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Liming Efficacy and Transport in Soil of a Dry PFBC By-Product

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**Liming Efficacy and Transport in Soil
of a Dry PFBC By-Product**

CONTRACT INFORMATION

Contract No.	DE-FC21-91MC28060
Contractor	Dravo Lime Company Research Center 3600 Neville Road Pittsburgh, PA 15225
Other Funding Sources	Ohio Coal Development Office, CDO/D-89-35 Electric Power Research Institute, RP2796-02 American Electric Power Company, C-8276 Ohio Edison Company, EPRI collaborator Dravo Lime Company, RF768342
Principal Investigator	Warren A. Dick
METC Project Manager	Scott Renninger
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ABSTRACT

The by-products of pressurized fluidized-bed combustion (PFBC) systems are mixtures of coal ash, anhydrite (CaSO_4), and unspent alkaline sorbent. Because PFBC by-products are alkaline and contain large concentrations of readily soluble bases (Ca and in some cases Mg) and other essential plant nutrients such as S and K, they have potential use as soil amendments, especially in acidic soils. PFBC by-products (particularly those with large Mg contents) may cause excessively high soluble salt concentrations when applied to soil. This could be detrimental to plant growth and might also impact the release of trace elements from the coal ash component of the by-product. In field experiments on three acidic soils, the liming effectiveness of a PFBC by-product, its effects on corn and alfalfa growth, and its impacts on crop, soil, and water quality were investigated. The PFBC by-product was applied at rates from 0 to 2 times the liming requirement of the three soils (0 to 70 Mg ha^{-1}), and incorporated to a depth of 10 cm. Amendment with PFBC immediately increased surface (0-10 cm) soil pH (up to 7) and extractable concentrations of Ca, Mg, S, and B. Soluble Al, Mn, and Fe concentrations in the surface soil were decreased. Within 1 year of application, pH began to increase below 10 cm, and Ca, Mg, and S concentrations decreased in the surface and had leached to a depth of 60 cm. Within 2 years, increased Ca, Mg, and S were measured at depths up to 100 cm. With the exception of a small, short-lived increase in soil B, PFBC

application did not cause measurable changes in soil extractable concentrations of trace elements. Surface runoff water concentrations of Ca, Mg, and S were increased in the first year after application, however, there were no effects on trace element concentrations. Alfalfa yield was increased by PFBC amendment, but corn grain yield was not affected. Alfalfa and corn leaf tissue concentrations of Ca, Mg, and S were increased while Al, Fe, and Mn were decreased by FGD, with no evidence of any plant toxicity. Application of PFBC up to two times the lime requirement of acid soils improved production of acid-sensitive crops with no detrimental effects on soil or water quality.