Evaluating Climate Change Mitigation Potential of Carbonaceous Materials: Do Different Indicators Point to the Same Conclusion?

Owsianiak, Mikolaj; Brooks, Jennifer; Renz, Michael; Laurent, Alexis

Published in:
Book of Abstracts, Sustain 2017

Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

Evaluating Climate Change Mitigation Potential of Carbonaceous Materials: Do Different Indicators Point to the Same Conclusion?

Mikołaj Owsianiak*[1], Jennifer Brooks[1],Michael Renz[2], Alexis Laurent[1]

1: DTU Management Engineering

2: Universitat Politècnica de València

*Corresponding author email: miow@dtu.dk

Life cycle assessment was employed to evaluate the use of hydrochars, prospective soil conditioners produced from biowaste using hydrothermal carbonization, as an approach to improving agriculture while using carbon present in the biowaste. In total, 17 categories of environmental impacts were considered, including three different indicators of climate change: global warming potential (GWP), global temperature change potential (GTP), and climate tipping potential (CTP) were used. It was found that although climate change benefits (GWP) from just sequestration and temporary storage of carbon were sufficient to outweigh impacts stemming from hydrochar production and transportation to the field, even greater benefits stem from replacing climate-inefficient biowaste management treatment options, like composting in Spain. By contrast, hydrochar addition to soil was not a good approach to improving agriculture in countries where incineration with energy recovery is the dominant treatment option for biowaste, like in Germany. Potential benefits from replacing composting were smaller in the GTP approach, which due to its long-term perspective gives less weight to short-lived greenhouse gases like methane. Using CTP as indicator, we also found that there is a risk of contributing to crossing of a short-term climatic target, the tipping point corresponding to an atmospheric GHG concentration of 450 ppm CO_2 equivalents, unless hydrochar stability in the soil is optimized. Our results highlight the need for considering complementary perspectives that different climate change indicators offer, and overall provide a foundation for assessing climate change mitigation potential of carbonaceous materials used in agriculture.

Owsianiak, M., Brooks, J., Renz, M., Laurent, A., 2017. Evaluating climate change mitigation potential of hydrochars: compounding insights from three different indicators. GCB Bioenergy 1–16. doi:10.1111/gcbb.12484