

## Biochar production from agricultural waste for carbon sequestration

### Riferimenti

Tipo di progetto

Gruppo Operativo

Acronimo

BIOCHAR

Tematica

Gestione dei sottoprodotti agricoli

Information

Time frame

2016 - 2019

Durata

36 months

Partners (no.)

8

Regione

Emilia-Romagna

Comparto

Multifiliera

Localizzazione

ITH51 - Piacenza

ITH52 - Parma

Costo totale

€199.966,89

Fonte di finanziamento principale

Programma di sviluppo rurale

Programma di sviluppo rurale

2014IT06RDRP003: Italy - Rural Development

Programme (Regional) - Emilia Romagna

Parole chiave

Landscape /land management

Agricultural production system

Sito web

<http://www.acchiappacarbonio.it>

Project status

completed



### Objectives

In recent years the use of biochar has yielded promising results in the reduction of CO<sub>2</sub>.

Biochar is a carbon rich charcoal that is formed by the thermal decomposition of biomass.

Due its chemical and physical stability biochar, besides being a soil amender, is a viable option for underground storage of the carbon that will remain in soil for centuries. This project specifically focuses on the production and characterization and use of biochar samples from residues of agricultural activities as an innovative tool for combating global climate change

### Activities

- Financial cooperation.
- Studies required to the implementation of the plan (market, feasibility, business plans, etc.).
- Collection (mowing and rotoimballatura) and transport of biomass plant.
- Setup load / carbonizer.
- Agronomic tests.
- Laboratory analysis.
- Presentation annual reports.
- Drafting of the guidelines.
- Data collection.
- Plan disclosure of transfer of results and implementation of PEI Network.
- Training activity.

## Context

To minimize or mitigate climate change is required the management of the carbon cycle and of CO<sub>2</sub> concentration in the atmosphere. The carbon cycle includes a first phase of subtraction of CO<sub>2</sub> by photosynthesis that accumulates in the organic biomass (leaves, stems, flowers ...), converting the CO<sub>2</sub> into organic carbon. A second phase in which the organic biomass is consumed: directly from plants in cellular respiration, by animals in the food chain, degraded by soil microorganisms; with the return of CO<sub>2</sub> into the atmosphere.

The high stability of biochar allows this product to be an interesting technology not only "Carbon neutral" but even "Carbon Negative" as sequesters more carbon than it is input during its production (Liu et al., 2014) .

The addition of biochar into the soil matrix lets you store carbon and thus mitigate the effects of climate-altering gases emitted continuously in high amounts in the atmosphere (Rhodes et al., 2012) by providing a sustainable approach for the mitigation of climate change through organic carbon storage in very stable form. (Dominic Woolf in 2009, Johannes Lehmann 2007)

The application of this product to the ground also has direct influences on the reduction of natural emissions of CH<sub>4</sub> and N<sub>2</sub>O in as change certain parameters of the matrix and consequently the metabolic activity of special microbial communities responsible for the production of these compounds (Rizhiya et al., 2015, Zhang et al., 2015).

## Partenariato

Role	Azienda	Address	Telephone	E-mail
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Partner	Università di Bologna - Dipartimento di Chimica "Giacomo Ciamician"	Via Selmi 2 40126 Bologna BO Italy	051 2099545	rita.guerra5@unibo.it
Partner	Azienda Agraria Sperimentale Tadini	Località Gariga 29027 Podenzano PC Italy	0523 523032	tadini@aziendatadini.it

Role	Azienda	Address	Telephone	E-mail
Partner	Azienda Agricola Querzola Francesco	Località Casembola 86 43043 Borgo Val di Taro PR Italy	0525 998210	info@querzola.it
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Partner	Azienda Agricola Ritorno al futuro di Mario Marini	Strada Costalta 62 43053 Compiano PR Italy	3482885159	mariomarini72@gmail.com
Partner	Università degli Studi di Parma - Dipartimento di Scienze Chimiche, della Vita e della Sostenibilità Ambientale	Parco Area delle Scienze 11/A 43124 Parma PR Italy	0521 905631	dip.scvsa@unipr.it

## Pratiche abstract

### Description

A1 EXERCISE OF COOPERATION - A monitoring action to ensure compliance with the aspects defined in the Agreement

### Description

A2 - STUDIES NEEDED FOR THE MARKET PLAN, EFFECTIVENESS, ETC):

The methodology used to measure the economic effects of the project for the realization of a pyrolysis plant is the Cost-Benefit Analysis (ACB).

### Description

Action 3. Collection, storage of organic biomass and subsequent carbonization. (FARMS and STUARD)

Collection of organic waste produced at the Farms involved in Piacenza and Parma, in areas D, for their carbonization. This action will be carried out in 2016 and will be repeated in 2017.

Harvested material will be delivered to the ASVT for later carbonization.

### Description

Action 4. Adjustment of the micro carbonization feed according to the type of bioamass carbonisation. (ASVT)

At the ASVT will be placed an innovative micro carboniser, granted in a Free-to-use agreement, to which will be added a specific feeding system for crop residues from farms.

Six months are planned for the feeding system, during which it will be produced the biochar which will be used for autumn autochthonous tests at farms.

The samples of biochar products will be analyzed at the specialized workshops partners of the project.

Biochar's production activity will begin on 1/8 2016 and will be carried out throughout the project life so that it can evaluate the different types of biochar obtained from different biomasses.

## Description

Action 5. Agronomic tests. (STUARD, ASVT, FARMS)

They will be run from autumn 2016

At the Farm in areas D in Parma and at ASVT, parcels trials will be organized in a randomized block diagram with 4 replicas to compare two doses of biochar (15 and 30 t ha<sup>-1</sup>) activated with slurry and digestate.

The experimental scheme, at the Piacentina and Parma fruit-growing company, provides for experiments on the rows of vines in which the replicas are represented by the plants, and comparison of the doses of biochar and different activation is distributed on the interfaces that will be subsequently buried.

## Description

A6 - Laboratory analysis

To be performed before sowing, and after harvesting.

UNIPR

Within the framework of the project, the role of UNIPR is to evaluate the efficacy of the biochar which is either functionalized with selected microorganisms as soil modifier to stimulate the growth of active microbial biomass and consequently to improve the filtration efficiency of the buffer bands. In the first phase, in collaboration with the main parameters useful for the chemical-physical characterization of the biochar, in order to evaluate its morphology and chemical composition. This information is important for determining the most advantageous and least beneficial aspects of biochar use in the agricultural and environmental field. First, there is no single type of biochar, but different types depending on the starting material and preparation conditions. Subsequently, UNIPR will evaluate the effects on plant life of different types of biochar, relative to growth parameters and metabolic function, using different types of plants of agronomic and environmental interest, and different types of soil. At the same time, the microbial community of rhizosphere will be analyzed and how it is influenced by the administration of biochar. Finally, the possible effects on living organisms related to possible toxicity and / or genotoxicity will be evaluated, using also mutagenesis tests and other biochemical and molecular analyzes to determine toxicity and carcinogenicity in vitro. From this stage could emerge the possible risk factors to be considered in each application.

UNIBO

Analysis of biochar characteristics

## Description

Action A7. Draft annual reports, detailing the technical-managerial details of each business test and the results obtained (year-to-year).

A report will be produced for each company, which will annually record all the results obtained (productions, technical-management data, costs, agronomic data ...) and which will be the basis of any improvements to be introduced for the following year.

## Description

Action A8. Drawing Guidelines for applying and disseminating practices and / or combining tested practices.

At the end of the planning period, a technical and agronomic account will be produced of the activity carried out in each company, showing the successes and possible failures of the tested techniques in the different types of terrain. The goal is to provide a list of good practices that can make the contextualization of the practices easier, even and above all, depending on the company's characteristics

## Description

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## A9 - Data collection

Data Collection Actions: Sampling and analysis of carbon and biocar content in soils will be carried out at the beginning, mid and end of the three-year trial in accordance with the official soil analysis methods (DM No.79 Of 11/05/1992 and DM No.185 of 13/09/1999), which allow uniformization of analytical methods and obtaining objectively interpretable values. In particular, soil biochemical analysis will follow the guidelines formulated by the International Biochar Initiative (IBI) for standardization of the Biochar for Soil (Standardized Product Definition and Product Testing Guidelines for Biochar That is Used in Soil - April 2012) and Biochar Quality Mandates and the European Biochar Certificate (UNIPR).

## Description

### A10 - DIAGNOSTIC TRANSLATION OF RESULTS AND IMPLEMENTATION OF PEI NETWORK

The dissemination of innovation to agricultural enterprises is an activity that the Operational Group intends to take particular care in the context of this Plan, given the importance of this phase in the Community addressing objectives. Therefore, the dissemination activity in addition to the implementation of the PEI network will include a series of dissemination actions capable of contributing to the transfer and application required in the PSR, particularly within Measure 16.1.

Technical Articles, such as:

- Guided tours
- Technical Meeting
- Experimental Business Portal
- Audiovisual
- Connecting to the PEI Network

## Description

A11 - AGRIFORM TRAINING ACTIVITIES as proposed in the Green Catalog

## Link utili

Titolo/Descrizione	Url	Tipologia
Sito web del progetto	<a href="http://acchiappacarbonio.it/">http://acchiappacarbonio.it/</a>	Sito web
sito Web dell'azienda Stuard	<a href="http://www.stuard.it/il-progetto-lacchiappa-carbonio/">http://www.stuard.it/il-progetto-lacchiappa-carbonio/</a>	Link ad altri siti che ospitano informazioni del progetto
sito web del DIPARTIMENTO DI CHIMICA, SCIENZE DELLA VITA E SOSTENIBILITÀ AMBIENTALE dell'Università di Parma	<a href="https://scvsa-servizi.campusnet.unipr.it/do/progetti.pl/Show?_id=222a">https://scvsa-servizi.campusnet.unipr.it/do/progetti.pl/Show?_id=222a</a>	Link ad altri siti che ospitano informazioni del progetto

# Carbonizzazione dei residui agricoli: Biochar preziosa Soluzione per il Sequestro di Carbonio nel Suolo

6/6

<https://www.innovarurale.it/pei-agri/gruppi-operativi/bancadati-go-pei/carbonizzazione-dei-residui-agricoli-biochar-preziosa>

Titolo/Descrizione	Url	Tipologia
sito web del gruppo di ricerca dell'Università di Bologna	<a href="https://site.unibo.it/pyrolysis/it/argomenti-di-ricerca/progetti-di-ricerca-in-...">https://site.unibo.it/pyrolysis/it/argomenti-di-ricerca/progetti-di-ricerca-in-...</a>	Link ad altri siti che ospitano informazioni del progetto
Video descrittivo ufficiale del progetto	<a href="https://www.youtube.com/watch?v=HnO4moBrNIY&amp;feature=youtu.be">https://www.youtube.com/watch?v=HnO4moBrNIY&amp;feature=youtu.be</a>	Materiali utili
Video della Conferenza a Bologna 1-2 marzo 2019	<a href="https://www.youtube.com/watch?v=KDOH3xFQdlU&amp;feature=youtu.be">https://www.youtube.com/watch?v=KDOH3xFQdlU&amp;feature=youtu.be</a>	Materiali utili
video Conferenza a Bologna 1-2 marzo 2019	<a href="https://www.youtube.com/watch?v=TLwz50YsivI&amp;feature=youtu.be">https://www.youtube.com/watch?v=TLwz50YsivI&amp;feature=youtu.be</a>	Materiali utili
Conferenza finale il 24 aprile - video	<a href="https://www.youtube.com/watch?v=aMryC6ktEDo&amp;feature=youtu.be">https://www.youtube.com/watch?v=aMryC6ktEDo&amp;feature=youtu.be</a>	Materiali utili
Inaugurazione del prototipo all'Università di Parma	<a href="https://www.youtube.com/watch?v=amI2i0KhF7Y&amp;feature=youtu.be">https://www.youtube.com/watch?v=amI2i0KhF7Y&amp;feature=youtu.be</a>	Materiali utili
Articolo su News Age Agro	<a href="http://www.newsageagro.it/content/Emilia-Romagna-settore-chiave-che-investe-176...">http://www.newsageagro.it/content/Emilia-Romagna-settore-chiave-che-investe-176...</a>	Materiali utili
Articolo su Agro Notizie	<a href="https://agronotizie.imagelinenetwork.com/agricoltura-economia-politica/2019/03/...">https://agronotizie.imagelinenetwork.com/agricoltura-economia-politica/2019/03/...</a>	Materiali utili
Articolo su Repubblica di Parma	<a href="https://parma.repubblica.it/cronaca/2019/04/26/news/food_valley_a_parma_la_sfid...">https://parma.repubblica.it/cronaca/2019/04/26/news/food_valley_a_parma_la_sfid...</a>	Materiali utili