 Decision on fertilizer registration**

Decision on fertilizer registration contains

- a) business name and type of fertilizer
- b) No. of decision on its registration
- c) data on given name, family name, permanent residence, personal identification
- d) data on manufacturer
- e) limitations at marketing and use,
- f) data on the content of individual components as well as trace elements in the fertilizer including the content of risk elements, risk substances and tolerances; in case of nutrients also the form and solubility,
- g) period of decision validity
- h) packing and warning marking of the fertilizer inevitable from the viewpoint of health protection and safety of people, animals and environment.

Decision on the fertilizer registration is in force for five years from the date of becoming absolute if not a shorter period is stipulated in the decision; provision of shorter period of validity must be substantiated in the decision. Holder of the fertilizer registration decision may request Control Institute an extension of the period of validity. The application must be delivered to Control Institute not later than within six months before the date of termination of the fertilizer registration.

### 7.1.3 Fertilizer application

Entrepreneurs in agriculture are obliged to use fertilizers and farm fertilizers in quantity and manner providing for required plant nutrition and permanently maintainable soil fertility. No risk elements and substances interfering with the development of cultivated plants or jeopardizing the food chain are to be added to farm fertilizers. Fertilizers must not be used on agricultural soil if

- a) special regulation prohibits or limits the use of fertilizers,
- b) method of their application is hazardous on the environment surrounding of the fertilized land.

Entrepreneurs in agriculture are obliged to keep records on acceptance and application of fertilizers on the agricultural or forest land. They are obliged to present the registration on request of Control Institute.

List of approved laboratories in selected Member States:

Member State	Approved laboratories
Czech Republic	<p><i>Central Institute for Supervising and Testing in Agriculture</i>  <b>ÚKZÚZ – Ústřední kontrolní a zkušební ústav zemědělský</b>            Hroznova 2            CZ-656 06 BRNO            Tel. : +420-543-54-82-71            Fax. : +420-543-21-11-48            E-mail : <a href="mailto:ukzuz@ukzuz.cz">ukzuz@ukzuz.cz</a></p>
Italy	<p><i>Laboratorio di Conegliano</i>  <b>Ministero delle Politiche Agricole Alimentari e Forestali — Dipartimento dell'Ispettorato Centrale della Tutela della Qualità e Repressione Frodi dei Prodotti Agro-alimentari</b>            Via Casoni, 13/B            I-31058 Susegana (TV)            Tel. +39-0438-453312            Fax +39-0438-450618            E-mail : <a href="mailto:icq.conegliano.laboratorio@politicheagricole.gov.it">icq.conegliano.laboratorio@politicheagricole.gov.it</a></p>
	<p><i>Laboratorio di Modena</i>  <b>Ministero delle Politiche Agricole Alimentari e Forestali — Dipartimento dell'Ispettorato Centrale della Tutela della Qualità e Repressione Frodi dei Prodotti Agro-alimentari</b>            Via J.Cavedone, 29            I-41100 Modena            Tel. +39-059-358-419            Fax +39-059-344-412            E-mail : <a href="mailto:icq.modena.laboratorio@politicheagricole.gov.it">icq.modena.laboratorio@politicheagricole.gov.it</a></p>
	<p><i>Laboratorio di Catania</i>  <b>Ministero delle Politiche Agricole Alimentari e Forestali — Dipartimento dell'Ispettorato Centrale della Tutela della Qualità e Repressione Frodi dei Prodotti Agro-alimentari</b></p>

	<p>Via Alessandro Volta,19 I-95122 Catania Tel. +39-095-480411 Fax +39-095-365066 E-mail : <a href="mailto:icq.catania.laboratorio@politichiagricole.gov.it">icq.catania.laboratorio@politichiagricole.gov.it</a></p>
	<p><b>Laboratorio di Roma</b> <b>Ministero delle Politiche Agricole Alimentari e Forestali — Dipartimento dell'Ispettorato Centrale della Tutela della Qualità e Repressione Frodi dei Prodotti Agro-alimentari</b> Via del Fornetto, 85 I-00149 Roma Tel. +39-06-5534161 Fax +39-06-55341691 E-mail : <a href="mailto:icq.roma.laboratorio@politichiagricole.gov.it">icq.roma.laboratorio@politichiagricole.gov.it</a></p>
	<p><b>Poland Nawozowe Laboratorium Badawcze w Instytucie Nawozów Sztucznych w Puławach</b> al. Tysiąclecia Państwa Polskiego 13A PL-24-110 Puławy Tel. : +48-81-887-64-44 Fax. : +48-81-887-63-36 E-mail : <a href="mailto:ins@atena.ins.pulawy.pl">ins@atena.ins.pulawy.pl</a></p>
	<p><b>Laboratorium Badania Niebezpiecznych Właściwości Materiałów w Instytucie Przemysłu Organicznego w Warszawie</b> ul. Annopol 6 PL-03-236 Warszawa Tel. : +48-22-811-12-31 Fax. : +48-22-811-07-99 E-mail : <a href="mailto:ipo@ipo.waw.pl">ipo@ipo.waw.pl</a></p>
	<p><b>Laboratorium Badawcze w Wojskowym Instytucie Technicznym Uzbrojenia w Zielonce k/Warszawy</b> ul. Prymasa St. Wyszyńskiego 7 PL-05-220 Zielonka Tel. : +48-22-761-44-01 Fax. : +48-22-761-44-45 E-mail : <a href="mailto:witu@witu.mil.pl">witu@witu.mil.pl</a></p>
	<p><b>Laboratorium Nawozów i Wyrobów Chemicznych w Polskim Centrum Badań i Certyfikacji Oddział w Pile</b> ul. Śniadeckich 5 PL-64-920 Pila Tel. : +48-67-213-87-00 Fax. : +48-67-213-83-84 E-mail : <a href="mailto:pcbcpila@i-pila.pl">pcbcpila@i-pila.pl</a></p>
Poland	<p><b>Dział Laboratoryjny Stacji Chemiczno - Rolniczej Oddział w Bydgoszczy</b> ul. Powstańców Wielkopolskich 6 PL-85-090 Bydgoszcz Tel. : +48-52-322-32-46 Fax. : +48-52-322-02-20 E-mail : <a href="mailto:bydgoszcz@schr.gov.pl">bydgoszcz@schr.gov.pl</a></p>
	<p><b>Dział Laboratoryjny Stacji Chemiczno – Rolniczej Oddział w Kielcach</b> ul. Wapiennikowa 21 PL-25-112 Kielce Tel. : +48-41-361-01-51 Fax. : +48-41-361-02-25 E-mail : <a href="mailto:kielce@schr.gov.pl">kielce@schr.gov.pl</a></p>
	<p><b>Laboratorium Stacji Chemiczno–Rolniczej w Lublinie</b> ul. Śaawnikowska 5 PL-20-810 Lublin Tel. : +48-81-742-63-01 Fax. : -48-81-742-63-34 E-mail : <a href="mailto:lublin@schr.gov.pl">lublin@schr.gov.pl</a></p>
	<p><b>Dział Laboratoryjny Stacji Chemiczno – Rolniczej w Olsztynie</b> ul. Kołobrzaska 11 PL-10-444 Olsztyn Tel. : +48-89-533-20-92</p>

	<p>Fax. : +48-89-533-20-92 E-mail : <a href="mailto:olsztyn@schr.gov.pl">olsztyn@schr.gov.pl</a></p>
	<p><b><i>Dział Laboratoryjny Stacji Chemiczno – Rolniczej w Poznaniu</i></b> ul. Sieradzka 29 PL-60-163 Poznań Tel. : +48-61-868-97-51 Fax. : +48-61-868-58-60 E-mail : <a href="mailto:poznan@schr.gov.pl">poznan@schr.gov.pl</a></p>
	<p><b><i>Dział Laboratoryjny Stacji Chemiczno – Rolniczej w Warszawie</i></b> ul. 6-kiewskiego 17 PL-05-075 Warszawa-Wesoła Tel. : +48-22-773-53-21 Fax. : -48-22-773-53-21 E-mail : <a href="mailto:warszawa@schr.gov.pl">warszawa@schr.gov.pl</a></p>
	<p><b><i>Laboratorium Badawcze nr 2 w Wojskowym Instytucie Techniki Inżynierskiej we Wrocławiu</i></b> ul. Obornicka 136 PL-50-961 Wrocław Tel. : +48-71-347-44-40 Fax. : +48-71-347-44-04 E-mail : <a href="mailto:witi@witi.wroc.pl">witi@witi.wroc.pl</a></p>
	<p><b><i>Dział Laboratoryjny Stacji Chemiczno-Rolniczej w Gdańsku</i></b> ul. Na Stoku 48 PL-80-874 Gdańsk Tel. : +48-58-302-38-15 Fax. : +48-58-302-38-15 E-mail. : <a href="mailto:gdansk@schr.gov.pl">gdansk@schr.gov.pl</a></p>
	<p><b><i>Dział Laboratoryjny Stacji Chemiczno-Rolniczej w Krakowie</i></b> ul. Kołowa 3 PL-30-133 Kraków Tel. : +48-12-637-55-17 Fax. : +48-12-637-04-61 E-mail. : <a href="mailto:krakow@schr.gov.pl">krakow@schr.gov.pl</a></p>
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Intra-community movement of national fertilisers should be covered by Regulation (EC) No 764/2008 on mutual recognition which aims at ensuring the EU free movement of

goods in the nonharmonised area through recognition of goods between Member States. Regulation (EC) No 764/2008 obliges a Member State to accept products lawfully marketed in another Member State unless the Member State of destination can demonstrate that the product poses a risk to human health or the environment (safeguard clause).

## **7.2 The application of the Mutual Recognition Regulation to biochar**

As EU law stands, fertilisers are only partially harmonised. Regulation (EC) No 2003/2003 introduced technical and labelling requirements for “EC fertilisers”, i.e. those inorganic fertilisers which comply with the fertiliser type designations specified in the Regulation. Those EC fertilisers are allowed to freely circulate within the internal market. The Regulation, however, does not prevent Member States, from additionally allowing the placing on the market of “national” fertilisers, i.e. products which are not designated as “EC fertilisers”, but are produced according to national provisions. While those provisions do not need to comply with the specific EU legislation in the area of fertilisers, they have nevertheless to respect the basic principles of the EU Treaty; especially the principle of free movement of goods. Regulation (EC) No 764/2008 (“the Regulation”) has been adopted to make the principle of mutual recognition fully operational, therefore reducing discrepancies between national rules in the non harmonised area.

The Regulation applies to administrative decisions addressed to economic operators, on the basis of a technical rule, in respect of any non-harmonised product lawfully marketed in another Member State, where the direct or indirect effect of that decision is the prohibition, modification, additional testing or withdrawal of the product. Any authority intending to take such a decision must follow the procedural requirements in the Regulation.

The Mutual Recognition Regulation should apply for biochar only if following conditions are met:

### ***7.2.1 The (intended) administrative decision must concern fertilisers and/or growing media lawfully marketed in another Member State***

The Regulation should apply only to “national” fertilisers and growing media lawfully marketed in another Member State. That means that fertilisers or growing media which have not previously been marketed on the territory of the EU fall outside the scope of the Regulation. They will have to comply with the technical rules applicable in the Member State where they are put on the market for the first time in the EU.

### ***7.2.2 The (intended) administrative decision must be addressed to an economic operator***

The Regulation applies to administrative decisions addressed to economic operators, whether taken or intended, on the basis of a ‘technical rule’, in respect of fertilisers and growing media lawfully marketed in another Member State, where the direct or indirect effect of that decision is the prohibition, modification, additional testing or withdrawal. An economic operator is, in essence, a person in the supply chain for the product concerned, from manufacturer/importer to retailer.

### 7.2.3 *The (intended) administrative decision must be based on a technical rule*

As regards fertilisers and growing media specifically, a technical rule is any provision of a law, regulation or other administrative provision of a Member State:

a) which prohibits the marketing of any “national” fertiliser or growing media lawfully marketed in another Member State in the territory of the Member State where the administrative decision is or will be taken or compliance with which is compulsory when that fertiliser or growing media is marketed in the territory of that Member State, and

b) which lays down either:

- the characteristics required for that (type of) fertiliser or growing media, such as levels of quality, performance or safety, or dimensions, including requirements as regards the name under which it is sold, terminology, symbols, testing and test methods, packaging, marking or labelling; or
- any other requirement which is imposed on that (type of) fertiliser or growing media for the purposes of protecting consumers or the environment, and which affects its life-cycle after it has been placed on the market, such as conditions of use, recycling, reuse or disposal, where such conditions can significantly influence the composition, nature or marketing of the fertiliser or growing media.

#### 7.2.3.1 *Prior authorisation procedures*

EU law does not in principle preclude Member States from establishing appropriate measures, if they deem this necessary to control and/or restrict the placing on the market of “national” fertilisers or growing media for public health reasons or environmental protection. Member States usually establish those measures through prior authorisation procedures in accordance with which, before a product may be placed on a given Member State's market, the competent authority of that Member State should give its formal approval following an application.

The Court of Justice has repeatedly held that any national legislation which makes the marketing of products subject to a prior authorisation procedure restricts the free movement of goods. Nevertheless, such procedures could be justified if national rules pursue a public-interest objective recognised by EU law and comply with the principle of proportionality.

The Court of Justice has set a number of conditions under which the prior authorisation procedure might be justified:

- it must be based on objective, non-discriminatory criteria which are known in advance to the undertakings concerned, in such a way as to circumscribe the exercise of the national authorities' discretion, so that it is not used arbitrarily;
- it should not essentially duplicate controls which have already been carried out under other procedures, either in the same State or in another Member State;
- prior authorisation will be necessary only where subsequent control must be regarded as being too late to be genuinely effective and to enable it to achieve its aim;

- the procedure should not, on account of the cost and time element, be such as to deter operators from pursuing their business plan.

#### **7.2.3.2 *‘Positive lists’ for fertilisers and growing media***

Some Member States refer through their relevant prior authorisation procedures to ‘positive lists’ sorting certain fertiliser and/or growing media types. According to these lists, products that comply with the types listed may be placed on the national market of the Member State of destination. EU law does not in principle preclude Member States from establishing such a positive list, if they deem this necessary to control and/or restrict the placing on the market of “national” fertilisers or growing media for public health reasons or environmental protection. Nevertheless, according to constant case law of the European Court of Justice national legislation should make provision for a procedure designed to allow a given type to be added to those lists and/or an individual registration or authorisation procedure for products (product types) not listed, but already legally marketed or manufactured in another Member State. Such a procedure must be one which is readily accessible, can be completed within a reasonable period, and, if it leads to a refusal, the decision of refusal must be open to challenge before the courts.

#### **7.2.3.3 *‘Negative lists’ for fertilisers and growing media***

In some other cases prior authorisation procedures rely on existing ‘negative lists’ where some substances are blacklisted. In application of this system, Member States refuse to authorise the marketing of fertilisers and/or growing media uniquely on the grounds that they present unauthorised components without justifying the refusals by reference to a real risk to public health. Additionally, it derives from the same case-law that Member States are not entitled to prohibit the marketing of fertilisers or growing media lawfully marketed in another Member State on the sole grounds that no benefit accrues from their use and without reference to any considerations of public health or protection to the environment.

#### **7.2.3.4 *Language requirements for labelling***

Member States may require that the label, the markings on the package and the accompanying documents must appear in at least the national language(s) of the Member State of destination as mentioned in recital 10 of Regulation (EC) No 764/2008.

#### **7.2.4 *The (intended) administrative decisions must prohibit the marketing of a fertiliser or growing media lawfully marketed in another Member State***

The direct or indirect effect of the (intended) administrative decision should be any of the following:

- prohibition of the placing on the market of that (type of) fertiliser or growing media;
- modification or additional testing of the (type of) fertiliser or growing media before it can be placed or kept on the market;
- withdrawal of that (type of) fertiliser or growing media from the market.

### **7.2.5 Evaluation procedures and requests for information**

When a competent authority submits a product to an evaluation to determine whether or not to adopt an administrative decision, Member State may request economic operators some relevant information concerning the characteristics of the product (Art. 4 of the Regulation). However, the request should remain proportionate: it should not essentially duplicate controls which have already been carried out under other procedures, either in the same State or in another Member State. Member States can not refuse certificates or test reports issued by a conformity assessment body accredited for the appropriate field of conformity-assessment activity in accordance with Regulation (EC) No 765/2008 on grounds related to the competence of that body.

### **7.2.6 Tackling risks to health and environment**

Mutual recognition is based on the freedom of movement of goods through mutual confidence between Member States and on the assumption that Member States are applying equivalent criteria for the protection of the environment and human health. However, the Member State of destination might have legitimate reasons to forbid or stop within its territory the marketing of fertilisers or growing media even if lawfully marketed in another Member State. EU legislation provides enough possibilities to directly ban dangerous products. Moreover, any measure must respect the principle of proportionality and not 'constitute a means of arbitrary discrimination or a disguised restriction on trade between Member States.

However, most Member States have expressed strong reluctance to accept mutual recognition for the fertilising materials sectors (organic fertilisers; growing media, soil improvers and biostimulants) for the following reasons:

- **Environmental and human health concerns**

Over the years, EU Member States have introduced stringent rules for the control of animal diseases and pathogens in organic fertilisers and the content of heavy metals in mineral fertilisers. These rules are not identical throughout the EU and thus constitute potential barriers to mutual recognition. There is now the risk that if Member States are faced with high numbers of demands for mutual recognition, they cannot respond within the required deadlines laid down in Regulation (EC) No 764/2008 even though they may have legitimate reasons to refuse the marketing of certain fertilisers, thus leading to potential adverse effects to their environment. It seems also difficult to ensure an equivalent level of protection of the environment throughout the EU in the absence of a harmonised system of controls covering all fertilising materials. In the case of biochar upper mentioned biochar certificates should help for standardization to ensure an equivalent level throughout the EU.

- **Socio-economic aspects**

Due to incomplete harmonisation, there is also a potential distortion of the market as producers of 'national' fertilisers must continue to comply with different rules in different Member States or request mutual recognition before they may place their products on national markets in other Member States. The intra-EU trade of fertilisers is thus hindered by technical

barriers that may not always be fully justified and which are difficult to overcome even with recourse to Regulation (EC) No 764/2008.

- **Administrative burden**

Even though requests for mutual recognition for fertilisers are currently limited, public administrations might be overwhelmed by high numbers of requests for mutual recognition in the future and they have limited human resources for dealing with such requests and related market surveillance.

**The main problems with the current situation are:**

- **Only (part of the) mineral fertilisers are harmonised at EU level:**

The current EU regulatory framework on fertilisers (Fertilisers Regulation) aims to ensure the free circulation on the internal market of 'EC fertilisers' i.e. those fertilisers that meet the requirements of the legislation for nutrient content, safety, and absence of adverse effects on the environment. The Fertilisers Regulation applies only to inorganic fertilisers for which harmonisation is however not completely achieved: the evaluation of Regulation (EC) No. 2003/2003 estimates that 60 to 70% of the inorganic fertilisers in Europe are 'EC fertilisers'. The estimates made also indicate that organic fertilisers represent about 17% of the total market value of fertilising materials.

- **Other fertilisers and other fertilising materials are not harmonised at EU level:**

The placing on the market of other categories of fertilisers is not harmonised as they are regulated at Member States level in accordance with national legislation. These include organic and organo-mineral fertilisers, liming materials and products like growing media, soil improvers and bio-stimulants. National pieces of legislation differ on multiple aspects like: existence or absence of legislation; varying degrees of stringency; different definitions and designations of products; different product conformity assessments and labelling requirements.

- **Mutual recognition is unsatisfactory for industry and NCAs:**

The mutual recognition Regulation (EC) No 764/2008 does not ensure the intra-EU free movement of non-harmonised fertilising materials. Firms are sceptical or clearly against the use of mutual recognition that has created confusion in the market in a way that could work against harmonisation (in particular unfair competition). The position of most NCAs is even more negative as they are of the opinion that the mutual recognition Regulation does not ensure appropriate protection of the environment and public safety and that control procedures bring significant additional burdens on them.

- **Categorisation of fertilising materials becomes problematic:**

Categorisation of fertilising materials is becoming an issue as such since innovation tends to create new blended products or products on the fringes of usually recognised categories.

- **Lengthy procedures for new EC fertilisers:**

Procedures to introduce a new 'EC fertiliser' on the market are very lengthy: currently, 'EC fertilisers' can only be marketed as belonging to one of the existing fertiliser type designations laid down in Annex I to the Fertiliser Regulation. If the product does not fit within any existing designation types, an evaluation dossier must be submitted by industry to

a Member State, which assesses whether the demand meets the requirements of the EU legislation. The technical dossier is then reviewed by all other Member States and the Commission, before a new fertiliser type is included in Annex I to Regulation (EC) No 2003/2003. According to the evaluation of Regulation (EC) No. 2003/2003 on average, the entire procedure takes between 18 months and 4 years: this discourages innovation and creates high administrative burdens and costs for companies and authorities to prepare and evaluate such dossiers.

- **Lack of convergence among NCAs and stakeholders on how to harmonise:**

Beyond the fact that most Member States are in favour of an EU-wide regulation of all fertilising materials, there is no clear view on how this can be implemented, as illustrated in the evaluation of Regulation (EC) No 2003/2003: this evaluation stresses the absence of consensus across authorities and stakeholders concerning aspects like: extension or not of this regulation to other categories of fertilisers, maximum limit values of heavy metals, presence of pathogens in organic fertilisers, agronomic efficacy criteria in different agro-climatic conditions, etc.

### **Who is affected by the problem?**

A large number of actors within the EU are affected by the problem, as described in earlier sections of this report. A distinction can be made between:

- Producers of mineral fertilisers, organic fertilisers and fertilising materials (soil improvers, growing media, liming materials and bio-stimulants). To identify the problems encountered by this group of actors, the distinction between large companies and SMEs (small and medium sized enterprises) has been made;
- Importers (and distributors) of above mentioned fertilising materials;
- Farmers and other end-users (like private households);
- National competent authorities in Member States;
- Consumers who are indirectly affected through the consumption of products from the agriculture.

The influence of history and of the national situations is also important: the different Member States have different traditions and practices as regards in particular the requirements on human safety and protection of the environment: these differences make it extremely difficult to agree on common EU safety criteria. In some Member States there also remains a will to keep some flexibility in the choice and/or the use of fertilisers and fertilising materials and a perception that harmonisation would eliminate this flexibility. This is explained by different motivations, in particular new demands for the protection of human health and the environment. The list of competent authorities responsible for regulations in countries involved in E2BEBIS project are shown below.

Member State	Product contact point details	Country code
Czech Republic	Ministry of Industry and Trade EU and Internal Market Na Frantisku 32 CZ - 11015 Praha 1 Tel: +420 224 852 470 Fax: +420 224 853 079 E-mail: <a href="mailto:vyrobky@mpo.cz">vyrobky@mpo.cz</a>	CZ
Italy	Ministry of Economic Development via Veneto, 33 ROMA Tel. + (39) 06 47 05 1 E-mail: <a href="mailto:pcp.italia@sviluppoeconomico.gov.it">pcp.italia@sviluppoeconomico.gov.it</a>	IT
Poland	Ministry of Economy Department of Economic Regulations Pl. Trzech Krzyży 3/5, 00-507 Warsaw Tel.: +48 (22) 693 58 52 Fax.: +48 (22) 693 40 25 E-mail: <a href="mailto:pcp@mg.gov.pl">pcp@mg.gov.pl</a>	PL
Slovakia	Slovak Office of Standards, Metrology and Testing Department of European Affairs Štefanovičova 3 P. O. Box 76 810 05 Bratislava 15 Tel : + 421 2 5249 3521 Fax : + 421 2 5249 3521 E-mail: <a href="mailto:productinfo@normoff.gov.sk">productinfo@normoff.gov.sk</a>	SK
Slovenia	Slovenian Institute for Standardization (SIST) Šmartinska cesta 152 SI - 1000 Ljubljana, Slovenia Phone: +386 1 478 3068 Fax: +386 1 478 3098 E-mail: <a href="mailto:info@sist.si">info@sist.si</a>	SI

## 8 BIOCHAR IN THE SCOPE OF REACH REGULATION

The introduction of REACH has wide-reaching impacts on chemical risk governance as it has shifted the burden of proof from authorities to industrial sectors, following the principle of ‘no data e no marketing’. Industries outside the EU have to evaluate and document the level of risk associated with chemical substances in products prior to their import into the EU market. Furthermore, the risks associated with manufacture, use and any release to the environment after use have to be documented prior to marketing. As such, the REACH regulation is expected to influence the chemical substance flow in products inside and outside the EU; and thereby, environmental quality and human exposure, not only within EU countries but also in non-EU countries exporting their products to the EU market. In respect to the first aim of REACH, which is to improve the protection of human health and the environment from risks that can be posed by chemicals, a broader perspective taking into account environmental health (EH) is needed. The health of human beings is influenced by the quality of the surrounding environment and the services provided by ecosystems in the region they live in. While ecosystems were formerly assumed to possess unlimited capacity to assimilate waste, it is now evident that the sustainability of ecosystems is threatened by degradation and not only by overexploitation of resources.

Historical, existing and emerging pollutants may also affect environmental quality and cause environment and human health problems. Therefore, REACH should take into account the differences in territorial environmental qualities caused by historical and existing industrial activities as well as the resulting differences in background exposure levels to

present a worst-case exposure scenario and adopt a precautionary approach to deriving the predicted environmental concentration (PEC) values. Only by applying such a systemic approach to the REACH exposure scenario will REACH be able to document its progress towards the aim of improved protection of environment and human health. Pollutants from human activities that were, and are presently, being used and released are continuously moving through the human and natural environment, while being transported and transformed in abiotic and biotic processes. As such, chemicals may degrade or accumulate according to persistence, fate, transport, and the detoxifying capacity of the natural system. The transport routes of hazardous substances to the environment, humans and other non-target organisms/populations as well as the combined effects from multiple exposures are difficult to evaluate and prevent by means of a single regulatory tool. This means that REACH alone cannot cover all sources of exposure or mixture toxicity. In this regard a systems approach is needed in order to solve the present EH problems. To fulfil the goals of REACH and to maximize the potential of REACH in contributing to improved protection of the environment and human health, the possibility of including local environmental quality data in the REACH exposure assessment tool for deriving PECs is needed.

## 8.1 Understanding REACH

REACH is a regulation of the European Union, adopted to improve the protection of human health and the environment from the risks that can be posed by chemicals, while enhancing the competitiveness of the EU chemicals industry. It also promotes alternative methods for the hazard assessment of substances in order to reduce the number of tests on animals. In principle, REACH applies to all chemical substances; not only those used in industrial processes but also in our day-to-day lives, for example in cleaning products, paints as well as in articles such as clothes, furniture and electrical appliances. Therefore, the regulation has an impact on most companies across the EU. To comply with the regulation, companies must identify and manage the risks linked to the substances they manufacture and market in the EU. They have to demonstrate to **ECHA (European Chemicals Agency)** how the substance can be safely used, and they must communicate the risk management measures to the users. If the risks cannot be managed, authorities can restrict the use of substances in different ways. In the long run, the most hazardous substances should be substituted with less dangerous ones.

## 8.2 REACH's effect on companies

REACH impacts on a wide range of companies across many sectors, even those who may not think of themselves as being involved with chemicals. In general, under REACH you may have one of these roles:

**Manufacturer:** If you make chemicals, either to use yourself or to supply to other people (even if it is for export), then you will probably have some important responsibilities under REACH.

**Importer:** If you buy anything from outside the EU/EEA, you are likely to have some responsibilities under REACH. It may be individual chemicals, mixtures for onwards sale or finished products, like clothes, furniture or plastic goods.

**Downstream users:** Most companies use chemicals, sometimes even without realising it, therefore you need to check your obligations if you handle any chemicals in your industrial or professional activity. You might have some responsibilities under REACH.

**Companies established outside the EU:** If you are a company established outside the EU, you are not bound by the obligations of REACH, even if you export their products into the customs territory of the European Union. The responsibility for fulfilling the requirements of REACH, such as pre-registration or registration lies with the importers established in the European Union, or with the only representative of a non-EU manufacturer established in the European Union.

### 8.3 Substance Identity

Unambiguous substance identification is a pre-requisite to most of the REACH processes. Actors in the supply chain must have sufficient information on the identity of their substance.

The following information on the manufactured or imported substance shall be included in the dossier in order to unambiguously identify the substance:

- **Substance name and related identifiers, molecular and structural formulae, if applicable**
- **Information on the composition and purity of the substance**
- **Spectral data and analytical information to verify the identity and composition of the substance**
- **Clear and concise description of the analytical methods**

The correct identification of a substance will enable, for example:

- The sharing of information by potential registrants and data holders to prevent the duplication of testing on animals and unnecessary costs
- The assessment of the applicability of test data across companies who registered the same substance, the assessment of read-across proposals (categorisation approach) or the use of non test information
- The assessment if a substance is included in the Authorisation List, the list of restrictions or if its classification and labelling has been harmonised

### 8.4 How does REACH work?

REACH establishes procedures for collecting and assessing information on the properties and hazards of substances. Companies need to register their substances and to do this they need to work together with other companies who are registering the same substance. ECHA receives and evaluates individual registrations for their compliance, and the EU Member States evaluate selected substances to clarify initial concerns for human health or for the environment. Authorities and ECHA's scientific committees assess whether the risks of substances can be managed. Authorities can ban hazardous substances if their risks are unmanageable. They can also decide to restrict a use or make it subject to a prior authorisation.

#### **8.4.1 Registration**

Companies have the responsibility of collecting information on the properties and the uses of substances that they manufacture or import at or above one tonne per year. They also have to make an assessment of the hazards and potential risks presented by the substance. This information is communicated to ECHA through a registration dossier containing the hazard information and, where relevant, an assessment of the risks that the use of the substance may pose and how these risks should be controlled. Registration applies to substances on their own, substances in mixtures and certain cases of substances in articles. Chemical substances that are already regulated by other legislations such as medicines, or radioactive substances are partially or completely exempted from REACH requirements. Registration is based on the "one substance, one registration" principle. This means that manufacturers and importers of the same substance have the obligation to submit their registration jointly. The analytical and spectral information provided should be consistent and sufficient to confirm the substance identity. For substance registration a fee is usually charged.

#### **8.4.2 Evaluation**

ECHA and the Member States evaluate the information submitted by companies to examine the quality of the registration dossiers and the testing proposals and to clarify if a given substance constitutes a risk to human health or the environment.

Evaluation under REACH focuses on three different areas:

- Examination of testing proposals submitted by registrants
- Compliance check of the dossiers submitted by registrants
- Substance evaluation

Once the evaluation is done, registrants may be required to submit further information on the substance.

#### **8.4.3 Authorisation**

The authorisation procedure aims to assure that the risks from Substances of Very High Concern are properly controlled and that these substances are progressively replaced by suitable alternatives while ensuring the good functioning of the EU internal market.

Substances with the following hazard properties may be identified as Substances of Very High Concern (SVHCs):

- Substances meeting the criteria for classification as carcinogenic, mutagenic or toxic for reproduction category 1A or 1B in accordance with Commission Regulation (EC) No 1272/2008 (CMR substances)
- Substances which are persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB) according to REACH (Annex XIII)
- Substances identified on a case-by-case basis, for which there is scientific evidence of probable serious effects that cause an equivalent level of concern as with CMR or PBT/vPvB substances

After a two-step regulatory process, SVHCs may be included in the Authorisation List and become subject to authorisation. These substances cannot be placed on the market or used after a given date, unless an authorisation is granted for their specific use, or the use is exempted from authorisation. Manufacturers, importers or downstream users of a substance on the Authorisation List can apply for authorisation.

## **9 STATUS OF THE EU APPROVAL AGAINST BIOCHAR**

**Switzerland has become the first country in Europe to officially approve the use of certified biochar in agriculture, with the Federal Ministry of Agriculture issuing its approval on 23 April 2013.** The Delinat Institute is given responsibility for controlling biochar quality and the sustainability of its production.

Following an exceptionally thorough 3-year approval procedure involving the various research groups of the Biochar Science Network of Switzerland and the Federal Ministries of the Environment and Health, the Swiss Federal Ministry of Agriculture has issued conditional approval for the use of biochar in agriculture. Approval is based on strict, scientifically checked requirements with regard to the sustainability of biochar production, to biochar quality and to user protection in its application.

In 1984, Japan became the first country worldwide to approve the use of biochar as a soil conditioner. Switzerland is now the first country in Europe officially authorising biochar for use in agriculture. Switzerland's strict quality and sustainability regulations are a major factor driving the development of biochar technology as a key technology for closing material cycles. Such regulations are currently missing in the European Union Member States, as well as in the USA and other countries using biochar in considerable amounts in agriculture. Looking at the EU, the use of biochar in agriculture is neither clearly regulated nor explicitly forbidden. In Germany for example, the use of biochar as animal feed is allowed. It can thus be composted with the manure and applied to fields. In addition, charcoal is allowed as an additive for fertilisers and soil conditioners. What however is missing is an exact definition of what can be counted as biochar and which production conditions and thresholds need to be complied with. With the Swiss approval, we now have an exact definition, along with a requirement for strict quality controls. As a result of this approval, Switzerland can justify its leading role not just in the research and application of biochar, but also into its regulatory approach. Thanks to a number of EU-sponsored research projects such as EBRN, Interreg or Refertil, we can now hope that a regulatory basis for the sustainable use of biochar will be created within the next few years, and that the development of a centuries-old agricultural tradition will not remain limited or even prohibited by fertiliser legislation pandering to the agri-chemical industry.

### **9.1 EU funded projects focused on biochar utilization**

Biochar as we know is very actual and growing research theme in EU and there a number of exciting projects underway or in the planning stages. Below is a short summation of some biochar projects.

## **INTERREG IVB North Sea Region**

Interreg IVB North Sea Region project "*Biochar: climate saving soils*". In this project eleven partners from seven different countries around the North Sea work together in close harmony to do research on the agricultural applications of a substance called biochar.

The project has two major goals. The first goal is to establish a transnational strategy for Biochar production and application. The other goal is communicating with and educating people about biochar, including authorities, producers and end-users. To actually be able to reach these goals the project partners have developed a very specific communication strategy. The project aims to contribute to the dissemination of biochar knowledge between various groups of stakeholders such as academic researchers, farmers, companies and policy makers on a national and on a transnational level.

## **REFERTIL**

Project title: *Development of comprehensive bio-waste transformation and nutrient recovery treatment process for production of combined compost and bio-char natural fertilizers and soil amendment products*. EU legislation support by definition of improved compost and biochar standards in the EU27. Improvement of common compost quality standards and development of new biochar quality standards for the EU 27 by 2013 for European Union Commission regulation law harmonization support. The aim of the REFERTIL project is about improved compost standardization and new standard development for biochar in the EU27, for safer, better, less costly and more environmental friendly utilization of the EU27 generated 150 M t/y plant/animal biomass waste streams.

## **FERTIPLUS**

Project title: *Reducing mineral fertilisers and agro-chemicals by recycling treated organic waste as compost and bio-char*. The Fertiplus consortium has fourteen partners from six European countries: the Netherlands, United Kingdom, Germany, Belgium, Italy and Spain. These partners include universities, research organisations and SME's.

The strategic goal of this project would be to support the European Union by providing the necessary tools and quality standards for the design and implementation of future strategies for transitions to a safe and sustainable recycling of urban and farm organic wastes as fertilizers and soil amendments.

## **EURO-CHAR**

Project title: *Biochar for Carbon sequestration and large-scale removal of greenhouse gases (GHG) from the atmosphere*. The EURO-CHAR consortium has 8 partners from 4 European countries. EuroChar will investigate carbon sequestration potentials that can be achieved by transforming plant biomass into charcoal (or Biochar) and add that to agricultural soils. Biochar production will be demonstrated using thermochemical (TC) or hydrothermal carbonization processes (HTC) that can produce energy and store 15 to 20% of the Carbon originally contained in the biomass.

## EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY (COST)

Project title: *Biochar as option for sustainable resource management*. This COST Action connects scattered European Biochar research to enable quick implementation of intelligent material flow management systems, to maintain or improve soil quality while efficiently sequestering carbon in the long-term. Innovative Biochar strategies can help the EU mitigating greenhouse gases, while industries and farmers benefit from new markets, opportunities and use of improved soils, e.g. for biofuel production without endangering food supply. However, a risk assessment is necessary to protect food web and human health. Current Biochar research is often fragmented, unnecessarily repeated, and new scientific evidence is not connected or implemented, due to the lack of interaction and knowledge exchange. Therefore, this Action aims at coordinating European Biochar research, bringing together researchers, stakeholders and potential users from EU and candidate countries. Four working groups will focus on (i) Biochar production and characterisation, (ii) land use implementation, (iii) economic analysis including life cycle assessment and (iv) environmental impact assessment. The Action will thus strengthen EU's leadership in the increasing competition with non-European Biochar actors.

## 10 SUMMARY

Biochar application to agricultural soils is an interesting emerging technology with promising potential for long-term carbon storage, sustainable waste disposal, and soil fertility enhancement. Extensive information exists in the literature on the highly beneficial properties of biochar. Nevertheless, systematic application of biochar on European agricultural soils may have wide ranging policy implications as well as environmental and public health concerns. Thanks to wide-ranging multidisciplinary research and field trials, the understanding of the biological and chemo-physical processes involved in the use of biochar has made great progress. Thus a major increase in the agricultural use of biochar is to be expected for the next years. Usage ranges from soil conditioning, compost additives and carrier for fertilizers, manure treatment and litter (bedding) materials to silage additives, feed-additives, medical applications and others. In this paper we critically review existing scientific evidence from a European policy perspective and identify research gaps for future comprehensive assessments of the policy, environmental, economic, and health implications of the systematic use of biochar in European agricultural soils. Assessing and managing cumulative risks from multiple sources and stressors pose a challenge in the regulation of chemicals. International organizations and national governments have used various risk assessment tools for setting policy goals, analysing cost-benefit aspects, and evaluating substitutes and alternatives.

One example is the European Community regulation on chemicals and their safe use, called **REACH (Registration, Evaluation and Authorization of Chemicals)**. When it entered into force in June 2007, REACH was considered the world's strictest regulation on toxic chemicals.

REACH is a regulation of the European Union, adopted to improve the protection of human health and the environment from the risks that can be posed by chemicals, while enhancing the competitiveness of the EU chemicals industry. In principle, REACH applies to all chemical substances; not only those used in industrial processes but also in our day-to-day lives, for example in cleaning products, paints as well as in articles such as clothes, furniture and electrical appliances. Therefore, the regulation has an impact on most companies across

the EU. To comply with the regulation, companies must identify and manage the risks linked to the substances they manufacture and market in the EU. They have to demonstrate to **ECHA (European Chemicals Agency)** how the substance can be safely used, and they must communicate the risk management measures to the users. REACH establishes procedures for collecting and assessing information on the properties and hazards of substances. Authorities and ECHA's scientific committees assess whether the risks of substances can be managed. The implementation of REACH regulation is detailed in chapter 8.

Next step is the **European Biochar Certificate** which is a milestone in the use of biochar in agriculture. Biochars produced under the certificate's guidelines fulfil all production criteria regarding the environment and climate protection. The product guarantee provided by the certificate covers the ecological supply of biomasses used for the production of the biochar and the latter's compliance with government regulations on soil protection. The intention of the Biochar Science Network in issuing these guidelines on how to gain biochar certification is first to introduce a control mechanism based on the latest research and practices. Second, the biochar certificate aims to enable and guarantee sustainable biochar production. It is introduced to give customers a reliable quality basis, while (third) giving producers the opportunity of proving that their product meets well-defined quality standards. Fourth, it aims at providing a firm state-of-the-art knowledge transfer as a sound basis for future legislation. Finally, it is introduced to prevent and hinder misuse or dangers from the start, as long as no "special interests" are calling for exceptions (e.g. such as cutting down native forests to produce biochar). It is high time for a substantial, policy-relevant, research effort at EU level allowing for the full assessment of all implications of this very promising technology. Once all the knowledge gaps are bridged a solid legislative framework addressing biochar may be developed in order to regulate its use at EU level.

## **11 SUMMARY OF EU PROVISIONS RELEVANT TO BIOCHAR APPLICATION**

- 1) Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Waste Framework Directive)
- 2) Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (Water Framework Directive)
- 3) Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture
- 4) Directive 2001/95/EC of the European Parliament and the Council of 3 December 2001 on general product safety
- 5) Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide
- 6) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
- 7) Regulation (EC) No 2003/2003 of the European Parliament and of the Council of 13 October 2003 relating to fertilisers
- 8) Regulation (EC) No 764/2008 of the European Parliament and of the Council of 9 July 2008 laying down procedures relating to the application of certain national technical rules to products lawfully marketed in another Member State
- 9) Commission Decision 2007/64/EC of 15 December 2006 establishing revised ecological criteria and the related assessment and verification requirements for the award of the Community eco-label to growing media
- 10) Commission Decision 2006/799/EC of 3 November 2006 establishing revised ecological criteria and the related assessment and verification requirements for the award of the Community eco-label to soil improvers

**Biomasses**

Origin	biomasse feedstock	Special requirements for basic grade biochar	Special requirements for premium grade biochar	Biomass for charcoal
Local waste collection services with waste separation	Biodegradable waste Biodegradable waste with kitchen waste Biodegradable waste with kitchen waste and leftovers			
Garden waste	Leaves	No street cleaning waste		
	Flowers			
	Vegetables	Only waste not / no longer usable as animal feed Attached soil is deemed an additive and must not account for more than 10% of DM		
	Roots			Yes
	Prunings from trees, vines and bushes Clippings from nature conservation measures			
Agriculture and forestry	Hay, grass	Only waste not / no longer usable as animal feed		Yes
	Harvest leftovers			
	Straw, used straw, husks and grain dust	Attention: health & safety precautions where dust is involved Only waste not / no longer usable for human consumption or as animal feed		
	Grain, feedstuffs, fruit			
	Grain, feedstuffs, prunings from biomass plantations grown for energy or biomass use (renewable resources).		Biomasses must have been produced in a sustainable manner.	Yes
	Prunings from trees, vines and bushes			Yes
	Seeds and plants			
Kitchens and canteens	Bark			Yes
	Bark and chippings	Only from untreated		Yes
	wood	Wood		Yes
	Sawdust, wood shavings, wood wool			Yes
Kitchens and canteens	Kitchen, canteen and restaurant leftovers			
Vegetable production	Material from washing, cleaning, peeling, centrifuging and separation processes			
	Pulp, pips, peelings, shreds or pomace (e.g., from oil mills, spent grain)			
Waterway maintenance	Raked off material, flotsam, fishing residues			

(vegetable material)	harvested material, water plants			
Animal by-products	Hides and skins, bristles, feathers, hair Bones	Subject to national hygiene regulations		
Materials from food and confectionary production	Expired food and confectionary Leftovers from the production of canned food	only vegetable Material		
	Leftovers from the production of canned food Seasoning residues Residues from potato, corn or rice starch production Residues from dairy processing Fruit, grain and potato residues, alcohol distillery residues Brewer's grain, germs and dust from spent hops in beer production, lees and sludge from breweries Marc, wine lees, sludge from the winemaking Tobacco, tobacco dust, slacks, ribs, sludge Tea and coffee grounds Fruit Treacle residues Oilseed residues Mushroom substrates Fish residues Eggshells			
Textiles	Cellulose, cotton and vegetable fibres Hemp, sisal and other fibres wool leftovers and wool dust	only from untreated Textile fibres		
Paper production	Paper fibre sludge	only from wood fibres not treated chemically (a contamination analysis of the paper fibre sludge must be presented)		
Plant-based packaging material Origin	Cotton and wood fibres	not chemically modified of solely natural origin, untreated		
Biogas plants	Fermentation residues		biomasses for biogas plants must be produced sustainably	

## Additives

Additives are used to improve pyrolysis conditions and biochar quality. They must not total more than 10% of the pyrolysed biomass (DM).

Group	Initial materials	Special requirements for basic grade biochar	Special requirements for premium grade biochar	
Mineral-organic ingredients	Lime Lignite Bentonite Rock flour Clay Loam Soil			