

U.S. DEPARTMENT OF ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

USE OF FLUIDIZED-BED COMBUSTION ASH IN AGRICULTURAL APPLICATIONS

Description

Modern agriculture depends on controlling soil properties to improve yields from crops and livestock, and substantial inputs may be required to improve soil structure and nutrient content. Labor and material associated with traditional drainage and fertilization methods are expensive and represent a significant portion of a farmer's annual production costs.

Dr. Ron Korcak of the Plant Sciences Institute in Beltsville, MD, and Dr. William Stout of the University Park, PA, Agricultural Research Service are investigating the use of coal by-products in agriculture. Fluidized bed combustion (FBC) ash and other coal combustion by-products represent a relatively untapped resource for agriculture. Coal by-products can contain significant amounts of lime to help raise soil pH to optimum levels, as well as many beneficial trace elements needed for plant growth and also have a granular structure that can help improve drainage. Although coal by-products can contain significant amounts of potentially toxic trace metals, appropriate application rates and use have been shown generally to prevent any significant detriment to crops, livestock, or the environment.

FBC ash also sets up when mixed with water, providing a low-strength concrete useful for stabilizing soft, wet soils in feedlots. Working with technology developed by the USDA/ARS and the Department of Energy (DOE), Ahlstrom Ash Development Corp. has been successfully using FBC ash from the Black River Co-Gen plant in Watertown, NY, as an agricultural soil amendment.

During times of the year when ash cannot be spread on crop land, Ahlstrom has been using the ash as a low-strength concrete to stabilize dairy barn feedlots. The stabilized feedlots provide a place for cattle to escape from muddy conditions in the spring and fall. Farmers have responded positively to these stabilized feedlots, and a stabilized dairy feedlot has been established and monitored in Pennsylvania for surface and pass-through water quality.

At Beltsville researchers are exploring the concept of co-utilization of by-products, in which an FBC-dairy manure product serves as a nutrient source for trellised blackberries. This product is similar to the mixture that would occur if the dairy farmer scraped an ash pad to remove manure for field spreading.

The established blackberry planting is in its second year of growth after receiving an application of the FBC-manure product. The initial application rate was 10 tons/acre and consisted of a 50/50 mix (by weight) of ash and dairy manure. To date, only background plant tissues and soil samples have been obtained and analyzed. The fate of the phosphorous applied via the manure-FBC ash mixture is being monitored to assess potential reductions in phosphate leaching. The behavior of other trace elements are also being monitored.

PRIMARY PROJECT PARTNER

U.S. Department
of Agriculture
Beltsville, MD

MAIN SITE

USDA Plant Sciences Institute
Beltsville, MD
**USDA Agricultural Research
Service**
University Park, PA

TOTAL ESTIMATED COST

\$129,492

COST SHARING

DOE	\$129,492
Non-DOE	—



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Goal

To ensure the most cost-efficient delivery of electrical power, the U.S. Department of Energy (DOE) is conducting research and development to improve coal combustion by-product (CCB) management. The research program emphasizes characterization and reuse of CCBs to help stimulate markets for new materials such as those produced under the DOE's Clean Coal Technology program. Over the next 5 to 10 years, the program's goals are to develop processes leading to a 100% increase in the current rate of FGD by-product use, a 10% increase in the national rate of overall CCB use, and a 25% increase in the number of CCB applications considered "allowable" under state regulations.

Benefits

- FBC ash provides a low-cost source of lime and trace nutrients for crops.
- Feedlot pads are a beneficial use for ash when fields are too wet for spreading or there are standing crops.
- Animals on a solid surface are not subject to the health problems that can be caused by standing in mud.
- Animals on a solid surface are more feed-efficient, since they do not waste energy wallowing in the mud.
- Manure is easily scraped from the ash surface for spreading on crops.
- The calcium in FBC ash may help bind phosphorus from manure in the soil, reducing the potential for phosphate pollution in surface and ground-water.

CONTACT POINTS

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PROJECT PARTNERS

USDA PLANT SCIENCES INSTITUTE

Beltsville, MD
(fruit production test plots)

USDA AGRICULTURAL RESEARCH SERVICE

University Park, PA
(feedlot pad test plots)