

Bio-methanation of rice straw to solve stubble burning

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Source: *PIB & Ministry of Science and Technology*

Various steps taken to solve the problem of stubble burning

The following steps are being taken to solve the problem of stubble burning, namely:

- In an all India coordinated project, efforts are on to produce bio-gas for kitchen use and quality manure for fields using bio-methanation of rice straw by anaerobic digestion method. Six domestic level paddy straw-based biogas plants have been installed in Punjab for field trials and further study is in progress.
- R&D project has been supported on refinement and demonstration of integrated process technology for conversion of crop residues into ethanol and methane for use as transport fuels.
- A major focus on agriculture waste/stubble management (waste to wealth), an alternative to burning, has been taken up under waste management technologies programme and proposals are being considered.

The initiative by the Department of Science and Technology, Ministry of Science and Technology

Agharkar Research Institute, an autonomous institute of the Department of Science and Technology, Ministry of Science and Technology, Government of India, has developed a solution suitable for mitigating the stubble burning problem in Punjab and Haryana, a practice cited as a major cause of air pollution in Delhi.

Why bio-methanation?

- Anaerobic digestion of rice straw to produce biogas may offer a promising approach to rice straw utilisation and mitigation of air pollution.
- Production of methane-rich biogas through anaerobic digestion can provide a versatile source of renewable energy, as methane can be used as a **replacement for fossil fuels in both heat and power generation** and as a vehicle fuel, thus, **significantly reducing greenhouse gas emissions and slowing down the climate change**.
- Biogas has various applications, right from electricity generation, lighting and cooking fuel to biomethane, a potential fuel for vehicles and natural gas grid.
- Furthermore, the process generates nutrient-rich digestate that can be used as an organic fertiliser. In this way, nutrients originating from plants can be recycled and returned to nature.
- Extraction of energy from rice straw is limited due to the presence of lignin mesh around the cellulose and hemicellulose structure, making it recalcitrant to microbial attack.
- Thermochemical pretreatment such as acid or alkali pretreatment at high temperature is required to break open the complex structure and make it amenable to bio-methanation. However, such pretreatment methods are expensive, highly polluting and laborious, making the options economically unviable.
- **Pune-based Agharkar Research Institute has developed a sustainable microbial process for bio-methanation of rice straw by creating an efficient microbial consortium**, which bypasses the need of any thermochemical pretreatment. Its intensive nutritional and process parameter optimisation has yielded over 500 L biogas per kg VS of rice straw with around 50 per cent methane content, considered to be a good yield.
- **The process of bio-methanation of rice straw developed is, thus, a clean, energy-efficient, cost-effective and environmentally benign method for efficient extraction**

of energy from agricultural waste.

- The process can not only solve the air pollution problem of Delhi but also help farmers of Punjab and Haryana earn extra income.