

A ‘concrete’ idea for stubble burning



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Winter is a few months away and with it comes concerns of deteriorating air quality. Last year, air pollution reached alarming levels in the national capital. Large-scale stubble burning during the onset of winter — 3.07 million hectares (Mha) in Punjab and 1.42 Mha in Haryana, with around 1.2 tonnes of straw (paddy) burnt every hectare — being identified as one of the primary causes for this pollution every year. Farmers find stubble burning convenient and time-saving, as it helps them get rid of the unnecessary waste to ready the field for the next crop.



Image Source: Bhajan Global Impact Foundation

Energy content from rice straw

Burning the generated straw in a closed system like a cement kiln, where the exhaust gas adheres to pollution norms, can significantly curb the woes of stubble burning. Every kilogram of rice produced implies 0.7–1.4 kg of rice straw, which means 4–8 million tonnes of straw being burnt on the fields in Punjab and Haryana collectively. The straw can produce as much as 50–100 petajoules (PJ) of energy. This can be used in cement kilns to meet the thermal energy demand for producing cement.

Coal, the primary fuel required to manufacture cement, is combusted in these kilns to maintain an operating temperature of 1450 degree Celsius. Given this high operating temperature, these kilns are designed to allow even the use of paint sludge and used tires as alternative fuels. Therefore, paddy straw, when available, can be a fuel source for these kilns. After all, India consumes around 700 PJ of thermal energy to manufacture cement.

Potential barriers and solutions

Though this idea presents an opportunity, there are a few barriers. It is important to factor in the availability before establishing a supply chain system. Creating a market with an attractive minimum support price (MSP) will incentivise farmers to make the paddy straw available for use as a fuel.

Stubble disposal requires either labourers or machines such as happy seeders to cut, organise, and pack the stubble. Briquette machines can be deployed to compress the straw for efficient transportability.

It is imperative to establish logistical support to transport this compressed straw to nearby cement kilns. A geographical information system (GIS)-based approach can be undertaken to identify burning sites and feasible kilns.

Long-haul transport can be done by rail or road. The straw can be transported to the nearest station by road using tractors. Subsequently, locomotive freight service — which these cement plants typically use to both receive coal and supply cement bags — can also be used. To implement this method, the government should get buy-in from the farmers and incentivise them to prepare the stubble for direct use in cement plants.

Co-benefits

The beneficiaries of the proposed idea are the government, farmers, citizens, and cement manufacturers. The government can incentivise cement manufacturers by

adjusting the heat-energy content derived from the straws in the energy-consumption calculation. This calculation is the baseline for deriving the targets that these industries ought to achieve in the Perform-Achieve-Trade (PAT) mechanism, spearheaded by the Bureau of Energy Efficiency. PAT aims to propagate the use of energy efficiently in large-scale manufacturing units.

The onus of creating this ecosystem lies with the government since the health benefits outweigh the costs. The costs include employment (technology and labour) and transportation. A preliminary assessment yields a total cost of about INR 415 crore (60% towards farm mechanisation, 15% on transportation, and 25% as employment cost to fulfil other logistical requirements) for processing stubbles from Punjab alone. These numbers imply that the marginal cost required to abate air pollution from stubble burning in Punjab would be roughly INR 140 per person living in NCR. Depending on the scale of the operations, these numbers can be further refined.

Much has been said about the ill-effects of air pollution and a critical need to address pollution from stubble burning. Though these episodes have reduced for now, they will resurface and haunt the capital again. Therefore, to make our air breathable, such ideas must be explored for large-scale adoption.

The authors work with the Center for Study of Science, Technology and Policy, a research-based think tank

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