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Addressing Air Quality Spurts due to Crop Stubble Burning during COVID-19 Pandemic: A Policy Brief

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CDEIS Policy Brief Series on Punjab Economy

The COVID-19 pandemic has shaken economies globally and added to the existing problems and their intensity like climate change, poverty, unemployment, migration, education, and of course, health. Developing economies have suffered even more due to their vulnerabilities to such sudden and large shocks. India is no exception to this trend and has regional variations in the impact of COVID-19 as there is much disparity and specificity in the levels of development of state economies. Punjab being an agriculturally grown state though still highly dependent on its agriculture and rural non-farm economy for significant proportion of its population and their livelihoods in the presence of public resource crunch has also faced this COVID-19 onslaught while being in economic, social and environmental crisis.

In this context, it was thought fit to get an independent set of policy directions from scholars in their respective domains based in Punjab, outside Punjab and even overseas to encourage public policy debate in and outside the state about the nature and magnitude of Punjab's economic and developmental crisis and the COVID-19 implications for it and explore possible ways forward to make the economic and social systems of the state move out of the situation of economic and policy inertia.

The policy briefs in this series numbering more than 20 examine issues ranging from agricultural sustainability, environmental and market aspects of the agricultural systems to allied sector and informal and small-scale sector livelihoods including dairy and MSMEs. The marginalised group livelihoods such as women, schedule castes, and farm labour and other rural and migrant workers also get adequate attention. The sectors of health and education are also examined. On the fiscal front, institutional credit for recovery and revenue of the state post-GST are analysed. The larger aspects of governance, federalism and diaspora also get a coverage as contextual and overarching themes.

We hope that these briefs would serve to encourage more informed debate and discussion in the interest of the betterment of the state economy and society to aid post-COVID recovery and medium and long-term sustainable development policy making.

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Abstract

World over the headlines are centered on COVID-19. The World Health Organisation (WHO) and various governments across the world see this pandemic sticking around for longer than everyone would hope for. Not a happy situation to be in (given the serious fallouts of the nature of COVID-19 management strategies on economies, employment, livelihood, health, and wellbeing of people). Yet, it demands that all stakeholders-governments, UN organisations, industry, people, civil society-to shift their strategy from reactive to proactive.

While industry needs to develop a good understanding of the implications of the current disruptions, as well as the future threats and risks and accordingly develop a contingency plan to totally avoid some of these, and minimise the impacts on their businesses.

The governments also have a duty to: (i) develop and implement the measures that would minimise the risks to the economic recovery and (ii) focus on all possible measures to arrest the events that may contribute to serious disruptions such as poor air quality (AQ) thus further aggravating this unprecedented health crises in at least two ways.

One, poor AQ poses additional risk to people getting hit by COVID-19, and two, cases of respiratory illnesses due to poor AQ will put additional burden on already overwhelmed modest health infrastructure in India.

Come winter, Delhi AQ (sudden worsening in AQ due to paddy stubble burning in Punjab and Haryana) becomes a hot topic for the media, government, political circles, and elite population. The concern and anger of the last category is due, largely, to delayed or missed flights. AQ in Delhi or AQ in general in other urban hot spots has not been a serious election issue so far which could be due to the fact that the common man which bears the large brunt of health issues due to poor AQ has many other serious issues to deal with, and partly due to lack of understanding and awareness of the costs of poor AQ.

However, available information shows that management of COVID-19 in persons with weak respiratory system is much harder and tricky and is associated with high mortality rates. There is evidence to suggest that cases of respiratory illness increase in Delhi in winter competing with other illness cases for limited health support systems. With COVID-19 the existing health infrastructure is already under severe stress.

Also, It is likely that poor AQ (high SPM) might aid human-to-human transmission of COVID-19 although there is no scientific evidence yet to support this. This may mean that we have a giant imperative to avoid the annual disaster of AQ in Delhi and other cities of India. In this note we focus on AQ in Delhi. What solutions can we find now, to avoid the disaster in November - December 2020?

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1. Introduction

During the COVID-19 pandemic, minimizing additional risks such as poor air quality is an important disease management strategy. Also, with COVID-19, existing health infrastructure is already under severe stress, and additional pollution related infections will only serve as a stress multiplier. In this policy brief, we focus on poor air quality (AQ) due to crop stubble burning in Punjab. What are the solutions to avoid this annual disaster in October–December 2020? The analysis in this piece brings to the fore some short-term practical measures and underlines that a medium to long term solution lies, among others, in making food production in certain pockets of north India efficient in resource use and resilient to environmental and climate changes.

2. Annual Trends of Poor Air Quality due to Paddy Stubble Burning

India has a huge imperative to address the annual trends of air quality during October–December 2020 in Delhi and other cities in north India when air quality levels reach up to twenty times higher than the safe threshold levels defined by the World Health Organization (PTI, 2019). In Delhi, up to 50 per cent increase in air pollution on many winter days is attributed to agricultural fires. According to a recent source apportionment study, open burning emissions in Punjab, Haryana, and the northwest of Uttar Pradesh accounted for 15 per cent to 35 per cent of ambient PM_{2.5} concentrations (GBD MAPS Working Group, 2018).

3. Why do Farmers Burn Crop Stubble?

With the onset of winter, farm fires become rampant in northern part of India in the states of Punjab, Haryana and western Uttar Pradesh. The problem of poor air quality is exacerbated for the already disadvantageous landlocked Delhi that has no rejuvenating ability like other coastal cities in India where pollutants are swept out towards the ocean. Over the years, parts of Northern states Punjab, Haryana and Uttar Pradesh have moved to extremely specialized short duration varieties of rice-wheat cropping system. With the adoption of these varieties; a rice crop (June/July to October/November), followed by a wheat crop (November/December to March/April) rotation became popular in areas which earlier produced only wheat or rice in any one farming year. However, this cropping system perceived as ‘efficient’ has come at a huge environmental and ecological cost that includes environmental unsustainability and loss of resilience in the medium to long run.

The main reason for paddy (rice crop) stubble burning is the short time available between rice harvesting and sowing of wheat. A delay in sowing wheat adversely affects the wheat crop. The short window of time available between rice and wheat crops can also be attributed partly to the Punjab Preservation of Subsoil Act, 2009. Farmers get less than 20–25 days between two crops, and hence the quickest and easiest solution is to burn the crop residue (Jitendra, 2019). It is estimated that 20 million tonnes of rice stubble is produced every year in

Punjab, out of which 80 per cent is burnt on the farm (DTE, 2019).

4. Crop stubble burning creates on-farm and off-farm externality

Stubble burning creates externality in the form of emissions with implications for climate change and health costs to people in affected region, disruptions in economic activity (cancellation/delays in flights and trains, and slow road traffic and accidents). Stubble burning emits PM 2.5, which is the most adverse for human health, since the particles can get trapped inside the lungs and increases the risk of lung cancer by 36 per cent. Cost of air pollution due to stubble burning in India is estimated to be USD 30 billion annually (IFPRI, 2019). Burning 1 tonne of rice accounts for a loss of nitrogen (5.5 kg), phosphorous (2.3 kg), potassium (25 kg), and sulphur (1.2 kg) in the soil. Moreover, the heat from burning crop residue kills critical bacterial and fungal populations in the soil, apart from organic carbon (Hesammi and Talebi, 2014).

Stubble burning emits PM2.5, which is the most adverse for human health, since the particles can get trapped inside the lungs and increase the risk of lung cancer by 36. According to (Kumar et al, 2015) people in rural Punjab spend more than Rs 7.6 crores every year on treatment for ailments caused by stubble burning. Cost of air pollution due to stubble burning in India is estimated to be USD 30 billion annually (International Food Policy Research Institute, 2019). Further,

stubble burning reduces the availability of straw to livestock, which is already in short supply by more than 40 per cent (Kumar et al, 2015).

Since air quality is a public good, the role of central coordination /government becomes even more important. Which would imply that the government would need to either share the cost of compensation or the cost of abatement (reducing stubble burning), or both in different measures. Broadly, the application of incentive-based regulation can be a potential cost-effective way to control air pollution.

5. Recent Policy Interventions and other measures taken

Various policy measures at the national and sub-national levels seek to resolve the problem of crop stubble burning in India. A National Policy for Management of Crop Residues is in place, along with a Crop Diversification Programme. According to the law, violators can be booked for disobedience of order duly promulgated by the government under Air (Prevention and Control of Pollution) Act. There are schemes to promote in-situ and ex-situ crop residue management through machines like happy seeder, rotavator and baler. However, there are many gaps in terms of policy design, implementation and awareness. The table below summarizes the key policy interventions. For a detailed discussion see Pandey, Rita, Kedia, S., Malhotra, A. (2020).

Policy Interventions and other measures to address stubble burning

S. No	Policy Intervention	Central/state government	Focus Area
1	National Policy for Management of Crop Residues (2014)	Central government	<ul style="list-style-type: none"> Promotion of technology for in-situ management of crop residue as well as uses of crop residues. Promotion of adaptive research
2	Crop Diversification Programme (CDP) under Rashtriya Krishi Vikas Yojana (RKVY), 2013-14.	Central government	<ul style="list-style-type: none"> Demonstration and promotion of production of alternate crops for diversion of paddy cultivation and to restore the soil fertility <p>However, the program appears off- track as there was increase in area under Paddy cultivation in 2016 (Kedia 2017)</p>
3	NGTs Ban on Stubble Burning (2015)	Central government	<ul style="list-style-type: none"> Ban on agriculture stubble burning in states of Rajasthan, Uttar Pradesh, Haryana and Punjab under Section 188 of the IPC and under the Air and Pollution Control Act of 1981¹. <p>However, following a ground level study, a government panel recommended to the NITI Aayog that a machinery - based solution may have greater potential (Vishnoi 2017).</p>
4	Promotion of Agricultural Mechanization for In-Situ crop residue management (CRM).	Central government	<ul style="list-style-type: none"> Financial assistance is provided to farmers for purchase of in-situ residue management machines Establishing farm machinery banks IEC for awareness on CRM
5	The Agriculture Policy for Punjab (2013)	State government	<ul style="list-style-type: none"> The policy aims to make concerted efforts to reduce the area under paddy cultivation by 40 per cent from current levels in a span of 5–7 years.
6	Field trials of technologies to decompose paddy (2019 onwards)	Central government	<ul style="list-style-type: none"> The Indian Agricultural Research Institute (ICAR) has been expeditiously conducting field trials for such technologies
7	MoU between Punjab Government and CSIR-NEERI (2019)	State government	<ul style="list-style-type: none"> MoU signed to extend technical support to the state for abatement of pollution, and waste management
8	Adoption of 100 villages by CII (2019)	Central government	<ul style="list-style-type: none"> 100 villages adopted to guide zero crop residue burning by providing technical support through machineries and training, and a comprehensive awareness campaign
9	Paddy Straw Challenge (worldwide) Fund	State government	<ul style="list-style-type: none"> Punjab's State Farmers and Farm Workers Commission have set up a fund of one million dollars to find an appropriate technology to address the issue (Sethi, 2018).
10	Compensation to farmers for not burning paddy straw	State government	<ul style="list-style-type: none"> In FY 2019-20, the Punjab Government disbursed INR 19 Crore among 29,343 non-basmati cultivating small and marginal farmers, as compensation for not burning stubble @ INR 2500/acre (New Indian Express, 2019).²

6. Other Issues: Gaps in Policy Design, Implementation and Awareness

i. Policy Issues:

The national programme on crop diversification does not have clear provisions on outreach activities to sensitize the farmers about alternate crop options. Similarly, there is insufficient convergence with other programmes such as the National Rural Employment Guarantee Scheme, National Rural Livelihood Mission, and agro-enterprise related schemes which could help in management of paddy stubble or crop diversification.

ii. Implementation Issues:

- Unavailability of CRM machines has been a key issue in mitigating crop residue burning. In 2019, despite a sanction of 22,854 machines, only 14,625 were available for use (Nirmal, 2019).
- The in-situ management machines are still unaffordable to many farmers despite subsidy provisions. Happy Seeder costs INR 1.50 lakh and requires a 65-horsepower tractor. It is not affordable for small farmers to buy the machinery, even with the subsidy at current rates of 50 per cent (PTI, 2019).
- Constraints in the supply-chain and rental markets are other issues impacting adoption of machines like happy seeder. Even though the CSS scheme provides 80% subsidy to cooperative societies to further rent out machines to farmers, most of the cooperative societies did not have funds to buy such machinery on even 80 per cent subsidy (Tribune, 2018).

iii. Lack of awareness, uncertainty about new technologies and misconceptions that Happy Seeder machine reduces yield are other issues impacting adoption of Happy Seeder.

7. International Experience

For years, crop burning was perceived as normal by several countries and open burning of crop residue was often overlooked to meet the growing demand for food as well as to maximize profits from cultivation. However, the problem was recognised as severe when the scale at which it is carried out became significant. In absolute terms, India, China are the biggest burners of crop residue in the world in term of the kilos of biomass burned annually (Cassou, 2018). Steps taken by China, Australia and UK are as below:

- China banned burning crop residue in 1999 and imposed heavy fines on violators. CRM in China has “in-situ” focus which helps balance composition of nitrogen, phosphorous and potassium in the soil (Sun et al., 2016).
- In Australia, comprehensive guidelines exist to deter for crop residue burning. There are certain exceptions where burning is allowed, such as clearing agriculture or regeneration of pastures.
- United Kingdom banned crop residue burning in 1993 due to environmental concerns. Farmers are pressing for return to licensed (limited and controlled) stubble burning which may be necessary in some cases to control Blackgrass (a weed) which is resistant to pesticides and herbicides. Burning of blackgrass is seen as the only solution to get rid of it (Tasker, 2012).

8. Way Forward

Need for Holistic Approaches

A holistic approach would be required to address the crop residue burning in a multi-disciplinary and multi-agency setting involving technical agencies, market based economic tools, supporting agricultural and environmental policies, and awareness and capacity building of farmers is necessary. First and foremost, there needs to be a central coordinating mechanism for paddy stubble management and crop diversification with adequate resources clear assignment of responsibilities between national and sub-national agencies. The target should be putting a stop on crop residue burning in COVID-19 year at any cost.

8.1 Short-term measures

Addressing practical Issues in adoption and availability of Happy Seeder

- Farmers' misconceptions regarding reduction in yield due to use of Happy Seeder and other CRM measures must be addressed through awareness campaigns and on-farm training.
- Current subsidies for CRM may be reviewed on a priority basis. A subsidy at Rs. 3000 per acre as compared to the current rate of subsidy of Rs. 2500 per acre may be more acceptable to farmers and might encourage removal of straw manually in cases where buying happy seeders is unaffordable and the rental market for happy seeders is unable to meet the demand for machines in time.
- Even though the CSS scheme provides for establishing Farm Machinery Bank to provide hiring services to farmers, there are serious issues of timely availability of machines to farmers. This is another priority action that the concerned agencies need to deliver on.

8.2 Medium-term measures

(i) Encouraging Crop Diversification/Rotation

While technological interventions may be useful in the short term, crop diversification as a policy intervention needs to be emphasized by the government. For instance, there is evidence that crop diversification (genetic variety, species, structural) can facilitate nutritional security and promote ecosystem services for pest and disease control and resilience to climate change variability and other extreme events (Lin, 2011). Resilient agriculture, in turn, contributes to productivity growth (Di Falco and Chavas, 2008).

It can be implemented in various ways such as crop rotation, poly-cultures, increased structural diversity or agroforestry. A flexible policy environment will allow farmers to choose a strategy that increases resilience as well as provides economic benefits (Lin, 2011).

- Focus on crop diversification needs to be increased and the crop composition in the IGP region needs to be re-evaluated.
- A detailed study involving all stakeholders will be required to understand slow progress towards crop diversification in spite of regulatory policy nudges and fiscal policy incentives announced by both the central and state governments.
- Crop diversification package should be a mix of policy measures, encouragement of agro-business enterprises possibly under "Aatmanirbhar Bharat Abhiyan" scheme, awareness campaigns for farmers explaining the importance of the scheme for them and what it offers, economic incentives such as minimum support prices for alternative crops, along with infrastructure support like agricultural inputs for identified alternative crops.

(ii) Other Issues

- More research is needed to understand the full implications of the Punjab Preservation of Subsoil Act, 2009 on crop stubble burning and the trade-offs therein. The short window of time available between rice and wheat crops can also be attributed partly to the Punjab Preservation of Subsoil Act, 2009. As per the Act, farmers are prohibited from sowing paddy seeds in nurseries before May 10 and transplanting the seedlings before June 10. The objective of the Act is to delay the sowing of paddy seeds so that the water used for harvesting these seeds can be reduced. There is evidence to show that the legislation did yield the desired results in terms of water conservation. However, by pushing the sowing of rice by a month it may have contributed to stubble burning.
- Also, a deeper understanding of the issue of labour availability due to rice sowing and thus rice harvesting getting pushed to festive season (Deepawali and Chatth) and its impact on stubble burning and what could be the potential solutions to address it, is required.

Notes:

1. The Punjab government took action against 2,923 farmers after receiving complaints against 20,729 cases of stubble burning in 2019. The enforcement teams had imposed environment compensation of Rs 41,62,000 in 1,585 cases, a red entry made in Khasra Girdawaris in 1,136 cases, and prosecution/FIR filed in 202 cases against the defaulting farmers (Sandhu, 2019). The State Government of Punjab during 2019-20 imposed Environmental Compensation in 23,200 incidents of paddy straw burning as per the directions of NGT (MOAFW, 2019).

2. The farmer must meet three conditions to receive compensation: the total landholding should not exceed five acres; the farmer has not burnt paddy residue; the crop is non-basmati rice (Vasdev, 2019).

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