

## AN ACHIEVABLE REALITY Eliminating Air Pollution From Crop-Residue Burning

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Air pollution is now ranked among the top five leading health risk factors in India, contributing to both premature mortality and ill health (Dandona et al. 2017).<sup>1</sup> While the problem needs to be addressed across the country, the case for action in Delhi is most urgent as the Air Quality Index (AQI) here rarely displays moderate, let alone good, air-quality days.

### **Air Pollution from Crop-Residue Burning**

There are several sources contributing to Delhi's poor air quality such as dust and emissions from vehicles, industries, power plants and more. Addressing air pollution holistically will require a multi-sectoral and multi-regional strategy. However, burning of biomass, including crop residue in Punjab, Haryana and western Uttar Pradesh, which contributes to a quarter of Delhi's air pollution in the winter months (Sharma and Dikshit 2016)<sup>2</sup>, may be an "easier" source to address. This is because an operational-technical solution already exists that is beneficial to both farmers and Delhi residents. If this source of pollution is successfully tackled, the public and the government will eventually grow confident about addressing other sources.

### **Happy Seeder: A Technology to Enable No-Burn Agriculture**

More than 2.5 million farmers across northwest India burn close to 23 million tonnes of rice residue in an attempt to clear their fields for the next sowing season.<sup>3</sup> The resulting air pollution impacts farmers and their families, as well as millions living in cities downwind. In 2010, deaths due to crop-residue burning across India were estimated at close to 42,000 (Lelieveld et al. 2015).<sup>4</sup>

The solution to crop burning is an innovative agricultural technology called the Happy Seeder. It has been recommended by India's National Academy of Agricultural Sciences (NAAS) as a holistic solution that eliminates crop-residue burning while increasing farmers' income, improving soil fertility and reducing water use. Currently, less than one per cent agricultural acreage in northwest India uses this technology. However, this can change with monetary support, technology demonstrations, as well as outreach and capacity building of farmers.

Happy Seeder technology has now received central government support. As part of its 2018 Union Budget, the government of India has agreed to support the states of Haryana, Punjab, Uttar Pradesh and Delhi "to address air pollution and to subsidise machinery required for in-situ management of crop residue". In January 2018, the Centre had announced that it would earmark ₹1000 crore in the 2018 Union Budget to tackle the problem of stubble burning through subsidies on agricultural equipment to manage farm residue. Prime Minister Narendra Modi, in his opening speech at the World Sustainable Development Summit organised by The Energy and Resources Institute (TERI), also endorsed the need to find holistic solutions that provide support for healthy air and soils. He said, "The campaign for clean India has moved from the streets of Delhi to every nook and corner of the country. We have also launched a massive campaign to ensure that our farmers convert agricultural waste to valuable nutrients, instead of burning them."

The Happy Seeder is the practical tool that will help implement the prime minister's vision. It eliminates the need to burn crop residue by enabling its in-situ management, and therefore, is also a critical first step in promoting conservation agriculture in northwest India. The machine is attached to a tractor and with the help of a spreader called the Super-Straw Management System, makes a hole in the soil. Subsequently it drops the seed for the next crop, disperses the rice residue and deposits it as mulch – all in one smooth operation.

The Happy Seeder is a win-win solution for farmers and the environment as it can increase profits by lowering equipment and labour costs. Also, it reduces fuel, fertiliser and herbicide requirements. It improves soil health by retaining nutrients and enhancing nutrient-use efficiency by 10-15 per cent (NAAS 2017).<sup>5</sup> It can save water by up to 1.45 million litres per hectare through reduced evaporation and elimination of pre-sowing irrigation (NAAS 2017).<sup>6</sup> This makes it ideal for Punjab and Haryana where declining water tables are a serious concern. For instance, of Punjab's 138 blocks, some 84 per cent are over-exploited or in a critical or semi-critical state in terms of groundwater availability (Mann 2017).<sup>7</sup> Thus, the Happy Seeder offers an opportunity to integrate long-term agricultural concerns with clean-air needs.

### **Accelerating Happy Seeder Use Among Farmers**

The central government's special scheme to support Happy Seeder subsidies definitely addresses a critical financial hurdle that farmers face. Under the new scheme, state governments will be able to provide a flat subsidy of 50 per cent through direct transfer to individual farmers on the purchase price of Happy Seeders, increasing it from the 30 per cent that was being offered until now. Cooperatives, farmer groups and women's self-help groups may receive up to 80 per cent subsidy on the cost of the machinery. It's true that an important step has been taken by the government. However, complementary efforts are needed to address the many behavioural barriers and information gaps that farmers face in adopting the Happy Seeder for the goal to be accomplished. Here are four areas that require action to ensure success. Therefore, government, civil society and socially-minded corporations will need to work together on them:

#### **a) Awareness, Capacity Building and Demonstration**

Majority of farmers are unaware of the existence of the Happy Seeder and its benefits. Many farmers believe it to be a good practice to sow in 'clean' fields and prefer removing agriculture residue. Such preferences will need to change as the machine requires leaving the rice stubble and mulched residue in the field. Moreover, its benefits may only become clear once farmers adapt and change their current field operations related to fertiliser, herbicide and irrigation applications, which will take time and learning. It will be critical to demonstrate the use of the machine to a wide array of farmers and service providers through focused-awareness campaigns and capacity-building efforts. Demystifying Happy Seeders by demonstrating their use in the field and clarifying the business case by comparing them to other technologies will play an important role in their adoption. The government's Krishi Vigyan Kendras (KVKs) can be an effective platform to launch such initiatives. Also, identifying 'champion' farmers already using the machine and creating platforms to facilitate farmer-to-farmer learning could be effective in removing barriers to behavioural change. Further, farmers are unaware that conservation agriculture promoted by the new technology offers higher returns compared to conventional agriculture, in unfavourable conditions. It's important that farmers have a first-hand experience of the machine so as to figure out the difference in their crop outputs that its usage results in.

#### **b) Meeting Happy Seeder Demand with Increased Supply**

Creating demand for the machine is one side of the story. However, it will only be effective if manufacturers can match it with supply. Close to 15 manufacturers currently produce the Happy Seeder, which is not a significant number. The machines are not readily available in the market and production is on the basis of the orders placed. Even if efforts to increase demand are successful, manufacturers may not be able to accelerate production in time. They will need to be incentivised through buy-back guarantees. Entrepreneurs and agriculture-service providers who rent out equipment and services to farmers can also be strong influencers. Therefore, building their knowledge about the Happy Seeder as the "go-to" technology and providing access to credit and equipment will be important.

One way to achieve this is by creating model business plans for service providers.

### **c) Smart Implementation of Subsidy Programme**

For this initiative to be successful, it will be important to ensure that the process of availing the subsidy is transparent and accessible. In addition, manufacturers should be certified providers of the equipment. Further, the current subsidy scheme covers several types of the equipment, but not all of them offer holistic benefits to the farmer, environment and soil like the Happy Seeder.

### **d) Enforcing the Government Ban on Crop Burning**

It is important that state governments strictly enforce the National Green Tribunal-imposed residue-burning ban and display a willingness to stem violations. In the past, this ban was viewed as anti-farmer and therefore, not uniformly imposed. However, with sizeable financial incentives becoming available to farmers, it would be easier for state governments to convince them to adopt the new technology.

### **Sparking a Movement for Change**

The Nature Conservancy India and its partners – International Maize and Wheat Improvement Centre (CIMMYT), Borlaug Institute for South Asia (BISA), Council on Energy, Environment and Water (CEEW) - have been closely following the issue of air pollution arising from crop-residue burning. We have interacted with farmers, agriculture-service providers and manufacturers to understand the challenges they face on the ground. We believe that a zero-burn agricultural future in the next five years is achievable and the government's financial subsidy is a critical step in this direction. Along with our partners, we are committed to complementing the government's efforts with initiatives on-the-ground that address information gaps and successfully convince farmers to use the Happy Seeder. Air pollution affects one and all. Therefore, it is important for all sections of the society to come together to make the government's initiative a success. There is also a huge potential for corporations and businesses to play an active role in this fight. Among other things, they can bring their core competencies and CSR funds to support farmer education and awareness building. It is time NGOs, civil society groups, and corporates join hands towards a no-burn agricultural future so that there is better air for everyone to breathe in.

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### **Endnotes:**

1 [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(17\)32804-0/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(17)32804-0/fulltext) - Nations within a nation: Variations in epidemiological transition across the states of India, 1990–2016 in the Global Burden of Disease Study. Dandona, Lalit et al. The Lancet, Volume 390, Issue 10111, 2437 – 2460

2 Sharma, M and Dikshit O. 2016. Comprehensive Study on Air Pollution and Green House Gases (GHGs) in Delhi (Final Report: Air Pollution component). Submitted to Department of Environment Government of National Capital Territory of Delhi and Delhi Pollution Control Committee, Delhi. Department of Civil Engineering Indian Institute of Technology Kanpur, Kanpur-208016

3 NAAS 2017. Innovative Viable Solution to Rice Residue Burning in Rice-Wheat Cropping System through Concurrent Use of Super Straw Management System-fitted Combines and Turbo Happy Seeder. Policy Brief No. 2, National Academy of Agricultural Sciences, New Delhi. 16 p.

4 Lelieveld, J., J. S. Evans, M. Fnais, D. Giannadaki, and A. Pozzer. 2015. "The Contribution of Outdoor Air Pollution Sources to Premature Mortality on a Global Scale." Nature 525 (7569):367–71.

5,6 NAAS 2017. Innovative Viable Solution to Rice Residue Burning in Rice-Wheat Cropping System through Concurrent Use of Super Straw Management System-fitted Combines and Turbo Happy Seeder. Policy Brief No. 2, National Academy of Agricultural Sciences, New Delhi. 16 p.

7 Mann, R. S., 2017. Cropping Pattern in Punjab (1966–67 to 2014–15). Punjab – Exploring Prospects. Economic and Political Weekly: 30-33.