



## CASE STUDY

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Practical help for businesses

## Caradoc Charcoal



European Union  
European Regional  
Development Fund

**OVER 110,000 TONNES OF CHARCOAL IS  
USED IN THE UK EVERY YEAR<sup>[1]</sup>**



**Wood-derived biochar, a form of  
sustainable charcoal, can benefit the  
environment and the economy**

**Biochar can offset 1.8 billion metric tons of  
carbon emissions annually<sup>[2]</sup>**

**The European biochar market is worth  
£0.45 billion and is set to reach  
£0.56 billion by 2025<sup>[3]</sup>**

# Biochar offers a wide variety of benefits and uses including carbon capture, water treatment, fuel source, odour control, soil improvement and industrial applications.



A thermal conversion process known as pyrolysis, which heats biomass in a reactor vessel containing an oxygen-free atmosphere, can be used to reprocess tree cuttings and other woody material into a solid product known as biochar.

## Case Study

Caradoc Charcoal Ltd, based in the Stretton Hills in rural Shropshire are producers of sustainably sourced 100% guaranteed British charcoal. The independent, family business is run by duo Kevin Fryer and Charlotte Smith. In 2019, having spent 25 years in the firewood business, they made the move to produce charcoal using a blend of native grown hardwood trees, all felled under licence from the Forestry Commission.

Their impressive product range includes charcoal, barbecue smoking wood chips and chunks in a variety of flavours

**A family Shropshire business: Kevin and Charlotte, the founders of Caradoc Charcoal, pictured with their daughter Fran along with a range of their products packaged in biodegradable bags.**

including whiskey oak barrel, cherry and sweet chestnut, hardwood kindling and natural wood wool firelighters.

Caradoc's customer base stretches from Scotland to the Isle of Wight. Not only do they supply their products to barbecue, pizza oven and firepit cookery enthusiasts, they also boast top chefs, farm shops and some of the UK's best restaurants among their growing list of regular purchasers.





# Caradoc's charcoal production process

Caradoc use only sustainably sourced British hardwood to make their charcoal products: ash, oak and chestnut. Firstly the wood is dried in a kiln before the charcoal is made via the retort process, a very efficient and clean method. A retort is a double-barrelled, air-tight steel vessel in which the wood to be charred is isolated and heated at high temperatures of up to 500°C by a separate fire.

Evolving gases are used to further heat the vessel and completely burn the wood, saving on fuel and reducing smoke emissions. The process, which can take between ten and twelve hours, is not wasteful with useful by-products resulting from the reaction including charcoal dust, wood vinegar and biochar.

**Kevin Fryer pictured using the retort method to produce Caradoc Charcoal.**



## Biochar: a new market horizon

The wood-derived biochar left over from Caradoc's charcoal production process offers numerous commercial and environmental benefits, and could potentially provide an additional revenue stream for the family firm.

As part of their business development drive, Kevin and Charlotte have been exploring the merits of biochar and are considering new market opportunities for this sustainable material - ranging from utilising it as a soil enhancer to pelletising it for fuel or cat litter.

**Biochar, a by-product of the charcoal production process has a variety of uses including soil amendment, animal feed and as a filtration technique for wastewater purification.**



# Support from EBRI

## New product feasibility, Shropshire, West Midlands



Innovative entrepreneur and co-founder of Caradoc Charcoal, Kevin Fryer first connected with the Energy & Bioproducts Research Institute (EBRI), Aston University when he sought guidance and expertise about how to take his biochar business idea further.

In March 2020, he attended the EBRI Biochar Workshop held on the Aston University campus in the heart of Birmingham. The one-day event gave him a full insight into the biochar market and supply chain, as well as applications and industrial technologies.

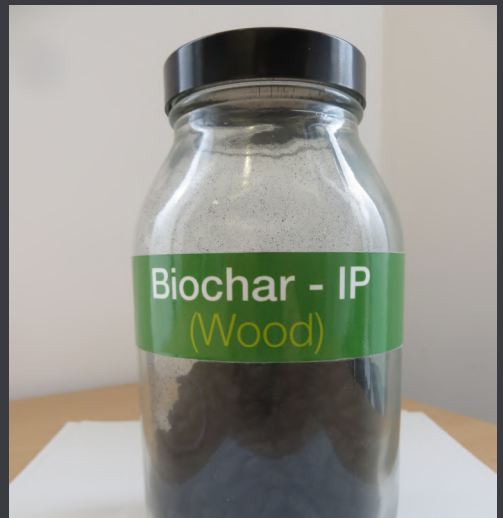


**The EBRI Biochar Workshop inspired Kevin to further explore a potential new avenue for his business - recovering the biochar by-product left over after burning firewood, and turning it into a marketable product.**

## Further specialist help from EBRI

Following on from the workshop, the EBRI team provided additional support to Kevin and Charlotte by conducting a full laboratory analysis of the Caradoc biochar. This included the measurement of basic quality parameters: carbon and ash content, acidity and electrical conductivity. The level of contaminants was tested too, as was the pH, density and nutrient content.

A full, detailed report was produced by EBRI which gave a thorough understanding and summary of the chemical composition of Caradoc's charcoal, and subsequently its potential for commercialisation.



# Findings and recommendations

The EBRI team presented a comparison of different production routes available for biochar, as well as a summary of innovative technologies available in the market to help Caradoc enhance the efficiency of their process.

Since the quality of the biochar is related to the wood feedstock, as well as the manufacturing conditions, it was recommended that some of the biochar

properties could be enriched by adding feedstock containing higher nutrient content, or operating the production process at a lower temperature, which would decrease the loss of minerals.

Caradoc have taken EBRI's recommendations and guidance on board in order to maximise the quality of their biochar for use as a soil enhancer and other commercial uses.

Overall, EBRI's full analysis of Caradoc's biochar sample led to the conclusion that the Shropshire firm's biochar meets the criteria set by the International Biochar Initiative (IBI), Biochar Quality Mandate (BQM) and European Biochar Certificate (EBC), which makes it suitable for market applications, such as soil amendment.



*The EBRI team has been very supportive. They really know the science behind biochar. Their report has helped put us one step ahead of the game."*

**Kevin Fryer**  
Director and Co-founder  
Caradoc Charcoal

# Outcome



**Caradoc are now exploring new, horticultural, commercial opportunities, as well as those connected to the livestock industry.**



The proof of quality results outlined in the EBRI report showed the Caradoc biochar to have high potential for commercialisation. Following on from this Kevin and Charlotte have already received interest from prospective buyers.

For instance, they have been approached by a potential commercial partner who is keen to buy their biochar to add to compost to potentially retail at garden centres. They are also holding discussions with a company Kevin met at the EBRI workshop regarding using their biochar as a cattle feed supplement.

Caradoc have taken EBRI' s findings and recommendations on board and have begun a new phase of development work. The couple are planning to take on extra staff in the future and invest in several more charcoal production retorts to facilitate biochar production on a larger scale.



***EBRI's recommendations support our long-term visions and goals. They have given us invaluable advice and the confidence to establish new markets and networks."***

**Charlotte Smith**  
Director and Co-founder  
Caradoc Charcoal



The Energy & Bioproducts Research Institute (EBRI) at Aston University provides practical solutions for businesses to explore the growing bioenergy, Energy-from-Waste (EfW) and bioproduct markets, and the opportunities they offer.

Companies can benefit from specialist support, cutting-edge technologies and bespoke events to stimulate business start-up and growth, plus the development of new low carbon products and services.

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[www.bioenergy-for-business.org](http://www.bioenergy-for-business.org)

[1] National Coppice Federation

[2] Science News: DOE/Pacific Northwest National Laboratory. August 12, 2010

[3] [www.marketdataforecast.com/market-reports/europe-biochar-market](http://www.marketdataforecast.com/market-reports/europe-biochar-market)

