Can biochar help suppress greenhouse gases?

18 March 2011

Biochar confines in situ grazed pasture nitrous oxide emissions. Credit: Arezoo Taghizadeh-Toosi

Nitrous oxide is a potent greenhouse gas and a precursor to compounds that contribute to the destruction of the ozone. Intensively managed, grazed pastures are responsible for an increase in nitrous oxide emissions from grazing animals' excrement. Biochar is potentially a mitigation option for reducing the world's elevated carbon dioxide emissions, since the embodied carbon can be sequestered in the soil. Biochar also has the potential to beneficially alter soil nitrogen transformations.

Laboratory tests have indicated that adding biochar to the soil could be used to suppress nitrous oxide derived from livestock. Biochar has been used for soil carbon sequestration in the same manner.

In a study funded by the Foundation for Research Science and Technology,scientists at Lincoln University in New Zealand, conducted an experiment over an 86-day spring/summer period to determined the effect of incorporating biochar into the soil on nitrous oxide emissions from the urine patches produced by cattle. Biochar was added to the soil during pasture renovation and gas samples were taken on 33 different occasions. The study was published in the March/April 2011 issue of the Journal of Environmental Quality.

Addition of biochar to the soil allowed for a 70% reduction in nitrous oxide fluxes over the course of the study. Nitrogen contribution from livestock urine to the emitted nitrous oxide decreased as well. The incorporation of biochar into the soil had no detrimental effects on dry matter yield or total nitrogen content in the pasture.

Arezoo Taghizadeh-Toosi who conducted the study, says that under the highest rate of biochar, ammonia formation and its subsequent adsorption onto or into the biochar, reduced the inorganic-nitrogen pool available for nitrifiers and thus nitrate concentrations were reduced. Such effects would have diminished the substrate available for microbial nitrous oxide production."

Research work is ongoing and still required to determine seasonal effects, and the effects of repeated urine deposition.

More information: View the abstract at www.agronomy.org/publications/ …g/abstracts/40/2/468

Provided by American Society of Agronomy