COLLINS AMOAH-ANTWI – ESR 10

INDIVIDUAL INTRODUCTION (WORK PACKAGE 3)

I am an early stage researcher based at the Warsaw University of Technology in Warsaw, Poland. My research focuses on studying the dynamics of soil organic matter transformation by addition of waste organic materials to improve soil function and productivity.

I hold a bachelor's degree in biochemistry from the Kwame Nkrumah University of Science and Technology, Ghana (2013), after which I worked as a food quality analyst at the Ghana Standards Authority for one year. I pursued further studies in M.Sc. Advanced Food Safety at the Queen's University Belfast, UK (2015 – 2016). During this period, I conducted research on the levels of arsenic in rice paddy soils using Diffusive Gradient-in-thin film gradient (DGT) technology at the Chinese Academy of Sciences in Nanjing & Xiamen.

As part of the overarching objective of Work Package 3, which is the restoration of marginal lands for agriculture using low cost amendments and bioremediation, my research aims to utilize low cost organic amendments: biochar, brown coal and farmyard manure to improve the functionality and agricultural productivity of marginal and contaminated lands. The exogenous application of organic materials to soils increases soil organic matter content which has positive effects on the physicochemical and biological properties of the soil. The enhancement of soil functions is attributed to the formation of humic substances, a group of highly stable C-rich organic compounds produced from the microbial decomposition of organic materials in the soil. However, evidence supporting the direct role of humic acids in soil productivity is not well established. My research, therefore, focuses on the structural changes that occur during the transformation of organic materials to humic acids in the soil. Results from my work together with historical data would be merged with several other experimental observations proceeding from the application of organic amendments to soils, including nutrient cycles, microbial biomass and diversity and other measurable changes. This would bridge a knowledge gap about the relation between the dynamics of organic matter transformation and soil productivity.

To do this, I have set up a field-scale experiment with selected organic matter sources: biochar, brown coal and farmyard manure. Techniques such as the Mehlich-3 extraction for nutrients; spectroscopic methods including FT-IR, CP-MAS ^{13}C NMR, EEM and EPR, as well as HPLC; PCR, sequencing and PLFA for soil fungal communities, modelling etc. are being used to assess the efficacy of organic amendments in improving soil functionality and productivity. The role of soil organic matter in bioremediation has also been tested in a batch experiment using the selected organic amendments. The project will be conducted in close collaboration with the University of Sheffield, where Rosa Soria (ESR 8) is also working with biochar. Collaborations within the network will be further strengthened by secondments – I am currently doing experimental work at the University of Sheffield, and plan to visit another network partner in Baku, Austria early 2019.