ANALYSIS OF PEAT-BASED BIOCHAR AS AN ADDITIVE TO CONTROL GREENHOUSE GAS EMISSIONS IN MANURE MANAGEMENT SYSTEMS

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The agricultural sector accounts for 10-12% of global greenhouse gas emissions. Within the agricultural sector manure management causes almost 10% of these agricultural greenhouse gas emissions, making it an important target area for mitigation strategies. The role of biochar as a regulator of greenhouse gas (GHG) emissions from soil has been well established, while its application in manure management holds promise considerable uncertainties remain regarding operational setting and efficacy. Traditional applications of biochar have used a wide variety of feedstock sources and production pathways which in turn determine the outputs of the resultant biochar as a GHG regulator. In this study slow pyrolysis, at temperatures of 450 - 750 °C with a heating rate of 7.5 °C min^{-1} and a residence time of 20 minutes, was used to produce biochar in a muffle furnace. Different temperatures were used to explore the unique characteristics of biochar and compare them throughout the temperature values in production. Even though the biochar production from many sources is well understood, there remains considerable uncertainty over the effectiveness of biochar production from defined peat sources and the ability to reliably replicate feedstock-production systems. This study attempts to explore the production and utilization of biochar produced from harvested peat in the Irish midlands relative to other feedstock sources to mediate reductions in greenhouse gas emissions for manure management systems. To do so a detailed analysis of the feedstocks and biochars will be carried out in order to establish appropriate protocols for the optimal production and application of biochar in GHG-manure management. Results indicate that drying as a pre-treatment in production does not increase the peat-based biochar yield, if calculated on a dry matter basis, making the process less emission intensive. It was also observed that the thermal treatment increases the pH of the tested materials irrespective of whether they were fresh or pre-dried, making the biochars more alkaline than the original materials. At the same time, rising process temperatures have been noted to lead to a decrease in yield for all materials used. The yield reduction with increasing temperatures was found to be slightly lower for pre-dried materials than for fresh materials. When focusing on yield and costs for drying, these preliminary results indicate that biochars produced from untreated feedstocks at lower temperatures are more environmental and economically viable than biochars produced from pre-dried material at high temperatures.