Biochar: the Material with Unique Properties for Carbon Sequestration and Global Warming Mitigation

Y. Azimzadeh [1] and N. Najafi

PhD Student of Soil Science, College of Agriculture, Tabriz University, Tabriz, Iran. **yaser.azimzadeh@gmail.com**

Associate Professor of Soil Science, College of Agriculture, Tabriz University, Tabriz, Iran. **nanajafi@yahoo.com**

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Abstract

Climate change caused by increasing atmospheric concentration of CO_2 due to fossil fuel combustion and land use change is one of the biggest challenges facing our modern world. Being a persistent and carbon-rich solid material, biochar remains stable for hundreds or even thousands of years in the environment. It can, thus, store carbon to mitigate the effects of climate change and global warming. Addition of biochar to soil may also reduce, directly or indirectly, N_2O and other greenhouse gases in soils. It is produced in a process called 'pyrolysis', which is indeed the thermal degradation of organic materials in environments with no oxygen or only a limited supply. During pyrolysis, biomass undergoes a variety of physical, chemical, and molecular changes in which it is converted into the three liquid (bio-oil), solid (biochar), and gas phases. All the three phases produced by pyrolysis can be used as fuel. Moreover, addition of biochar to soil not only leads to carbon sequestration but also improves soil physical, chemical, and biological properties, thereby playing an important role in sustainable agriculture and soil management by improving soil fertility and plant yield.

Keywords: Bio-oil, Carbon, Climate change, Pyrolysis, Syngas.

1- Corresponding author: Department of Soil Science and Engineering, Faculty of Agriculture, Tabriz University, Tabriz, Iran.