The Use of Class F Fly Ash in Reclaiming the Agricultural Potential of Surface Coal Mine Cover Soils

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ABSTRACT

The agricultural potential of surface coal mined soils is difficult to reclaim. It is possible to re-vegetate the covering topsoil, but the sustainability of many reclamation procedures is poor. This covering topsoil is exposed to chemical and physical degradation over time lowering the agricultural potential of these newly created “productive lands”. This is due to the unsustainable fertilizer practices used during re-vegetation, the management of these production systems and the additional acidity generated in the soils/substrates by contaminants of pyritic material or the shallow underlying pyritic spoil material. Roots are unable to grow properly in these substrates and vegetation is unable to become productive in these hostile growth mediums due to the changed chemical and physical properties. As a result, the covering topsoil becomes unstable, and susceptible to erosion. The experimental work is to identify amelioration strategies for the cover soil using the coal combustion by product - class F fly ash as a soil ameliorant.

The cover soil is planted to various grasses used in the reclamation process of South African agricultural land. Significant increases in yield were measured where class F fly ash had been incorporated into the soil as an ameliorant, relative to conventional mine treatments over specific growing seasons. The pH of the cover soil was the most strongly affected soil parameter during the experimental period. Therefore, the potential of class F fly ash as an ameliorant will facilitate effective reclamation of coal cover soils to reinstate the optimal agricultural potential of this pre-mined agricultural land.