

The key to resolving straw burning: farmers' expertise

Policy brief on missing cultural perspectives

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Farmers burning residues on the farmland

Key insights

The problem of **straw burning is persistent**: rules and regulations nor technological alternatives have been able to end it. This points at the need for a much deeper understanding of the underlying causes.

Using **agricultural waste for energy** is not only a technological and supply-chain problem, but requires integrated policies from the agricultural and energy-domain ministries.

Without the **collaboration of farmers**, no solution will work. Farmers thus need to be involved in finding solutions that help their communities and livelihoods, values their skills and knowledge, and respects their identities and dignity.

The problem has such diverse technological, economic and cultural dimensions, that a **diversity of solutions** should be pursued. This diversity should include localized and community-based solutions. One centralised industry-led bioenergy approach, such as 2G ethanol, will not accommodate the diverse forms in which the problem exists.

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The problem of rice straw burning

Putting farmland on fire has become an urgent problem in India. Burning of paddy straw in Punjab, Haryana and Western Uttar Pradesh in the months of October and November deteriorates the air quality. *Pollution* levels rise unacceptably high in the capital city of Delhi and other surrounding regions. The resulting *smog* severely affects visibility, mobility and health. Around 12 Million tons of rice straw is estimated to be burned in Punjab alone.

Farmers feel that they have to burn rice straw, because they must vacate their fields quickly between *two crop cycles*. This is the consequence of the Green-Revolution model of utilizing maximum capacity to produce staple food grains. This practice has resulted in production of large amounts of agricultural waste in the form of straw. While wheat straw can be utilised as an animal fodder, rice straw cannot. From a farmer's viewpoint, burning of straw to *clear the fields* and prepare them for the next crop is the easiest and cheapest solution, and in all practical sense the only one. *For farmers, the burning is the solution, not the problem.*

The majority of farmers use the combine harvester for harvesting. This machine leaves 2-4 inch long stubbles in the field. To remove the stalk from the field, farmers would have to rely on manual labor, which is either unavailable or too costly. This problem is enhanced by the very brief time period in which the stalk needs to be removed. From harvesting of paddy to sowing of wheat, there is only a window of 15-20 days.

The failure of current solutions

The problem of rice straw burning evidently resists current attempts at solution. For solutions to better fit the existing practices and livelihoods of farmers, we need a broader social-technological understanding of the issues.

Ineffective penalization of burning practices

Burning is *illegal* and liable to punitive measures ranging from fines to imprisonment. Upon repeated reports of worsening air quality in Delhi and health hazards to its residents, the National Green Tribunal passed a law in December 2015 to ban burning of straw in the fields. This step by NGT was lauded by the residents of Delhi and efforts of enforcement were made by the respective state agencies. However, the effort was not successful in curbing the practice of straw burning. Instead, this move *received huge criticism* and uproar from the farmer community. It was felt to make farmers into criminals, without recognizing that India has pushed farmers to increase productivity in the first place, during the Green Revolution.

Unsuccessful removal of straw from the field

Various civil society and farmer organizations have repeatedly demanded for subsidies to farmers so that they can efficiently *remove straw* from the field—for example subsidies on labour or diesel fuel. Such subsidies have indeed been allocated, be it inefficiently and with an unclear strategy. They have thus in the past shown proven *ineffective*. The lack of proper implementation and monitoring mechanisms has made this option largely unsuccessful. Importantly, issues of storage and usage of the collected straw have not been addressed.

Unrealistic hope on technical solutions

Technological solutions, even if cleverly designed, often fail to deliver when put to use. For example, engineers and scientists at Punjab Agricultural University have developed a device named happy-seeder, that can be mounted on tractors and used to sow wheat right after harvesting rice. The machine removes the straw and evenly distributes it on the sown fields to later act as mulch. The technology is being used in a few farms in Punjab and Haryana and is receiving good responses. However, the high cost of the equipment, the operational costs of diesel fuel, and the work to prevent infection and waterlogging because of the distributed mulch, present *considerable challenges*. In addition, the manufacturers of the combine harvesters are

resisting the ruling of the Punjab government to mount Straw Management Systems (SMS) on their machines, because the SMS decreases the efficiency and increases their costs.

Key elements of the current problem

- **Laws and regulations against burning remain ineffective**
- **Removing straw poses more complex challenges than only a shortage of diesel or funding**
- **Focusing on technological challenges fails to secure cooperation of farmers**
- **Alternative uses for straw are underdeveloped**

Poorly developed alternative uses for straw

In principle, straw could be put to use in various production chains. For example, rice straw has been traditionally used in a number of industries to produce *materials* such as cardboard industry, paper and packaging industry, brick kilns and bangle industry. However, there is not enough demand from these industries for farmers to make a profit out of removing, collecting and transporting straw.

Second, straw can be used as a feedstock for *electricity production*. Many industries are established in and around Punjab that convert biomass into electricity. It was notified by many farmers during our study that they do not like this option because conversion of biomass to electricity is still destruction of the nutrients in the biomass through burning. Moreover, it is still not clear whether the biomass to electricity conversion can be profitable.

Finally, multiple efforts try to utilise rice straw to produce *biofuels*. In December 2016, MoUs were signed between oil marketing companies, research institutions and private energy companies for establishing 5 pilot plants that convert agricultural residues (including rice straw) into 2G ethanol. This initiative, though a welcome step, seems lacking sufficient impetus from both the demand and the supply side. A proper channel of communication between farmers, agricultural departments and local collectors and suppliers of straw is yet to be identified for this model to be functional.



Farmers' meeting

Biogas: one possible solution?

Biogas is often proposed as a solution for the rice-straw burning problem: using it as feedstock to biogas plants would provide an outlet for the straw, and moreover one that provides energy, which will become a scarce good in the decades to come. Our research shows that this solution has many faces.

It is a **cultural problem**. Cooperation of farmers is needed. This will only happen if the values of farmers are somehow incorporated in the innovation, and if the knowledge held by the farmers is appreciated as relevant expertise. Farmers should be involved in setting agendas, defining innovation strategies, and prioritizing alternatives.

It is a problem of **political economy**. Governmental and corporate actors need to rethink biogas not only as a sustainable energy or rural livelihood option, but also as an option for waste remediation and soil enhancement. Seen as only an energy option, it will not survive on the market when left to compete against 2G ethanol and solar energy.

It is a problem of **innovation and implementation**. Supply chains are to be put in place, and even if a proof of principle for the relevant technologies has been delivered, considerable logistical problems remain.

First when the problem has been addressed in these perspectives, it will start to make sense to think of it as a **technical problem**: the optimal technical solution can first be envisioned when the surrounding cultural, political-economic and logistic territories have been mapped.

The problem thus has many faces, while we see that it is today mostly discussed as a merely technical challenge!

Policy strategies

Work across divides

The problem of rice-straw burning extends into numerous spheres of economic, cultural and social life throughout the whole of Indian society. This implies that no single party will comprehend all relevant knowledge, and no single-point solution will accommodate all the complexities and ramifications of the problem. *Institutional gaps* need bridging. Interdisciplinary working groups are needed that work across *ministries, academic sectors* (including social sciences and humanities), commercial *research laboratories*, and *social organizations* from various social strata and cultural sectors. First of all, *farmers should be at the table*.

Support contextual innovation

Innovation should no longer be considered something happening at the design desk of engineers, but as something *social* and *contextualized*. The contexts of implementation and operation are essential parts of the viability of a technology, and are highly variable between different situations. Therefore, this context should be part of the very innovation process, and innovation should take place in close connection to local contexts. Innovation projects that explicitly pay attention to *integration of solutions into farmers' practices* should thus be prioritized.

Foster diversity in problem definitions

There is an urgent need at the policy level to allow for *multiple problem definitions* of the issue of rice-straw burning and to aim for diversity of solutions. The dominant problem definition of

rice-straw burning in India is as a health problem, and the associated solution is to penalize farmers and to implement new centralized technologies to convert straw to bioethanol. This dominant view neglects *alternative problem definitions*, for example of farmers and of scientists exploring biogas from rice straw as a way to combine *agriculture, energy* and *rural livelihoods*. The biofuel policy of 2011 has an overemphasis on ethanol production that needs to be checked in relation to the diversity of context specific, local solutions available.

Policy strategies

- **Work across institutional and social divides**
- **Support contextual innovation**
- **Foster diversity in problem definitions**
- **Recognize farmers' knowledge as expertise**
- **Learn from organic farmers**

Recognize farmers' knowledge as expertise

Expertise is not limited to academically trained *consultants* and *researchers*, but also exists as specialized knowledge held by *farmers*. The recognition and mobilization of farmers' knowledge requires that farmers and farmer organizations be seen as *full partners* in innovation processes. However, as farmers' knowledge is often not written down, but passed on in oral and tacit forms, explicit attention to their emancipation is needed. This may on the one hand consist of supporting farmers in the *presentation* of their knowledge, and on the other hand of *making innovation and policy processes receptive* to these different forms of knowledge. Only once this fair treatment of

knowledge is in place, farmers will be able to stake their interests, assume their fair share of responsibility for the straw-burning problem, and endorse and support current and future solutions.

Learn from organic farmers

The unsung heroes of the problematics are in fact the *organic farmers*. It has been reported that farmers practicing organic/natural agriculture *never burn* any straw on their field. On the contrary, they often buy straw from other farmers to use it for mulch and organic manure production in their fields. This process improves the *soil health* and helps in *conservation of water*. However, their practices are often undermined in relation to chemical and mechanical farming because of claims about low yield, chances of infection, uncertain results and time and effort required from the farmers. Years of chemical farming and reliance on official agricultural information has *reduced the trust of farmers in local knowledge systems*. To seriously deal with the problem of straw burning in-situ, strategic programs need to be launched by government, in coordination with local Civil Society Organizations, to encourage alternative methods of straw utilization in the field.

Key policy actions

- Establish **comprehensive working groups**.
- Notably, expertise on **soil treatment, waste disposal, energy conversion, supply-chain management**, and **farmers' livelihoods** should be brought together.
- Do not focus on setting a definition of the problem, but permanently allow for **revision and expansion of the problem definition**.
- **Involve farmers** in all phases of **innovation** processes, not only when the solution seems finished.
- Keep a permanent eye on what problems as well as solutions mean for farmers and their lives, i.e. what the problems and solutions mean **culturally**.
- Involve consultants or social scientists specialised in **transdisciplinary work** and **heterogeneous knowledge production**.



Organic farmer inspecting mulch sheet

About the project

The project *Responsible Innovation in Biogas in India* was funded by the Netherlands Organization for Scientific Research NWO and conducted at Maastricht University, Netherlands.

During the project, *interviews, workshops* and a *farmers' meeting* were held to acquire understanding of the problem of rice straw burning, and the potentials for biogas as a solution. Data was generated from *farmers, policy makers, scientists* and *civil-society organizations*.

The current policy brief is to reflect upon the complexity of the problem and the diversity of solutions as they unfolded during the project.

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Imprint

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