At the Root of Stubble Burning

A new series gets to the root of the air pollution problem choking Punjab and the neighbouring states during winters.

By Merlin Francis.

Every morning at 8.30 a.m., Deputy Ram Arora takes his car out to visit the people of Mansa, a town in Punjab. A registered medical practitioner by profession, Arora converses with the locals about their illnesses and recommends medications or a visit to the nearest hospital. I joined him for the drive in early December, hoping to listen to the voices from the ground on the issue of stubble burning.

Many fields still held signs of stubble burning, which farmers resorted to, to clear the paddy fields in time for sowing wheat. The fields were still recovering from the burns they had been subjected to, but there was also a fresh green hue — the colour of young leaves.

On our drive, Arora pointed to a field and said, “When stubble burning is at its peak, smoke hangs in the air and our terrace is filled with ash particles that travel in the wind. The visibility is poor because of the smoke. Once, we had two people on a bike ride right into the fire because the smoke was so thick and the visibility so bad. Luckily they escaped with minor burns.”

Illnesses are common during the stubble burning season, with a dramatic increase in respiratory issues and eye problems (burning, watering, and conjunctivitis). Children suffer the most as they take longer to recover from these ailments.

In 2021, Punjab saw the second-highest number of fires in the last 5 years: over 62,863. This is despite the growing awareness of the seriousness of the act and its repercussions among the public, politicians, and bureaucrats. It makes one wonder where things are going wrong.

Why is Punjab burning?

Punjab is at the heart of India's agricultural success story. Buoyed by the Green Revolution and favourable policy measures, the state contributes to 16% of India's agricultural exports. The Agricultural Export Policy (AEP) of Punjab, notified in 2019, aims to more than double the value of its total exports of rice, wheat, and fruits from INR 14,000 Cr to INR 32,000 Cr by 2027–28, a staggering increase of 233%.

Punjab has played a stellar role in India's food security. But this success seems to have come at a cost, and the price paid is most visible when stubble burning is at its peak after the annual paddy harvesting season.

As smoke and ash from the crop residue burning reach Delhi, the blame game begins. The usual suspects are Punjab and its neighbouring agrarian states. "People tend to forget that air pollution is serious in Delhi throughout the year and is caused by a number of reasons. But it is a good opportunity to blame others," remarked Sukhdev Singh, a farmer, as we arrived at his home and settled down to fresh, sweet buffalo milk with a sprinkle of coffee on top.

He believes that the root of the problem begins in June, just before the monsoon, as the land named for its five rivers runs out of water.

If you travel further back in time, you will find that a few developments of the 1960s led to Punjab turning into a rice-producing state: the minimum support price (MSP) for rice and wheat offered by the central government to ensure food security to the nation (triggered by food shortages), the construction of the Bhakra Nangal Dam, and the beginning of the Green Revolution.

Farmers responded to the MSP by shifting to rice and wheat cultivation. The Bhakra Nangal Dam allowed water to be used for irrigation (and firmly institutionalised it). It facilitated cheap (practically free) electricity. Technology, which was the focus of the green revolution, brought in high-yielding varieties, water pumps, pesticides, and fertilisers. Farmers got wealthy, and the tractor became a symbol of wealth and higher status. Punjab was bestowed the statuses of a pioneer in technology adoption and the granary of India.

Some things are too good to be true, and when they are true, they rarely last forever. A little over half a century later, there is a dedicated cancer train in Punjab. Thanks to the water-intensive nature of paddy cultivation, the groundwater has depleted to crisis levels and farmers' incomes are dwindling.

One of the policies that the government adopted to check the groundwater crisis was to delay paddy sowing. This delay would allow farmers to make use of the monsoon instead of relying on groundwater. But the rice–wheat crop cycle means that farmers are on a tight schedule. Once the paddy is harvested in late October, only a few days remain before the wheat is sowed in November. Farmers run short of time as the harvested paddy and stubble need to be cleared from the fields quickly to make way for wheat. The delay may be by a time-frame of just 5–15 days, but to the farmers of Punjab, the stakes are too high. A delay in clearing the field would mean a delay in sowing wheat, which needs to be completed before the winter sets in.

Zero Drill, the solution that farmers have traditionally relied on (and as straightforward as the name suggests), was both cheap and efficient. All it took was a spark of fire to burn the stubble that was left behind. But that was until air pollution began nagging our collective mindset, and Delhi noticed how bad its air quality was.

"It is quite bad, and if farmers had other options, I'm sure they wouldn't do it," said Sarabjit Kaur. Kaur's husband Bahadur Singh owns about 5 acres of land and is an employee of the state electricity department.

Survival Experiments

The Government of Punjab banned stubble burning two years ago, and Bahadur, as a responsible government employee and a parent, felt morally obliged to stop. He showed us parcels of land where all three new technologies are applied: Zero Drill, Happy Seeder, and Super Seeder.

The Happy Seeder is a tractor-mounted machine that cuts stubble, lifts it, and sows wheat — leaving the stubble on the land to be used as mulch. The Super Seeder ploughs the stubble to the ground, leaves it there, and plants wheat. "The Super Seeder is considered superior technology, but the price for either is too high for us," Bahadur said.

The Super Seeder costs about INR 2 lakhs but requires 65 hp to pull the equipment. A quick Google search revealed that Preet 6549, a 65 hp tractor with a lifting capacity of 1800 kg, costs upward of INR 8,00,000 on India Mart. Forget small farmers; even big farmers would find this expensive.

On the other hand, the Happy Seeder costs about INR 1.3 lakh and requires only ~50 hp of power. But it leaves the crop residue on the ground, leaving the additional work of collecting the residue and sowing the wheat to the farmers.

While the government provides a 50% subsidy on these products, farmers claim that subsidies are paid to manufacturers. Instead, they suggest that the payouts be made directly to cooperation societies where farmer groups can collectivise for purchasing machines.

Biomass is another effective solution, but there are challenges. “We have only about 15 days to clear the fields and sow the wheat, and we cannot find enough labourers in time for completing this task. Most of them need to clear their fields first. Everybody needs labourers during those 15 days. We tried collecting the stubble this season, but for days, nobody came and collected the packaged stubble. Eventually, we had to clear it, and we wasted a few days on that,” Bahadur recalled. He still has some of the packaged stubble lying in his backyard.

However, policymakers are keen to implement this solution. At an event organised in Punjab by the Center for Study of Science, Technology and Policy (CSTEP) in December, Mr Krunesh Garg, Member Secretary of the Punjab State Pollution Control Board, remarked that “Over 5000 crores of paddy straw is burnt within a month. This can contribute to the economy of Punjab. “If we are resourceful, the straw can be used as fuel or blended into the soil. This will bring money into the farmers’ bank accounts.”

At the same event, Dr Sandeep Singh Sandhu, Principal Agronomist, Department of Climate Change and Agricultural Meteorology, Punjab Agricultural University — which has been playing a crucial role in finding solutions to Punjab’s agrarian challenges — listed the numerous options available to farmers instead of burning stubble.

Farmers themselves seem to be closely watching the organic agriculture movement across states in India. For now, they have set up mini-farms in the land available in their backyard. As we were leaving, Sukhdev Singh offered us mustard plant leaves to make Sarson ka Saag along with some other vegetables. Sukhdev and his wife seemed pleased with the fruit of their labour, but scaling up this backyard initiative to the entire state is a momentous task that requires careful and cautious planning.

There are plenty of solutions, but what is needed is a collaborative effort, incorporating a circular and sustainable economy that lets farmers be a part of the solution. Attempting to do this needs the collaboration of different government departments, farmers, and agriculturists. Citizen groups can help factor in environmental, economic, and social aspects of the problem.

In the next article in this series, we look at how incorporating a new form of thinking — in policy, philosophy, and engineering — can help resolve Punjab's agrarian crisis.

Merlin Francis is Communication Officer at CSTEP and may be contacted on Twitter @franc_merlin or on LinkedIN.