

Empowering Farmers To Practice No-Burn Agriculture



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The farmers of North-West India led the Green Revolution that turned the tide of famines in 1960's and helped us become a food-surplus producing nation. For this, we the people of India, owe the farmers' a debt of gratitude. In the decades since, the varieties of grains and cereals that ushered in the Green Revolution have resulted in intensive use of fertilisers, pesticides, and large quantities of water for irrigation.

These are proving harmful for people and nature, on which the agriculture system significantly depends. For example, the depleting groundwater and deteriorating soil quality, combined with fickle rains owing to climate change, is undermining and could ultimately destroy the food productivity of the farms. In Punjab alone, the water table has declined so dramatically that unless there is a drastic change, the State will run out of water in the next 25 years.

These deep issues are begging solutions without delay. They also have a more visible symptom that the public at large (especially the citizens of Delhi) is seized with - the air quality crisis to which burning of the crop residue by farmers in NW India is a significant contributor.

In 2009, in an effort to reduce ground water extraction, the governments of Punjab and Haryana mandated that the timing of rice planting must coincide with monsoon rains. This shift, while reducing water consumption, left farmers with a short window of about 15-20 days to

harvest rice, dispose of its residues, and plant the subsequent wheat crop. Burning has since been viewed by the farmers as the cheapest and quickest way for them to accomplish this and has been widely adopted.

Current estimates indicate that 23 million tonnes of rice residue are burned each year in Punjab, Haryana and Western UP alone. Apart from air pollution, which has been linked to chronic respiratory health issues and increased mortality rates, the practice diminishes soil health and long-term agricultural productivity, and contributes to climate change. Thus, it impacts the health and livelihood of millions of farmers, as well as, hundreds of millions of people living in cities downwind, especially in New Delhi and the National Capital Region.

The Nature Conservancy Centre – India (TNC-India), in collaboration with the University of Minnesota, the International Maize and Wheat Improvement Center (CIMMYT) and the Borlaug Institute for South Asia (BISA), and a host of other relevant stakeholders started to review the available options for tackling the crop residue burning in 2017. With the ultimate goal of ushering in conservation agriculture practices to address the challenges resulting from the Green Revolution, TNC-India and its partners decided to undertake research that would allow us to advance the most cost-effective and scalable solutions on-the-ground.

Through a series of farmer and policy-maker dialogues organized by the partners, we worked with farmers, leading economists, finance and policy experts and conservation and natural resource management practitioners to explore the challenge and its solutions. Our analysis, captured in a resultant publication, found the Happy Seeder, a conservation agriculture technology that manages rice residue on site, to be the most scalable option .

We then advanced a deeper analysis by engaging the farmers in surveys. TNC-India led a review from 29 researchers to analyse the results of these surveys and concluded that the best and most-scalable solution to manage such large volumes of crop residues across millions of hectares is to utilise it on the field itself and that the Happy Seeder is the most preferable technology for it. Published in the internationally acclaimed journal, Science, this research paper "Fields on fire: Alternatives to crop

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residue burning in India ” evaluated the public and private costs and benefits of 10 alternate farming practices to manage rice residue (burn and non-burn options). It found that the Happy Seeder has the potential of generating an annual maximum profit of Rs. 22,254 per hectare for an average farmer.

This research also shows that the Happy Seeder has the largest potential to reduce air pollution and to contribute to a 78% reduction in GHG emissions per hectare from on-farm activities when compared to alternative crop residue management scenarios.

Over the last 10 years, the Happy Seeder is a tractor-mounted machine that cuts and lifts rice straw, sows wheat into the bare soil, and spreads the straw over the sown area as mulch, all in a single pass after harvesting paddy through combines with super straw management systems (SMS). It therefore allows farmers to sow wheat immediately after their rice harvest without the need to burn any rice residue for land preparation. The use of Happy Seeder is a win-win for the farmers, the environment, and the residents of cities living downwind of NW India, such as the National Capital Region. It has the following advantages:

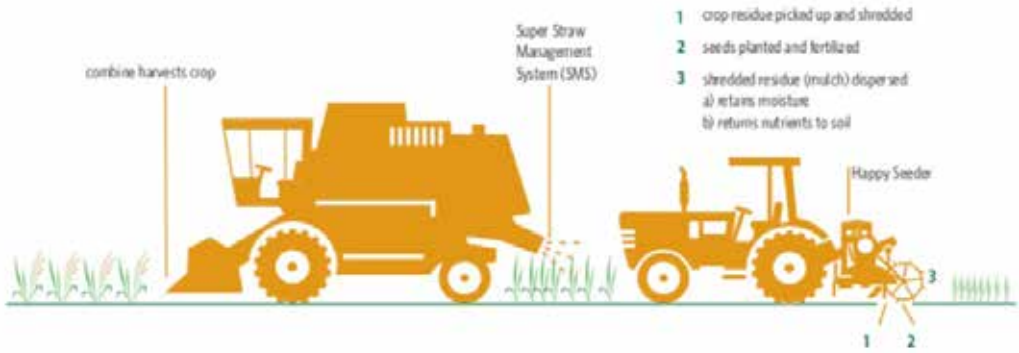
- Reduces additional labour requirement (especially for application of agro-chemicals), fuel (saves 10 litres of fuel mainly diesel per ha),

chemical fertilizer use and pre-sowing irrigation requirements (saves almost half a million litres of water per hectare), which results in the 22,254 INR cost savings per hectare referenced above.

- Improves soil organic matter over time, which enhances soil health, productivity potential and soil biodiversity.
- Reduces green-house gas emissions and air pollution from PM2.5 and PM10 particles, black carbon and obnoxious gasses.

Convinced by these benefits, in 2018 the government of India had announced a two-year subsidy of INR 1,151 crores in the Union Budget to promote the adoption of in-situ crop residue management machinery including the Happy Seeder. Since the subsidy was offered by the government, the uptake of this technology has increased ten-fold from 1,000 units in January 2018 to 10,000 units by December 2018.

However, it has not yet translated to completely eliminating the practice of burning. The subsidy has partly addressed a major financial barrier for farmers. However, other barriers still exist, such as lack of knowledge of profitable no-burn solutions (including the Happy Seeder) and impacts of burning, uncertainty about new technologies, and constraints in the supply-chain and rental markets/ service provisions for crop residue management machineries.



To address these barriers and informed by our scientific analyses, TNC - India and its partners have designed an initiative called “Harnessing the power of Agricultural Residues through Innovative Technologies” (HARIT). With support from the Tata Trusts, we have set the ambitious target of achieving zero-burn agriculture through the use of Happy Seeders by 2024.

To achieve this, we are creating ‘clusters’ of 150 zero-burn villages across seven districts and conducting focused communication and educational activities in 700 additional villages in Punjab and Haryana to eradicate burning crop residue in the winter.

We expect to bring about changes in these clusters by raising awareness regarding the use of Happy Seeder, field demonstration and trainings on Happy Seeder use on farms and working towards improving service delivery of Happy Seeders to increase its access in the field.

Of course, the transition to make the Happy Seeder mainstream will not be easy. Our work will focus on engaging with all stakeholders, providing an interface between farmer groups and the agricultural experts and providing the handholding needed to help farmers transition to using the new technology in the areas identified. Through coordinated public and private actions, India has an opportunity to eliminate burning, increase

farmer income and transition to more sustainable agriculture, while also addressing the urgent problem of seasonal air pollution.

India’s efforts can provide lessons for other countries facing similar risks and challenges. In the long run, India will also have to make efforts to overcome underlying systemic challenges facing agriculture sector. These include shifting to a more diversified cropping system that is not water intensive; aligning policies related to agricultural practices to reduce clashes and key policy reforms in the agricultural sector.

**Pollution is Nothing
But the Resources we
Are Not Harvesting.
We allow them to disperse
Because we’ve been
Ignorant of their value.**

~ Buckminster Fuller

Seema Paul is Managing Director of The Nature Conservancy in India.

Since 2015, The Nature Conservancy in India has been advancing projects to support India’s efforts to develop win-win solutions for people and nature. We work closely with the Indian government, research institutions, NGOs, private sector organisations and local communities to develop science-based, on-the-ground, scalable solutions for some of the country’s most pressing environmental challenges. (To more about our work please visit our website at <https://www.tncindia.in/about-us/>)