

EFFECTS OF AGRICULTURAL AND INDUSTRIAL BY-PRODUCTS ON RESTORATION QUALITY OF RECLAIMED COAL MINE SOIL IN MISSISSIPPI¹

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Abstract: The generally low level of organic C in reclaimed coal mine soils may limit microbial activity. The oxidized material used as substitute soil for upland restoration at a surface mine in Mississippi contains a mixture of topsoil plus oxidized subsoils that provide for biota reestablishment. By increasing organic C in mine soil redevelopment there is potential to enhance restoration. Broiler litter could be considered as an excellent source of C sequestration for these soils. However, organic matter in broiler litter is readily bioavailable and decomposes by microbial activity in the soil and thus may contribute little to long-term C sequestration. Any management practices to transform organic matter from a readily bioavailable to stable form can contribute more to long-term C and N sequestration. Coal combustion power plants generate enormous amount of Flue Gas Desulfurization by-product (20 Million ton in 2015) that contains elevated levels of calcium which has potential to protect organic C from decomposition through formation of stable Ca-soil organic matter complexes. A field study was conducted at a surface coal mine in Mississippi to determine the effect of agricultural and industrial by-products either alone or in combination with each other on C and N pools of reclaimed coal mine soils. A randomized complete block design with seven treatments was used and replicated 3 times. Treatments included inorganic N-P-K (13-13-13) at the rate of 896 kg ha⁻¹ as the standard reclamation practice, fresh broiler litter and composted swine manure, either alone or in combination with FGD gypsum, applied at the rate of 22.4 and 11.2 Mg ha⁻¹, respectively. The area was planted to warm-season forage grasses. Soil samples were analyzed for total and organic C and N. Preliminary results indicated the combination of FGD gypsum and broiler litter increased biomass production and the level of extractable nutrients in soil. Detailed information on soil properties will be presented and discussed.

Additional Key Words: Organic C, Flue Gas Desulfurization, Degraded Soil, Swine manure

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