

A Sustainable Approach for Agricultural Waste Management: SAMARTH National Mission

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Agriculture is the backbone of the Indian economy and generates a huge quantity of crop residues every year. After harvesting crops such as paddy, wheat, maize, sugarcane, and cotton, large amounts of agricultural residues remain in the fields. In many parts of India, especially northern states, farmers burn these residues to quickly prepare land for the next crop season. This practice, known as stubble burning, has become a major environmental concern because it causes severe air pollution, smog formation, greenhouse gas emissions, and health-related problems. To address this issue, the Government of India launched the SAMARTH Mission (Sustainable Agrarian Mission on use of Agri-Residue in Thermal Power Plants) on 12 July 2021 under the Ministry of Power. The mission aims to utilize agricultural residues as biomass fuel in coal-based thermal power plants. It promotes biomass co-firing technology, where biomass pellets are mixed with coal for electricity generation. The mission supports sustainable agriculture, cleaner energy production, and environmental protection. According to official estimates, India generates nearly 750 million metric tonnes (MMT) of biomass annually. Approximately 97,000 MT biomass had been co-fired in thermal power plants by March 2023. Co-firing of 97,000 MT biomass helped reduce more than 1.2 lakh metric tonnes of CO₂ emissions. Procurement contracts for more than 11 lakh MT biomass pellets were awarded. The number of thermal power plants adopting biomass co-firing increased from 7 plants to 35 plants within a short period. A substantial quantity of this biomass remains unused or is burnt openly in fields. The SAMARTH Mission was introduced to convert this agricultural waste into a useful energy resource and reduce dependence on fossil fuels.



Objectives of SAMARTH Mission

The SAMARTH Mission was launched with several important objectives related to agriculture, environment, and energy sustainability.

- ❖ **Reduction in Stubble Burning:** - One of the primary objectives of the mission is to reduce open-field burning of crop residues. Stubble burning releases harmful gases and particulate matter into the atmosphere, contributing significantly to air pollution. By creating a market for crop residues, the mission encourages farmers to sell agricultural waste instead of burning it.
- ❖ **Promotion of Biomass Co-firing:** - The mission promotes the use of biomass pellets in coal-based thermal power plants. Biomass pellets made from crop residues are mixed with coal during electricity generation. The Government of India has mandated thermal

power plants to use 5–10 per cent biomass pellets with coal. This reduces coal consumption and promotes cleaner power generation.

- ❖ **Reduction in Carbon Emissions:** - Thermal power plants are major sources of greenhouse gas emissions. Biomass co-firing reduces carbon dioxide emissions and helps India move toward its climate change mitigation goals.
- ❖ **Additional Income for Farmers:** - Crop residues, which were previously considered waste, become a valuable economic resource under the SAMARTH Mission. Farmers can earn additional income by selling paddy straw and other residues to biomass pellet manufacturers.
- ❖ **Promotion of Renewable Energy:** - Biomass is a renewable source of energy. The mission supports India's transition toward sustainable and renewable energy systems by increasing biomass utilization in the power sector.

Need for the SAMARTH Mission

The mission became necessary due to increasing environmental and energy-related challenges in India.

- ❖ **Air Pollution from Crop Residue Burning:** - Every year, stubble burning in states like Punjab, Haryana, and Uttar Pradesh causes severe air pollution in North India, including Delhi NCR. Burning crop residues releases smoke, particulate matter, carbon monoxide, methane, and other harmful gases into the atmosphere.
- ❖ **Heavy Dependence on Coal:** - India's thermal power sector depends heavily on coal for electricity generation. Coal combustion contributes significantly to carbon emissions and environmental degradation. Biomass co-firing provides a cleaner alternative by partially replacing coal with agricultural biomass.
- ❖ **Poor Crop Residue Management:** - Large quantities of agricultural residues remain unused due to lack of proper management systems. The mission provides a scientific mechanism for converting agricultural waste into energy resources.
- ❖ **Need for Sustainable Agricultural Practices:** - Sustainable residue management is essential for maintaining soil health and environmental sustainability. The SAMARTH Mission promotes integrated approaches for agricultural waste utilization and clean energy generation.

Key Features of SAMARTH Mission

The mission includes several important features for effective implementation.

- ❖ **Biomass Co-firing in Thermal Power Plants:** - Under the mission, biomass pellets are blended with coal in thermal power plants for electricity generation. Co-firing helps reduce fossil fuel consumption and lowers carbon emissions.
- ❖ **Biomass Pellet Manufacturing:** - Agricultural residues such as paddy straw, cotton stalks, mustard residues, and sugarcane trash are converted into biomass pellets and briquettes. These pellets are easier to transport, store, and utilize in thermal power plants.
- ❖ **Institutional Framework:** - The Government established a dedicated Mission Directorate and Steering Committee under the Ministry of Power for monitoring and implementation of the mission. Coordination is maintained among ministries, thermal power plants, research institutions, and state governments.
- ❖ **Research and Development:** - The mission promotes research on advanced biomass combustion technologies, pellet manufacturing systems, and emission reduction methods to improve efficiency and sustainability.
- ❖ **Participation of Farmers and Industries:** - Farmers, biomass aggregators, transporters, pellet manufacturers, and industries are actively involved in the biomass supply chain created under the mission.

Benefits of SAMARTH Mission

The SAMARTH Mission provides environmental, economic, and energy-related benefits.

Environmental Benefits	Economic Benefits	Energy Benefits
Reduction in Air Pollution	Additional Farmer Income	Reduced Coal Consumption
Reduction in Greenhouse Gas Emissions	Employment Generation	Promotion of Renewable Energy
Improvement in Soil Health	Rural Industrial Development	Cleaner Power Generation

Conclusion

The SAMARTH National Mission is an innovative and sustainable initiative that connects agriculture, environment, and energy sectors. Launched in 2021, the mission provides an effective solution to the growing problem of crop residue burning in India. By promoting biomass co-firing in thermal power plants, the mission helps reduce air pollution, lower carbon emissions, improve renewable energy utilization, and create additional livelihood opportunities for farmers. The successful implementation of the SAMARTH Mission can contribute significantly toward sustainable agricultural development, cleaner energy production, rural employment generation, and environmental protection in India.