



## **Toward a predictive understanding for the function of biochar in soil**

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Trends in certain features of biochar have been reported, typically comparing systematic sets of material produced by one set of equipment and defined by a key feature of the conversion process - usually temperature.

However, a generalised, predictive understanding of how feedstock and biomass conversion parameters determine the function of biochar products once added to soil, in terms of carbon storage, nutrient and water cycling and, ultimately, crop performance or yield, is lacking.

This compromises the ability to demonstrate the extent and limits of the utility of biochar in the management of soil and crop production.

To address this critical gap in our knowledge, we developed a set of novel laboratory assays and applied them to more than 30 different biochar samples. The samples were sourced such that no sample had more than one production parameter in common with any other (including feedstock). Also, each sample was produced in a different facility, encompassing the full range of conversion technologies and equipment configurations.

The assays seek to provide a comprehensive, comparative assessment of five key biochar functions in soil, i.e. are designed to emphasise the behaviour of biochar in the field environment, over periods of time relevant to these contrasting functions.

By applying multivariate statistics it was possible to assess the level of co-correlation in functional properties assessed across the entire sample set. Secondly, the source of variance in results could be examined. We were able to not only establish the general effect of feedstock properties and process settings on each of the functional attributes assessed by the assays, but also the importance of the equipment used in determining the characteristics of biochar created from related feedstock at similar temperatures.

Results from this statistical analysis will be presented, together with an assessment of its utility with suggestions for targeting further work.