



Case Study

**Tree planting and growth  
trial with biochar**

**Hall Green, Birmingham**

**Young tree growth is heavily influenced by the ability to establish a strong root system within the first 12 to 36 months, with the primary factors being water availability, soil quality, and protection from external damage.**



# Biochar, a sustainable form of charcoal, can significantly boost young tree growth and improve survival rates by:



- Enhancing soil structure;
- Increasing water and nutrient retention;
- Fostering beneficial microbial activity in the root zone.

By permanently storing carbon in the soil and increasing its porosity, biochar can help mitigate stress, especially in tough or compacted soil environments, so that roots and microorganisms can thrive.

## Case Study

Kier Group plc is a leading provider of construction, infrastructure and property developments in the UK. One of their divisions, Kier Transportation Ltd, operates a maintenance and response contract working on behalf of Birmingham City Council, carrying out proactive and reactive maintenance across the city's highways network including tree planting.

### The challenge

Over the last few years, several trees, especially the ash variety, planted in public spaces in the UK have encountered difficulties and need replacing.

Kier was seeking a solution to help prevent sapling mortality after planting, and to improve soil health.



# Help from EBRI

Aston University in central Birmingham has been researching pyrolysis, the method by which the carbon-rich material biochar is produced, since the 1970s.

In 2023, Kier entered discussions with the Energy & Bioproducts Research Institute (EBRI) at Aston University regarding how biochar could benefit tree planting and subsequent growth, including soil improvement and carbon capture. It was agreed that a joint trial would take place of sapling planting with biochar in the Birmingham area. Kier would arrange the tree planting and EBRI would provide the biochar at the time of planting, and monitor the future growth of the trees on an annual basis which would also include soil analysis.



## The trial

During November 2023, 14 lime trees (*Tilia x europaea*) were planted in Hall Green, Birmingham, to replace diseased ones, utilizing pinewood biochar pellets produced by EBRI's advanced pyrolysis technology, mixed with compost.

A blend of 5% biochar and 95% compost (by volume) was applied.



To see more about how the biochar was made see page 7.

- Two types of biochar, produced by heating biomass at 500°C for either 20 minutes or 40 minutes, were separately mixed with compost at a ratio of 5% biochar to 95% compost by volume.
- The study included 20 trees in total: seven received the first type of biochar, seven received the second, and six served as the control group.
- Baseline measurements were recorded in August 2024 (nine months after planting) and then repeated in August 2025.



**Soil sampling and tree measurements carried out by EBRI in August 2024.**



# The impact

- Each tree trunk diameter was measured at different heights from the ground to breast height (1.1, 1.3, 1.4 and 1.5 m) and soil samples were taken from each tree canopy area.
- Between August 2024 and August 2025, the biochar treatment resulted in an average increase in tree diameter of 2.2 cm – which is 1.1 cm more compared to the control group of trees where no biochar had been added to the soil.
- **The average annual growth rate of trees with biochar was 50% higher than those without.**



## Findings and conclusion

- Adding biochar derived from pinewood pellets (pyrolysed at 500°C for 20 minutes) to standard compost enhances nutrient retention and plant growth in sandy soils.
- Notably, a mixture containing just 5% biochar by volume successfully improves the retention of key nutrients, specifically potassium.
- Future studies incorporating a broader range of biochar concentrations and increased treatment replications would be useful to better assess the material's impact on this specific tree species and soil profile.

## How was the biochar made?

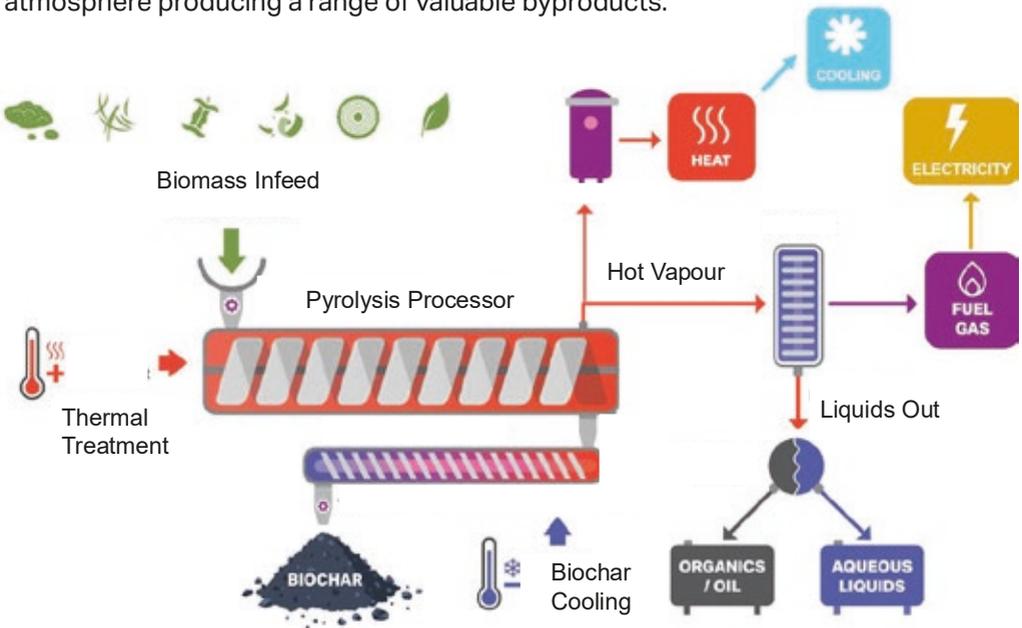
Innovative technology developed by EBRI in association with its industrial partners, including FuturEnergy Ltd, can help organisations meet their commercial and environmental goals.

Through the thermal conversion process known as pyrolysis, our technology converts organic waste and residues into valuable products such as heat, power, electricity, cooling, gas, biochar, organics and aqueous liquids which can be adopted in numerous industrial and environmental applications.



## Carbon Capture Technology

The PyroFlex™ pyrolysis technology heats biomass in an oxygen-free atmosphere producing a range of valuable byproducts.





# How to get involved

**EBRI is working with companies to take research out of the lab into the market.**

If your organisation has access to large-scale volumes of organic residual material and requires heat and power for facility/production processes, we would love to hear from you.

Alternatively if you are looking for innovative ways to incorporate biochar and other pyrolysis products into your organisation's product or service portfolio please get in touch.

## Contact EBRI

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



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