BLACKSMITH INSTITUTE

Project Completion Report:
Panki Thermal Power Plant

- **Project Details:**

Location:	Kanpur, India. Awadh Region, in the state of Uttar Pradesh
Contaminant:	Fly Ash
Project Duration:	January 2006 – June 2007
Project Cost:	$5160
Implementing Partners	Centre for Environmental Education (Northern Regional Cell)
Other Partners:	Uttar Pradesh Pollution Control Board; ADHAR; Indian Institute of Technology; Shakti Bhawan Etn,; Panki Thermal Power Plant.

- **Background and Scope:**

Coal is India's most abundant resource, and it will continue to play a pivotal role in the country over the upcoming decades. There currently exist in India 82 coal-fired power plants, each of which uses around 1,000 tons of coal and produces about 13.34 tons of fly ash. Fly ash is, alone, a waste product and its responsible disposal poses a huge problem. From each power station, thousands of tons of fly ash are pumped into the ash ponds in the form of slurry (fly ash mixed with water) every day; these lagoons occupy millions of acres of agricultural land all over India.

When coal is burned in a plant, two types of ash are produced: fly ash and bottom ash. Fly ash, otherwise known as pulverized fuel ash, is the residue of coal combustion and is comprised of very fine, powerdy glass-like particles. Because it is so fine, it is highly susceptible to wind erosion; its light color – grayish white – reflects more light than dirt, raising surface temperature. Bottom ash refers to the non-combustible materials in coal, and is heavy and coarse. A mixture of both types of ash is called pond ash.

In the past, fly ash produced by thermal power plants, cement industries, railway track, etc. was simply taken up by flue gases and released into the atmosphere, creating significant environmental concerns. Studies have shown that fly ash dumping would continue to cause groundwater contamination, surface water contamination during flooding, and air pollution relative to dust emission via wind erosion if preventative measures were not taken.

- **Solution Implemented:**

Studies performed on fly ash utilization in agriculture in agriculture and wasteland development reveal that mixing appropriate concentrations of fly ash with soil provides essential plant nutrients, modifies the soil texture, and helps to maintain soil texture; this can help improve both wasteland quality and improve agricultural productivity at the laboratory and field scale. However, its uncontrolled disbursement causes serious human and environmental health risk. This project was intended to discover cost effective remedial measures addressing the issues caused by the power plant in the Panki region of Kanpur. The three primary focuses of the project were (i) an assessment of human health and environmental degradation due to improper disposal of fly ash in Panki thermal power plant, Kanpur; (ii) demonstration of the reclamation of the fly ash dumps by the suitable symbiotic fungi for use in floriculture and mushroom culture; (iii) an education and awareness program.

Additional uses for fly ash were also strongly promoted. Every construction agency engaged in the construction of buildings within a radius of 100 kilometers from a coal based thermal power plant is required to use fly ash bricks, blocks, or tiles. Additionally, the fly ash may be used to compact low-lying areas.

Adjacent to the thermal power plant, three residential areas were selected to gather data on the health impact in the community – Pankikatra, PPS, and Gangaganj. Fly ash samples from two fly ash ponds were collected in April 2006; four samples were taken from each pond at various depths. Additionally, ground water samples and composite soil samples were taken from the surface and subsurface for varying analytical work. The fields were prepared conventionally (ploughed, leveled, weeded), and before experiments were performed top soil was sterilized to

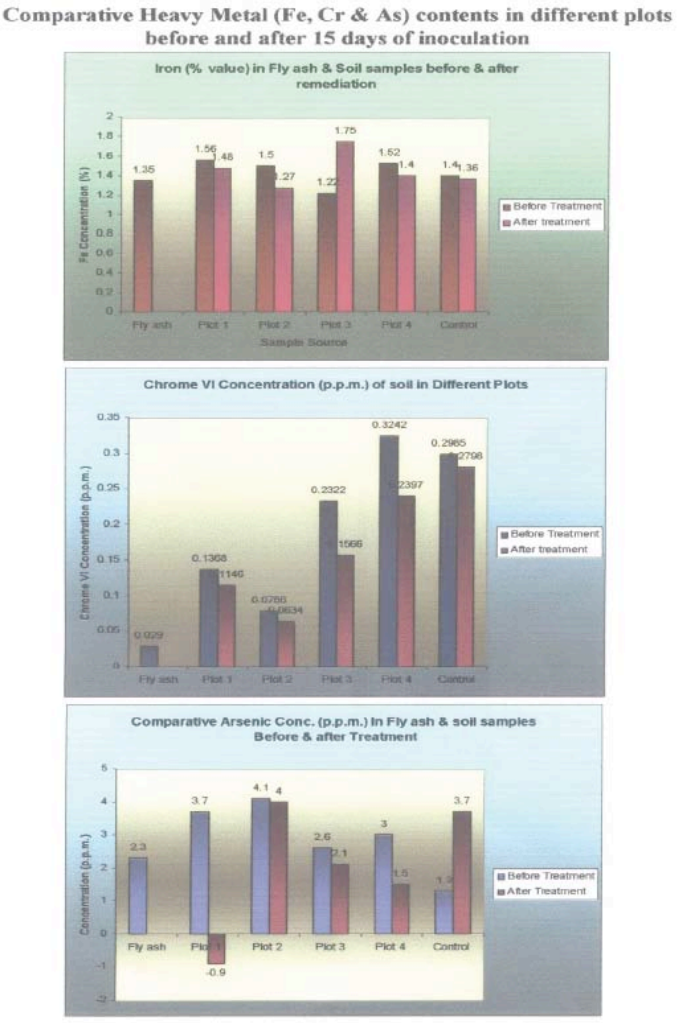
remove any microbial colonies. Plant, soil, and water samples were also appropriately prepared.

Remediation for the contaminated soils was achieved by the following steps:

1. Physicochemical analysis of 5 plots of park site soils to check the extent of remediation by using mycorrhizal inoculation.
2. Preparation of fungal inoculation
3. Mychorrhizal treatment of remediated soil; evaluation of metal bioremediation in soil; and observation plant growth before/after mycorrhizal treatment.

The field surverys showed that ~100,000 people are affected due to fly ash exposure. 50-55% is affected with asthmatic disorder due to fly ash exposure. Overflow of pond ash towards residential areas is causing unnecessary human exposure and has serious health risks due to the high content of heavy metals. The villagers are even more negatively effected when monsoon season begins, as the ash is deposited in the fields and farmers use ash-laden water to irrigate; this has an adverse affect on productivity and blocks the drainage system.

- **Project Metrics and Results:**



- **Outcomes and Follow-up:**

Utilization of Mychorrhizal treatment can play a very good role because of its metal sequesteringproperties for effective metal bioremediation on Fly ash dumps. Mychorrhizal fungi are abeneficial group of micro-organisms that form a mutual relationship with living roots of higherplants. The mycorrhizal treatment offers an economically feasible biological means for assuring plant production at fly ash contaminated sites. Mychorrhizal produces organic acids that combine with some heavy metals to form compounds that are less mobile and less likely to pollute groundwater and surface runoff. *Glomus intradice* is one of the most resistant fungal species for fly ash and plays a major role in heavy metal remediation. Mychorrhizal inoculation is found to be beneficial to attained plant growth (shoot height and leaf surface area) and thus plants get effectively rooted in the soil. Various fruits vegetable and flowers are reported to grow well after mychorrhizal treatment.