



Biochar for reducing GHG emissions in Norway: opportunities and barriers to implementation.

Daniel Rasse, Adam O'Toole, Erik Joner, and Signe Borgen
NIBIO, Norwegian Institute of Bioeconomy Research, Ås, Norway

Norway has ratified the Paris Agreement with a target nationally determined contribution (NDC) of 40% reduction of greenhouse gas emissions by 2030, with the land sector (AFOLU) expected to contribute to this effort. Increased C sequestration in soil, as argued by the 4 per 1000 initiative, can provide C negative solutions towards reaching this goal. However, Norway has only 3% of its land surface that is cultivated, and management options are fairly limited because the major part is already under managed grasslands, which are assumed to be close to C saturation. By contrast, the country has ample forest resources, allowing Norway to report 25 Mt CO₂-eq per year of net CO₂ uptake by forest. In addition, the forest industry generates large amounts of unused residues, both at the processing plants but also left decaying on the forest floor. Because of the unique characteristics of the Norwegian land sector, the Norwegian Environment Agency reported as early as 2010 that biochar production for soil C storage had the largest potential for reducing GHG emissions through land-use measures. Although straw is a potential feedstock, the larger quantities of forest residues are a prime candidate for this purpose, as exemplified by our first experimental facility at a production farm, which is using wood chips as feedstock for biochar production.

The highly controlled and subsidised Norwegian agriculture might offer a unique test case for implementing incentives that would support farmers for biochar-based C sequestration. However, multiple barriers remain, which mostly revolve around the complexity of finding the right implementation scheme (including price setting) in a changing landscape of competition for biomass (with e.g. bioethanol and direct combustion), methods of verification and variable co-benefits to the farmer. Here we will present some of these schemes, from on-farm biochar production to factories for biochar-compound fertilizers, and discuss barriers and opportunities towards implementation as a soil C sequestration measure.