The Characterization of Pyrolysed Biomass Added to Soils Needs to Encompass Its Physical And Mechanical Properties

Over the last 15 yr, a considerable body of literature has heralded the agronomic and environmental benefits that could be derived from char- ring biomass of various origins and applying the resulting “biochar” or “agrichar” to soils. Very early in this movement, claims have been made that pyrolysed biomass constitutes a “win-win” solution to energy production, carbon sequestration, and ecosystem service delivery (e.g., Quilliam et al., 2013). In some cases, the “charcoal vision” has even been promoted to “win-win-win” or “triple-win” status (e.g., Biederman and Harpole, 2013).

In spite of all these enthusiastic endorsements, the experimental evidence relative to the benefits of biochar or agrichar remains weak and inconclusive. Reviews after reviews in the last few years tend to all show that for every supportive result, one can find another instance where the claims made about the benefits of pyrolysed biomass are either not substantiated or are sharply contradicted (e.g., Baveye, 2007; Quilliam et al., 2013; Mukherjee and Lal, 2014).

The severe knowledge gaps manifested in this area are likely due to a number of different causes. Nevertheless, several authors have suggested that a foremost reason is that the terms “biochar” or “agrichar” are often used in the literature as if they were associated with a chemical reagent exhibiting uniform properties. A stereotypical example is Bruges’ (2009, p. 48) statement that “biochar can be made from any organic material”, with the use of the singular “biochar” instead of the plural “biochars” suggesting that he is referring to a single material. In fact, the reality is very different. As a number of researchers have pointed out (e.g., Sohi, 2012; Zhao et al., 2013; Angin and Sensoz, 2014), the nature of the biomass that is pyrolysed, the specifics of the pyrolysis process used (in particular the temperature at which it is performed), not to forget the handling of the charred materials, all contribute to the manifestation of sometimes strikingly different properties.

There are simple remedies to this problem. One possible approach is to require every manuscript that describes research on the use of pyrolysed biomass in soils to indicate explicitly and in detail how the material was obtained and what its properties are (Manya, 2012). Along with that, authors should be encouraged to restrict the scope of their conclusions to the material used and to not make blanket statements generically about biochar or agrichar, as is still often the case nowadays. Alternatively, similar to what has been done for decades in the research on humic acids, researchers could be encouraged to use one or more standardized charred materials whose characteristics would be fully accessible to all. The International Biochar Initiative could spearhead the effort of setting up such a standard collection.