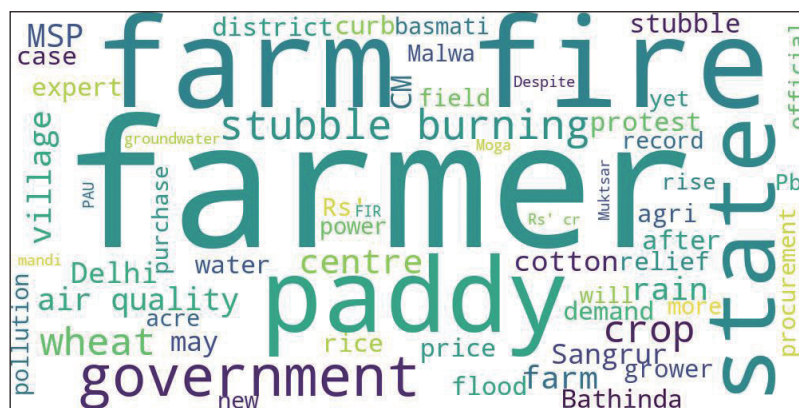




Working Paper No. 4

Aakash Working Paper

**Recent social trends in Punjab regarding stubble
burning issue:
A summary of newspaper articles during 2019–2024**



by

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(Nara Women's University)

December 2024



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About the Aakash Working Papers

These working papers are based on the work of the Aakash Project at the Research Institute for Humanity and Nature (RIHN), Kyoto, Japan.

This study addresses air pollution caused by the large-scale post-harvest burning of rice straw in October and November in the Indian states of Punjab and Haryana. The burning results in severe air pollution in the areas around it, affecting public health and the well-being of hundreds of millions of people. Therefore, the Aakash project aims to encourage the social change needed to keep air clean, improve public health, and develop sustainable agriculture in northwestern India.

The aim of this series is to share the initial findings and lessons learned from the research studies conducted by the Aakash project. By sharing new knowledge in a prompt manner, we will be able to identify complexities and develop solutions faster than if this was not done. In addition, reporting detailed information and data that cannot be presented in a general paper will create new areas of knowledge. We hope that the publication of this series will stimulate discussion among project members and facilitate communication with academic and general stakeholders outside the project.

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Preface

The Aakash project: “An Interdisciplinary Study Toward Clean Air, Public Health and Sustainable Agriculture: The Case of Crop Residue Burning in North India” is designed to address air pollution caused by large-scale post-harvest rice straw burning in Punjab and Haryana, in northwestern India during October and November. Straw burning causes severe air pollution in the surrounding areas, affecting the health and well-being of hundreds of millions of people.

The research activities in this project have been aimed at promoting behavioural changes to realise clean air, improved public health, and sustainable agriculture. Researchers from different fields of interest, including satellite and ground-based observations of air pollution, atmospheric model simulation, epidemiology and public health, as well as agro-economics, human geography and agricultural science, have been involved in the five-year project, drawing on their own expertise while learning about other fields.

The Aakash Project was launched as Pre-Research in 2019, and moved to Full-Research in April 2020. Since 2019, Dr. Haruhisa Asada read *The Tribune*, a leading newspaper in the Punjab region, to follow the local situation relating to Aakash Project. He has meticulously prepared a list of news headlines and article summaries related to crop residue burning. The contents covered a wide range of topics, including local incidents and government responses as a background of the large-scale straw burning, farmers’ activities, diversification of rice varieties and crops, mechanisation of agriculture, climate change, and water resource management. This list of headlines was shared monthly with Aakash project members living in Japan. It greatly helped researchers from other disciplines who were not familiar with Indian agriculture to understand the key information essential to orient their project research.

As the Aakash project comes to an end in March 2025, the six years’ worth of headlines were reviewed again and reorganised thematically in this working paper by Dr. Asada. The article headlines in English and the summary of the article in Japanese are available on the Aakash Project website (https://aakash-rihn.org/indian_news2024/). We would be happy if they are utilised to develop further research for improving quality of life in the region and serve as a record of changes in India’s agricultural policy.

December 2024

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Recent social trends in Punjab regarding stubble burning issue: A summary of newspaper articles during 2019–2024

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Abstract

This paper explores the socio-political and environmental dimensions of stubble burning in Punjab and Haryana, a significant contributor to air pollution in Delhi NCR. Using *The Tribune* newspaper articles from 2019 to 2024, it examines key themes such as government policies, crop diversification, farmers' protests, subsidies, and straw management. Despite measures like machinery subsidies, penalties, and alternative practices, challenges persist due to poor machinery adoption, inefficient policy implementation, socio-economic constraints, and political unrest. Farmers' resistance, compounded by delayed financial support and trust deficits, underscores the disconnection between policy and reality. Technological initiatives like biomass plants and satellite monitoring show promise but require broader integration. The study calls for a multi-pronged strategy combining farmer participation, infrastructure development, and collaborative governance to achieve sustainable crop residue management and mitigate environmental impact.

Keywords: stubble burning, farm fire, air pollution, farmers' movement, government policies

Introduction

Air pollution has emerged as a significant environmental issue in the Delhi National Capital Region (NCR) and North India since the early 2010s. Various contributing factors have been identified, including vehicle exhaust emissions, industrial smoke, and dust. However, it is widely believed that crop residue burning after the rice harvest, which starts at the end of September in Punjab and Haryana (north-west of Delhi NCR), plays a considerable role in the problem (e.g., Balwinder-Singh et al., 2019; Beig et al., 2020).

The Aakash Project, undertaken by the Research Institute of Humanity and Nature (RIHN), began its full research phase in April 2020 and is set to conclude in March 2025. The project investigates the link between crop residue burning in Punjab and air pollution in Delhi NCR (Hayashida 2024). During this period, state and central governments have introduced various measures to curb farm fires, including subsidies for crop residue management machinery and promoting alternative crops to move away from paddy-wheat double cropping (Kumar et al. 2022).

Farmers' responses to these initiatives have been varied. Some farmers have stopped crop residue burning by adopting new technologies, while others have ignored government warnings and continued the practice (Kurinji et al. 2024). In March 2020, the COVID-19 pandemic began to affect the entire country, and central government-imposed lockdowns disrupted farming operations. Additionally, in September 2020, the passage of new agricultural laws by Parliament sparked year-long farmer protests.

To understand the socio-political dynamics in Punjab over the five years of the project (Fig. 1), daily newspaper articles were summarized alongside reviews of scientific papers and government reports. Articles from the local newspaper, *The Tribune*, published between September 2019 and November 2024, were analysed to extract those related to stubble burning. These articles were categorized into nine sections: overall situation of stubble burning, compensation for farmers, crop

diversification, agricultural inputs, market systems, monitoring systems, penalties for farmers, sowing dates, straw use (ex-situ management), government subsidies (in-situ management), farmers' movements, weather conditions, the impact of diseases, the impact of COVID-19, and stubble burning in Haryana. Summaries of key events in each category are presented in the following sections.



Figure 1. Map of Punjab

Overall situation of stubble burning

Farm fire in 2019

1. Tribune, as other local newspapers, reports the number of fires detected by NASA's orbiting satellites at around 10:30 or 13:30 as the number of stubble burnings. In 2019, Punjab observed the highest number of stubble burnings of the season, with 6,668 cases based on satellite observation on November 5. Specifically, the southern part of the state showed more cases; Sangrur district recorded 1,007 cases, Bathinda district had 945 cases, and Moga district reported 628 cases (November 6, 2019).
2. Between September 23 and November 20, the total number of stubble burnings in Punjab reached 52,003, surpassing the 50,829 cases from 2018. Consequently, the government plans to pay Rs 2,500 per acre as compensation to farmers cultivating non-basmati rice to stop them from burning stubble (November 22, 2019).

Farm fire in 2020

1. By May 2020, fines of Rs 61 million had been imposed on violating farmers, but only a little over Rs 100,000 had been paid. Politicians feared losing farmers' votes, and thus no one seriously tackled the issue (May 24, 2020).
2. In the Majha region, Amritsar and Tarn Taran districts recorded the highest number of stubble burnings in Punjab, with 1,657 and 2,086 cases, respectively. This is because the harvest season in Majha is earlier than in the Malwa and Doaba regions (October 23, 2020).
3. By October 29, the number of stubble burnings had surged to 23,177, particularly in the southern Malwa region. Despite deploying 8,000 officials for monitoring and over 70,000 machines for straw management, 92% of the violators faced no action (October 31, 2020).
4. Although Rs 15 billion was spent on machinery subsidies and awareness campaigns, the number of

stubble burnings in Punjab increased over the past three years. This season saw 76,000 burnings, an increase of 25,000 from the same period in 2019 (November 28, 2020).

Farm fire in 2021

1. In 2021, protests against the new agricultural laws continued, and because the government had not paid the financial aid mandated by the Supreme Court, the number of stubble burnings might increase (August 31, 2021).
2. Stubble burning in 2021 also began in the Majha region, where farmers started burning fields after harvesting basmati rice that was planted earlier than usual. As the state government was busy with election preparations, farmers predicted that no strict measures would be taken against stubble burning (September 23, 2021).
3. Given the unstable political situation and the upcoming state assembly elections, the number of stubble burning was anticipated to increase in 2021, as farmers constitute a significant voting bloc (September 29, 2021).
4. An analysis by the Council on Energy, Environment, and Water revealed that while the area planted with PUSA 44, which produces a large amount of straw, had significantly decreased, it remained prevalent in many districts. By 2020, Punjab had established 19,834 custom hiring centers and distributed 76,626 machines for straw management, yet the adoption and usage of these machines by farmers remained low (November 2, 2021).
5. During the 2021 harvest season, with the state assembly elections just three months away, the Punjab government took a lenient stance on stubble burning. As a result, the police did not apprehend or penalize violating farmers (November 12, 2021).

Farm fire in 2022

1. In 2022, the state government deployed 8,000 officials to the fields from September 15, using an app to detect stubble-burning locations in shifts of 2,000 people each. While straw management machines were provided, their numbers were inadequate for the 3 million hectares of rice fields (September 14, 2022).
2. Farmers in Sangrur district had no choice but to resort to stubble burning, as the Punjab government neither provided the necessary subsidies nor the required machinery. Given their debts from private moneylenders, borrowing more money for straw management was impossible (October 21, 2022).
3. Another farmer from Sangrur district mentioned that post-burning, they had to plough the fields 3–4 times, which increased costs. In contrast, using a Happy Seeder without burning would allow them to sow wheat with just 5–6 liters of fuel per acre (November 2, 2022).
4. 599 new stubble-burning cases were identified in Punjab, totaling 29,999 cases. This was fewer than the 32,734 cases reported in the same period last year. However, the actual number of burnings might be higher than detected by satellite, judging by the smoke situation (November 7, 2022).
5. The state government's officials' inability to visit stubble-burning sites within 24 hours allowed farmers to plough their fields and erase evidence of burning. In Sangrur district, where stubble burning was the most severe, 5,016 burning cases were recorded, but only 2,653 sites were visited by officials (November 14, 2022).
6. In 2022, there were 49,922 cases of stubble burning, significantly fewer than the 76,755 cases in 2020 and 71,286 cases in 2021. This season, 14.79 million tons of straw were managed, with 10 million tons handled in-situ and 1.8 million tons ex-situ (December 1, 2022).
7. This reduction was due to the increasing number of farmers using straw management machines (November 27, 2022).

Farm fire in 2023

1. In February 2023, the Punjab government promised the Commission for Air Quality Management (CAQM) to reduce stubble burning cases by 50% compared to the previous year. To achieve this, they aimed to address challenges faced by ex-situ industries, promote crop diversification, and spread the use of in-situ management machines (February 7, 2023).
2. The Punjab Agriculture Department set targets for the kharif season of 2023: zero stubble burning in seven districts and a 50% reduction in four districts. A budget of Rs 3.5 billion was allocated to subsidize 22,000 crop residue management machines. Since the subsidy program began in 2018, the state government has distributed 117,000 machines. The central government provided Rs 14 billion to Punjab over the past five years. For 2023, the budget of Rs 3.5 billion would be covered 60% by the central government and 40% by the state government. Additionally, the cultivation of short-duration PR126 variety after the floods was expected to reduce straw production by 10%, as PR126 matures 93 days after transplanting (August 13, 2023).
3. Experts predicted a surge in stubble burning in October due to delayed harvesting caused by recent rains in Punjab (September 27, 2023).
4. The number of stubble-burning cases in 2023 was significantly lower than the previous year. However, with delayed rice harvesting in southern Malwa, a sharp increase in cases was anticipated in the coming days (October 29, 2023).
5. Farmers devised methods to quickly burn straw in response to strict government measures against stubble burning. One method involved running a tractor over the burning residue to manage it without producing visible smoke, making it undetectable by satellite surveillance by the Punjab Pollution Control Board (PPCB). Another method involved collecting straw into piles at the field's edge using a tractor after harvesting with a combine, then burning it to prevent widespread fires (October 29, 2023).
6. In 2023, Punjab recorded 36,663 stubble burning cases, a 27% decrease from 49,922 cases in 2022, a 49% decrease from 2021, and a 56% decrease from 2020 (December 1, 2023).

Farm fire in 2024

1. The number of farm fires in Punjab has maintained a steady and increasing trend, but there has been a noticeable spike in the number during the evenings and at night. This is because farmers have found ways to deceive monitoring agencies that rely heavily on satellite imagery (November 7, 2024).
2. Many farmers set fire to crop residues in the afternoon to avoid detection by satellites. In farm lands along the Sirhind-Patiala Road, many farmers were seen setting fire to crop residues after 3pm (November 17, 2024).
3. According to reports obtained by *The Tribune*, on October 26, November 4, 6, 11 and 25, the locations of the farm fires indicated by satellite coordinates crossed the Indian border; the Tarn Taran district supervisor confirmed that all six incidents occurred on the Pakistani side (November 28, 2024).
4. The Department of Agriculture and Farmer Welfare, Punjab, submitted a report stating that “as a result of efforts made by Punjab government, the number of farm fires has reduced from 36,551 on 25 November 2023 to 10,479 on 25 November 2024, a reduction of 70 per cent” (November 29, 2024).
5. According to the Punjab Pollution Control Board (PPCB), the number of farm fire incidents decreased to 10,909 this season compared to 36,663 in 2023 and 49,922 in 2022, with the highest number in Sangrur district (1,725 cases), followed by Ferozepur district (1,342) and Tarn Taran

district (876), Muktsar district (816) and Amritsar district (735) (December 1, 2024).

Table 1. Newspaper articles on stubble burning

Year	Month	Date	Headline
2019	11	06	At 6,668, state sees most farm fires in a day
2019	11	22	No let-up in farm fires, 3 booked in Fazilka
2020	05	24	State sees record 11,844 stubble fires this season
2020	10	23	Most farm fires in Amritsar, Tarn Taran
2020	10	31	No let-up in stubble burning, 16K cases in 10 days
2020	11	01	Farm fires cases highest in four years
2020	11	28	State sees 25K more farm fires this year
2021	08	31	Expect farm fires by mid-Sept, say experts
2021	09	29	Harvesting begins, 2 dists see 96 farm fires already
2021	11	02	At 2,895, Sunday spike steepest
2021	11	12	Farm fires rage but no FIR* yet
2022	09	14	10K employees to keep tabs on farm fires from tomorrow
2022	10	21	No 'option', farmers to burn stubble in Sangrur
2022	11	02	Not all farmers to blame, some show the green way
2022	11	07	Farm fires cases dip, but smog stays
2022	11	14	Officers' failure to visit five sites in time helps farmers escape action
2022	11	27	34% decline in farm fires in Sangrur
2022	12	01	State sees 30% dip in farm fires; encouraging trend, says expert
2023	02	07	Punjab aims to reduce stubble-burning incidents by 50 per cent
2023	08	13	Punjab plans to provide 22,000 straw management machines for 2023 kharif season to check stubble-burning
2023	09	27	8 farm fires reported so far in Punjab; lowest in past two years
2023	10	29	Three Malwa districts see decline in farm fire cases
2023	10	29	To dodge govt, farmers come up with novel ways of burning crop residue
2023	12	01	Farm fires down by 27% in Punjab, 37% in Haryana compared to last year: Environment ministry
2024	11	07	To dodge satellite, farmers in Punjab resort to stubble burning during night
2024	11	17	Farmers scheduling straw fires to duck detection
2024	11	28	Satellite flagging farm fires across border too, leaves field staff in a fix
2024	11	29	Short wheat sowing window fuels stubble burning spike despite 70% decline: Punjab Agri Dept to NGT
2024	12	01	Farm fire monitoring ends, state sees 70% decrease

Note: * FIR = First Information Report.

Compensation for farmers

Bonus for farmers who stopped stubble burning

1. In November 2019, the Chief Minister of Punjab requested that the central government pay a bonus of Rs 100 per quintal to farmers who stopped stubble burning. This would require a total budget of Rs 17 billion (November 5, 2019).
2. The Supreme Court directed the Punjab, Haryana, and Uttar Pradesh governments to pay a reward of Rs 100 per quintal within one week to farmers who stopped stubble burning in non-basmati rice cultivation. The Court stated that penalizing farmers would not resolve the issue (November 7, 2019).
3. The Punjab government decided to provide a separate compensation of Rs 2500 per acre to small and marginal farmers who own less than 5 acres of land and do not engage in stubble burning. This compensation is aimed at farmers cultivating non-basmati varieties and who own less than 5 acres

of land. Farmers are required to submit a declaration to the Panchayat by November 30 (November 14, 2019).

Suspension of the payment

1. By November 15, the Punjab government had paid compensation of Rs 190 million to 16,000 farmers who had not engaged in stubble burning, but subsequently, the payments were temporarily suspended (November 19, 2019).
2. On November 18, a person was reported for attempting to fraudulently obtain compensation by using a fake ID to pose as a farmer who had not engaged in stubble burning. Although the government claimed to calculate the area of paddy fields using remote sensing and field surveys, accurately estimating the area of stubble burning for each farmer proved difficult (November 19, 2019).
3. Since mid-November 2019, out of 115,000 farmers who applied for compensation for stopping stubble burning, only 42,000 were approved, while 19,000 were rejected and 53,000 were put on hold. Reports of farmers fraudulently obtaining compensation led the state government to suspend approvals (February 27, 2020).

Proposal by AAP government

1. In July 2022, following a proposal from the ruling Aam Aadmi Party (AAP) of Punjab to the Air Quality Commission, the Chief Minister of the Delhi NCR announced that farmers in Punjab who do not burn stubble would receive a compensation of Rs 2,500 per acre. This compensation was to be split, with Rs 500 each from the Punjab and the Delhi governments and Rs 1,500 from the central government (July 28, 2022).
2. Since the central government did not approve this proposal and the Delhi AAP administration remained cautious, it appeared that the actual compensation farmers would receive would likely be reduced to Rs 500 per acre (August 31, 2022).
3. Due to budget constraints, the Punjab government's plan to pay Rs 1,500 per acre for stubble management eventually fell through. In contrast, Haryana has been providing farmers with a compensation of Rs 1,000 per acre (September 13, 2023).
4. The Central Government has rejected the Punjab Government's request to pay Rs 1,200 crore as an incentive to farmers to discourage stubble burning (November 5, 2024).

Table 2. Newspaper articles on Compensation

Year	Month	Date	Headline
2019	11	05	Capt seeks ~100 per quintal to curb farm fires
2019	11	07	Punjab, Hry under SC fire on stubble burning
2019	11	14	Rs. 2,500/acre incentive for Pb farmers
2019	11	19	Govt to resume relief disbursal with checks
2019	12	25	No headway in stubble compensation scam
2020	02	27	Over 53K farmers yet to get relief for not burning straw
2022	07	28	Rs 2,500/acre incentive for not burning paddy straw
2022	08	31	No Central help, state mulls cut in incentive to check farm fires
2023	09	13	Cash incentive for scientific handling of stubble in Punjab a far cry due to fund crunch
2024	11	05	Centre turns down state's Rs 1,200-cr demand for checking farm fires

Crop Diversification

Decision of the Punjab government

1. On October 2019, the Chief Minister of Punjab stated that diversifying cropping systems is the only way to prevent groundwater depletion (October 15, 2019).
2. To facilitate the shift from paddy and wheat cultivation, he requested financial and technical support from the World Bank. Additionally, he planned to present an amendment to the Agricultural Produce Market Committee Act (APMC) in the state legislature. This reform aims to allow the procurement of crops other than paddy and wheat at Minimum Support Price (MSP) (October 30, 2019).
3. On December 19, the Finance Minister in Punjab demanded that the central government set minimum procurement prices not only for rice and wheat but also for maize and other crops to encourage crop diversification among farmers. To support this transition, the Punjab Finance Department allocated a budget of Rs 2 billion for the fiscal year 2020 to convert 300,000 hectares of paddy fields to other crops. Instead of water-intensive rice, plans were made to cultivate maize and basmati rice, and in the southern part of the state, cotton and pulses were also encouraged (March 2, 2020).
4. To further advance crop diversification, the Punjab government decided to implement price guarantees for potatoes and kinnow starting in the fiscal year 2021. The state government will set a procurement price, and if the market price falls below this threshold, the difference will be paid to farmers from a reserve fund (March 16, 2021).

Encouragement of moong bean

1. In December 2021, the Agriculture Minister of Punjab promised farmers that even if the central government could not do so, the state government would guarantee MSP for 113 types of crops (December 1, 2021).
2. The Chief Minister of Punjab announced that moong beans would be purchased at an MSP of Rs 7,275 per quintal to promote crop diversification (May 7, 2022).
3. The area under moong bean cultivation increased significantly from 42,000 acres in 2021 to 96,000 acres in 2022, with Mansa district having the largest area. Farmers were able to generate income within a 60-day growing period (May 17, 2022).
4. The central government agreed to purchase Punjab's moong beans at MSP, with the Punjab state government covering more than 15% of the procurement cost (May 22, 2022).
5. Following the encouragement of moong bean cultivation in 2022, the Chief Minister announced on May 28, that to prevent groundwater depletion, the state would promote the cultivation of maize, millet, sunflower, mustard, and pulses in 2023. However, due to strict government procurement standards, only 114 out of 2,351 moong bean farmers were able to sell their produce to the government at MSP, while the rest sold to private buyers. The state government promised to subsidise up to Rs 1,000 per quintal to farmers who sold their moong beans to private traders for less than Rs 6,000 per quintal (July 3, 2022).
6. Only a few moong bean growers were able to sell their produce at MSP. Additionally, due to concerns that moong bean cultivation could lead to an infestation of whiteflies affecting subsequent cotton crops, the state government urged farmers to stop cultivating moong beans in cotton-growing areas (March 13, 2023).
7. Despite the state government's efforts to promote crop diversification through moong bean cultivation, procurement in 2023 saw a 77% decrease compared to the previous year. While products

meeting government specifications were purchased at MSP, others were bought by private traders at prices below MSP (June 26, 2023).

8. This season, the government purchased only a small amount of moong. Ninety-nine per cent of the produce brought to the market was bought by private traders at or below the MSP of Rs 8,555 (July 8, 2024).

Failure of sugarcane cultivation

1. Farmers in the sugarcane-growing regions of Doaba and Majha expressed their anger over the low procurement prices despite being instructed by the state government to cultivate sugarcane for crop diversification. They declared that they would continue their protest until the State Advised Price (SAP) was increased (August 22, 2021).
2. Although sugarcane cultivation began in the 1990s as part of a crop diversification strategy, farmers criticized the state government for worsening their situation. The state government had promised to raise the SAP by Rs 15–20 annually, but this promise has not been fulfilled (August 22, 2021).

Changes in the area under paddy cultivation

1. According to a report by the Comptroller and Auditor General of India, despite spending Rs 2.74 billion on crop diversification policies from 2014 to 2019, the area under paddy cultivation increased by 7.18%, and the number of districts facing groundwater depletion also rose (June 30, 2022).
2. The Chief Minister of Punjab stated that although the state government is ready to advance crop diversification, it cannot implement these measures due to the central government's failure to guarantee Minimum Support Prices (September 24, 2022).
3. To address this issue, the Punjab government established a committee of 11 experts to develop a new agricultural policy. The committee is expected to discuss resources such as soil and groundwater in Punjab, farmers' economic conditions, crop exports, and crop diversification (January 17, 2023).
4. Following an announcement in 2019 that the Punjab government would pay Rs 7,000 per acre to farmers who converted more than 50% of their paddy fields to other crops, the area under paddy cultivation decreased by 100,000 hectares (February 10, 2023).
5. The Chief Minister of Punjab has set up a committee to explore alternative crops to paddy. Experts have suggested crops such as basmati rice, the short-duration PR126 variety, soybeans, and maize (March 31, 2023).
6. The Punjab Agriculture Department has decided to pay a bonus of Rs 17,500 per hectare to farmers who abandon paddy cultivation and shift to alternative crops to conserve groundwater (July 21, 2024).

Table 3. Newspaper articles on Crop diversification

Year	Month	Date	Headline
2019	10	15	CM meets farmers, motivates them
2019	10	30	Help farmers shift to other crops: CM to World Bank
2019	12	19	Make provision to tackle farm fires, Manpreet urges Centre
2020	03	02	Diversification plan set to take off, finally
2021	03	16	Assured price for potato, kinnow from next fiscal
2021	08	22	Cane farmers ready for long haul, toilets raised
2021	08	22	Doaba, Majha cane growers lead stir
2021	12	01	Nabha promises MSP on crops if no Centre's relief

Year	Month	Date	Headline
2022	05	07	Mann promises MSP on moong
2022	05	17	With 25K acres, Mansa tops state in moong cultivation
2022	05	22	Centre agrees to buy moong at MSP
2022	05	28	Will go for corn, millet cultivation next year: CM
2022	06	30	Rs 274 cr spent on diversification, but paddy area up 7.18%: CAG
2022	07	03	To pacify farmers, govt set to relax procurement norms for moong
2022	09	24	CM: Ensure fair prices to help farmers opt for diversification
2023	01	17	Punjab to frame new agricultural policy; 11-member committee formed for the purpose
2023	02	10	Area under paddy down 1L hectares
2023	03	13	To prevent white fly attack, avoid sowing moong in cotton belt: Agriculture & Farmer Welfare Department
2023	03	31	Punjab govt sets up panel to look at alternative crops to paddy
2023	04	03	Enable farmers to make the most of moong
2023	06	26	Govt moong purchase slides by 77% in Punjab
2024	07	08	No moong purchase by govt in Punjab this year
2024	07	21	Punjab farmers shunning cultivation of paddy to get Rs 17.5K per hectare

Agricultural Input

Rice variety preference

1. The Punjab Agricultural University (PAU) developed a new rice variety, but farmers who attended the Kisan Mela preferred to purchase the old variety (April 3, 2022).
2. When PAU conducted rice seed sales at 35 locations across the state, farmers opted for early-maturing varieties like PR-126 over water-intensive varieties like Pusa-44 and other late-maturing types. Farmers from Muktsar and Fazilka districts chose Basmati varieties (June 21, 2022).

Ban on the long-duration variety

1. In October 2023, the Chief Minister of Punjab announced a ban on cultivating the long-duration, water-intensive rice variety PUSA-44 starting from 2024. Farmers were urged not to cultivate PUSA-44 even in 2023, but many did so regardless. While PR126 takes 92 days to mature, PUSA-44 takes 152 days (October 3, 2023).
2. Long-duration rice varieties like Peeli PUSA and PUSA-44, which take 150 days to mature, delay the harvest. Although these seeds are not sold within the state, farmers purchase them from neighboring states (November 3, 2023).
3. In the Sangrur district, a longstanding issue is that 50% of the farmland is used to cultivate long-duration varieties like PUSA-44 and Peeli Pusa. Here, large-scale farmers own straw management machinery, and cooperatives are dominated by them, leaving small farmers unable to access these resources (November 30, 2023).
4. The Chief Minister of Punjab stated that urging farmers to refrain from cultivating PUSA-44 in 2023 resulted in a 50% reduction in the area under cultivation, saving Rs 477 crore in electricity costs and 5 billion cubic meters of groundwater. Instead, farmers have started opting for varieties with a 90-day growing period, such as PR-126, PR-127, PR-128, PR-129, and PR-130 (April 27, 2024).
5. In April 2024, it was noted that although PUSA-44 can increase farmers' income by Rs 15,000–22,000 compared to short-duration varieties, it requires 5–6 additional irrigations and produces 2% more straw (April 21, 2024).
6. The Punjab government decided to immediately stop the sale of PUSA-44. The Department of

Agriculture will monitor stores to ensure this seed is not sold within the state (April 24, 2024).

7. The area of short-season variety PR126 is expected to double this season. PAU has sold more than 10,000 quintals of PR126 this season compared to 4,800 quintals last season (June 7, 2024).

Shortage of DAP and seeds

1. After the rice harvest, wheat sowing must be completed by November 15. However, in October 2020, there was a severe shortage of DAP (Di Ammonium Phosphate), which affected sowing and posed a risk to the yield (October 29, 2022).
2. With only two days left until the end of the ideal wheat sowing period, there was a shortage of subsidized wheat seeds provided by Punseed (November 14, 2022).

Table 4. Newspaper articles on Agricultural input

Year	Month	Date	Headline
2022	04	03	New seed available, but 'time-tested' varieties sell
2022	06	21	PAU-approved rice varieties getting good response: Expert
2022	10	29	Sowing begins amid DAP shortage
2022	11	14	No end to shortage of subsidized wheat seeds
2023	10	03	PUSA 44 paddy variety to be banned from next Kharif season: Punjab CM Bhagwant Mann
2023	11	03	Surge in farm fires raises alarm as 40% area yet to see harvest
2023	11	30	Flood-hit areas near Sangrur see rise in farm fires
2024	04	21	Farmers in a bind over lack of information on varieties to be sown this kharif season
2024	04	24	Sale of PUSA 44 seeds banned by Punjab Govt
2024	04	27	Moving away from PUSA-44 helped Punjab save Rs 477 crore: CM Bhagwant Mann
2024	06	07	Sale of early-maturing paddy seeds doubled this season: Punjab Agricultural University

Market system

The problem of MSP

1. In 2020, the central government raised the MSP for rice by Rs 53 per quintal, setting it at Rs 1,868 per quintal. Additionally, A-grade varieties were set at Rs 1,888 per quintal. The prices for 14 other commodities, including oilseeds, pulses, and coarse grains, were also increased (June 2, 2020).
2. Moreover, in 2021, the central government decided to increase the MSP for the kharif crop. The price for common grade paddy was raised from Rs 1,868 per quintal to Rs 1,940 per quintal. However, farmers were unsatisfied since the increase was smaller than other crops (June 10, 2021).
3. The central government raised the MSP for rice by Rs 100, setting it at Rs 2,040 per quintal. The MSP for 14 other Kharif crops, including maize, jowar, pulses, and cotton, was also increased (June 9, 2022).
4. Cheap rice from Bihar was being transported to a rice mill in Mansa district to sell to the Food Corporation of India (FCI) at the MSP (April 5, 2024).

Procurement of rice and wheat

1. Since the Food Corporation of India (FCI) strictly checks the moisture content of rice during procurement, farmers and middlemen prefer selling their rice to state agencies such as Pungrain, Markfed, and Punsup (October 12, 2021).
2. Furthermore, the Punjab state government amended the Agriculture Produce Markets Rules 2020, deciding to pay the procurement price of rice directly into the farmers' accounts instead of through middlemen. Despite this change, middlemen will continue to earn a commission of 2.5% (January

- 28, 2020).
3. The Food Corporation of India announced that starting next month, the payment for wheat arriving in the market will be directly transferred to the farmers' accounts. This measure aims to prevent rice brought from other states from being procured at MSP in Punjab. Previously, payments were made to intermediaries (arhtiyas), who then transferred the money to the farmers (March 5, 2021).
 4. Farmers in Punjab received Rs 128.17 billion for their harvested wheat through the Direct Benefit Transfer system. It was the first time in 2021 that payments were made directly to the farmers (April 29, 2021).
 5. As the Punjab government purchases rice starting on October 1, there is concern about warehouse space issues. There is still an overflow of rice and wheat purchased in the previous year (September 23, 2024).

The price of Basmati

1. Basmati rice does not have an MSP and is influenced by foreign demand. In the 2019 fiscal year, the yield per unit area of Basmati rice decreased, and the selling price was also lower at Rs 2,400–2,600 per quintal compared to Rs 3,300 per quintal the previous year. Therefore, non-Basmati varieties, procured at prices above the MSP, are more profitable for farmers (November 14, 2019).
2. In September 2022, in Amritsar district, the Basmati variety 1509 fetched a high price of Rs 3,700 per quintal, much to the farmers' delight. However, the price dropped to Rs 3,100–3,200 as the harvest progressed. Many farmers advanced their harvest timing to sell at a high price (September 12, 2022).
3. In Muktsar district, the purchase price of Basmati rice in 2022 was high at Rs 4,000 per quintal, leading to an expected increase in cultivation area for 2023 (June 24, 2023).
4. Basmati variety 1509 was bought for Rs 3,500–4,000 per quintal last year, but this year, it is being sold for Rs 2,000–2,400 per quintal in the market. Due to the government campaign this season, the area under basmati cultivation has expanded considerably (September 28, 2024).

Table 5. Newspaper articles on Market

Year	Month	Date	Headline
2019	11	14	Basmati rates fall post high output, growers dejected
2020	01	28	Rules amended, direct payment to Pb farmers
2020	06	02	Paddy MSP hiked by Rs.53/quintal
2021	03	05	FCI: Direct payment into farmers' account
2021	04	29	Rs 12,817 crore paid via DBT* to farmers
2021	06	10	Paddy MSP up Rs 72; meagre, say farmers
2021	10	12	Stringent norms slow down FCI purchase
2022	06	09	Paddy MSP hiked by Rs 100/quintal
2022	09	12	After initial spike, 1509 basmati variety prices dip; growers upset
2023	06	24	Area under basmati set to increase in Muktsar
2024	04	05	Farmers protest smuggling of Bihar rice into Punjab
2024	09	23	Punjab stares at storage crisis ahead of paddy procurement
2024	09	28	Farmers dump basmati produce on Amritsar city roads to protest low price

Note: *DBT = Direct Benefit Transfer.

Monitoring system

Severity of air pollution

1. According to the IQAir report, 22 of the world's top 30 most polluted cities are in India, with Delhi ranking as the worst. Additionally, nine other cities are located in Haryana (March 17, 2021).
2. The annual Air Quality Life Index published by the University of Chicago's Energy Policy Institute states that India is the most air-polluted country in the world. This affects 480 million people in the Indo-Gangetic Plain, which accounts for 40% of the country's population (September 2, 2021).
3. A report by the Centre for Science and Environment revealed that the number of deaths due to PM2.5 pollution in India has increased 2.5 times over the past 20 years. In 2019, one in four deaths from air pollution worldwide occurred in India. Out of 6.67 million global deaths from air pollution, 1.67 million were in India (March 2, 2022).
4. According to the World Air Quality Report 2021, Delhi has been named the world's most polluted city for the fourth consecutive year. Out of the top 50 most polluted cities, 35 are in India. Delhi's annual average PM2.5 concentration rose from 84 $\mu\text{g per m}^3$ in 2020 to 96.4 $\mu\text{g per m}^3$ in 2021 (March 23, 2022).
5. A report by the Health Effects Institute in the United States indicated that in Delhi, 106 out of every 100,000 people die due to PM2.5 pollution (August 18, 2022).
6. According to a joint report by the Health Effects Institute and UNICEF, 2.3 million people in India died from air pollution in 2021 (June 21, 2024).

Observation of air pollution

1. Every year, from October to February, rural areas in Punjab experiences worse air pollution than urban areas. However, the Punjab Pollution Control Board (PPCB) does not have the means to record AQI and obtain real-time data in rural areas. Air monitoring stations are only installed in six cities: Ludhiana, Khanna, Mandi Gobindgarh, Patiala, Amritsar, and Jalandhar (October 9, 2019).
2. The Punjab Pollution Control Board (PPCB) has 48 manual machines for measuring air pollution, with 24 installed in rural areas. However, these machines are not designed to record AQI and provide real-time data (October 22, 2020).
3. In response to the annual increase in stubble burning, the Punjab Pollution Control Board (PPCB) decided to install monitoring stations at 18 locations across the state (Faridkot, Fazilka, Moga, Mansa, Tarn Taran, Barnala, Sangrur, Malerkotla, Fatehgarh Sahib, SAS Nagar, Hoshiarpur, Muktsar Sahib, Pathankot, Gurdaspur, Kapurthala, Ferozepur, SBS Nagar, and Ropar) to monitor air pollution. Each station costs Rs 10 million (October 27, 2021).
4. Furthermore, as part of the USAID-supported Cleaner Air and Better Health project (CABH), nine air quality monitors and automatic weather stations were installed in Gurugram to reveal the current state of air pollution at construction sites near the capital and to take necessary measures (May 6, 2023).
5. The Punjab State Pollution Control Board (PSPCB) announced that it would operate mobile air quality monitoring vehicles to observe pollution levels across the state. This initiative also aims to raise public awareness about air pollution (August 27, 2023).
6. The National Green Tribunal (NGT) instructed the Punjab state government to revise its action plan for preventing stubble burning. The NGT demanded not only regular air quality monitoring but also the establishment of an adequate number of monitoring sites around hotspots (January 23, 2024).
7. After failing to control air pollution in the metropolitan area due to farm fires the Commission for Air Quality Management (CAQM) set up a base in Chandigarh to conduct ground monitoring for

two months (September 29, 2024).

Gap between stubble burning and air pollution

1. Although the Haryana Space Applications Centre (HARSAC) detected stubble-burning locations via satellite, officials from the agriculture and revenue departments were unable to confirm these on the ground in 672 cases. HARSAC detected 1,116 instances of stubble burning in Karnal district, but the teams could only confirm 444 of these on-site (November 22, 2019).
2. A study by the Indian Institute of Science Education and Research (IISER) showed that, based on AQI data from 2018 and 2019, the air quality in Punjab was cleaner than in Delhi. Consequently, the Punjab state government argued that Delhi's air pollution should not be blamed on farmers in Punjab (October 15, 2020).
3. In Sangrur district, out of 1,753 stubble-burning sites that officials visited based on satellite data, only 525 sites were confirmed as having stubble burning. This discrepancy led farmers to question the reliability of data from the Punjab Pollution Control Board (PPCB) and the Punjab Remote Sensing Centre (PRSC) (November 8, 2022).
4. In Punjab, while 2,175 cases of stubble burning were confirmed on November 13, only four cases were confirmed on November 14. PPCB officials suggested that cloud cover across the state might have hindered satellite observations (November 15, 2022).
5. In the Ludhiana district, out of 70,286 farmers, 56,229 had completed harvesting, but only 993 instances of stubble burning were recorded. As the AQI continued to deteriorate, the former Vice-Chancellor of Punjab Agricultural University (PAU) doubted the effectiveness of PPCB's stubble-burning monitoring system (November 8, 2023).
6. Despite a decrease in stubble-burning incidents compared to the previous year, the AQI in major cities in Punjab worsened. By November 7, the number of stubble burning cases was 20,978, compared to 32,486 during the same period the previous year (November 8, 2023).
7. According to HARSAC, 16 instances of stubble burning were detected in Karnal district and 54 in Kaithal district. However, officials could not find evidence of stubble burning at these sites, and in some places, the rice had not yet been harvested. An official from the agriculture department suggested that the satellite's thermal sensors might have mistakenly detected drifting smoke (November 10, 2023).
8. A judge of the National Green Tribunal (NGT) questioned the widely held discourse that farm fires in Punjab are causing air pollution in Delhi, questioning whether there is a lack of scientific evidence. Research needs to identify the sources of emissions of air pollutants (July 2, 2024).
9. The large discrepancy between the number of farm fire incidents based on remote sensing imagery and the number of farm fire occurrences identified in the field has puzzled the team at the Commission for Air Quality Management (CAQM). As of November 10, the Punjab Remote Sensing Centre reported that the total number of farm fires in Punjab was 6,611, but no fires were observed at 2,983 sites (November 13, 2024).
10. The Supreme Court noted that the Land Recorder and Sangrur Block Patwari Union President had reportedly admitted advising farmers to burn stubble after 4 pm to avoid detection by satellite. Citing this as 'very serious' if the reports are to be believed, the court directed state officials not to allow farmers to take advantage of the fact that their activities are detected via satellite during only a few hours of the day (November 29, 2024).

Table 6. Newspaper articles on Monitoring system

Year	Month	Date	Headline
2019	10	09	Farm fires leave rural areas gasping for breath
2019	11	22	Spotted by satellite, 672 fire locations in Karnal ‘missing’
2020	10	15	Can’t blame farm fires for Delhi air pollution: Govt
2020	10	22	Dip in air quality takes toll on villagers’ health
2021	03	17	New Delhi ‘Most Polluted’ capital
2021	09	02	Air pollution can shorten lives of 40% Indians by 9 yrs: Study
2021	10	27	21 more stations to monitor real-time air quality in state
2022	03	02	Air pollution deaths up 2.5 times in 2 decades
2022	03	23	Delhi most polluted capital
2022	08	18	106 deaths per lakh in Delhi owing to PM2.5
2022	11	08	Farm fires: Satellite, field visit data varies
2022	11	15	Farm fires see sudden dip
2023	05	06	New air quality monitors installed in Gurugram
2023	08	27	Punjab to get first air quality monitoring van
2023	11	08	Big mismatch: Paddy harvested by 56K farmers in Ludhiana, fires just 993
2023	11	08	Poor air quality counters Punjab govt claims on fewer farm fire incidents this year
2023	11	10	16 active fire locations ‘not traced’ in Karnal
2024	01	23	NGT seeks amended action plan from Punjab government to prevent farm fires
2024	06	21	Air pollution deaths in India a cause for concern
2024	07	02	Blaming Punjab farmers for Delhi’s air pollution unfair: NGT member Justice Sudhir Agarwal
2024	09	29	Air quality management panel to set up base in Chandigarh
2024	11	13	No stubble burning detected in 45% cases reported via satellite imagery
2024	11	29	Punjab, Haryana slow in taking action over farm fires: Supreme Court

Penalty for farmers

Surveillance by government officials

1. PPCB and the Department of Agriculture classify stubble burning by farmers as a violation. Fines are imposed based on the land size: Rs 2,500 for land up to 2 acres, Rs 5,000 for land more than 2 acres, and Rs 15,000 for land more than 5 acres (October 30, 2019).
2. PPCB uses satellite images to identify locations of stubble burning. The identified locations are then communicated to the authorities, and teams are dispatched to act (October 24, 2020).
3. Additionally, the Department of Agriculture has ordered all field officials to visit farmlands that are likely to engage in stubble burning after 12:30 pm each day (November 2, 2019).
4. In Sangrur district, although 2,500 instances of stubble burning were confirmed, officials could visit only 100 sites due to continued surveillance by farmers’ groups, which prevented access. Farmers continued burning stubble with impunity and stated that if the government seriously wants to stop stubble burning, it should pay at least Rs 200 per quintal for straw management costs (November 8, 2021).
5. The Punjab state government has been unable to collect fines from farmers who defied orders and continued stubble burning. Despite 23,308 violations amounting to Rs 61 million in fines, only Rs 100,000 has been collected (January 6, 2020).
6. Officials visit farmers to promote awareness about the harmful effects of stubble burning. However, farmers are already aware of this issue and argue that they have no choice but to burn stubble as they do not own machinery to manage it (November 5, 2023).
7. In Bathinda district, an audio clip circulated online revealed an announcement from a Gurdwara

instructing farmers to burn stubble after 3:30 pm to avoid police crackdowns that occur earlier in the day (November 22, 2023).

8. Due to the failure to enforce penalties on stubble-burning violators in 2019, it is anticipated that stubble-burning will increase in 2020. Last year, fines amounting to Rs 60 million were not collected (August 26, 2020).
9. The Chief Secretary of Punjab has notified the heads of nine districts (Barnala, Bathinda, Faridkot, Fazilka, Ferozepur, Ludhiana, Moga, Muktsar, Sangrur) that disciplinary actions will be initiated against them for failing to prevent stubble burning (November 17, 2023).
10. Not only the district heads but also the police chiefs of 11 subdivisions (Barnala, Bathinda, Faridkot, Fazilka, Ferozepur, Ludhiana, Moga, Muktsar, Sangrur, Jagraon, Khanna) have been asked to explain the reasons for their failure to prevent stubble burning (November 18, 2023).
11. The central government has doubled the fine for farmers who burn crop residues. Farmers with less than two acres of land will now have to pay environmental compensation of Rs 5,000, up from Rs 2,500. And those with land between two and five acres will be fined Rs 10,000 instead of Rs 5,000 (November 7, 2024).

Mandatory to attach Super SMS

1. The Punjab state government has mandated installing the Super Straw Management System (SMS) on all combine harvesters under the Air (Prevention & Control of Pollution) Act, 1981. Violators face fines or imprisonment for less than six months. Additionally, this season, the state government plans to subsidize 23,500 machines by 50–80% (August 24, 2020).
2. Furthermore, those who use combine harvesters without the SMS will be fined Rs 50,000 for the first offence, Rs 75,000 for the second, and Rs 100,000 for the third offence (September 30, 2020).
3. While operating combine harvesters without the SMS allows the collection of residual straw for use as cattle feed, the SMS finely chops the straw, rendering it unsuitable for feed. Consequently, harvesting with machines equipped with the SMS not only results in the inability to obtain feed but also increases the cost from Rs 1,200–1,300 to Rs 1,800 (October 19, 2020).

Establishment of a new institute

1. The central government introduced a bill to tackle air pollution in the Delhi metropolitan area. The President promulgated the Commission for Air Quality Management in the National Capital Region and Adjoining Areas Ordinance 2020, establishing a commission on air pollution. This commission's decisions take precedence over any other organization regarding air pollution issues (October 30, 2020).
2. The Commission for Air Quality Management in the National Capital Region and Adjoining Areas was newly launched on November 6 (November 7, 2020).
3. The National Green Tribunal (NGT) has ordered the Chief Secretary of Punjab and the officials of the Central Pollution Control Board (CPCB) to identify violators and propose solutions, as stubble burning in Punjab is causing serious environmental problems in the Delhi metropolitan area (October 22, 2023).

Table 7. Newspaper articles on Penalty

Year	Month	Date	Headline
2019	10	30	14 Moga farmers penalised for stubble-burning
2019	11	02	Conduct field visits, officials told
2020	01	06	Pb straw fire fine ~6 cr, but just ~1 lakh paid up

Year	Month	Date	Headline
2020	08	24	Combines without straw mgmt system to be seized: Agri Secy
2020	08	26	To manage stubble, state to rely on 75,000 machines
2020	09	30	Combines sans straw system to be impounded
2020	10	19	Penalised, farmers seek subsidy on straw management system
2020	10	24	25 FIRs over straw burning have Mansa farmers fuming
2020	10	30	Ordinance to curb pollution in Delhi
2020	11	07	Ensure smog-free Delhi, SC tells Centre
2021	11	08	Farmers won't allow officials at farm fire sites
2023	10	22	Stubble-burning: NGT issues notice to Punjab Chief Secretary, Central Pollution Control Board
2023	11	05	Officials' pleas against burning straw fall on deaf ears
2023	11	17	9 Punjab DCs slapped notices over farm fires
2023	11	18	After DCs, police chiefs of 11 Punjab districts face heat over farm fires
2023	11	22	Bathinda: Call for burning stubble after 3.30 pm, probe on
2024	11	07	Punjab farmers condemn Centre's move of doubling fines for stubble burning

Sowing date

Changes in paddy sowing date

1. The Punjab and Haryana state governments each enacted the Preservation of Subsoil Water Act in 2009 to limit the transplanting period to after mid-June. Article 1 of the Act stipulates that nursery sowing should occur after May 10, and field transplanting should begin after June 10. The start date for transplanting was set to June 10 in 2009, pushed back to June 15 from 2014 to 2017, and to June 20 in 2018. In 2019, the date was advanced by a week to combat stubble burning, and in 2020, it was also moved to June 10 due to labor shortages caused by the lockdown. However, advancing the rice transplanting date did not reduce stubble burning, as late-maturing varieties with high biomass, like Pusa 44 and Peeli Pusa, were still being cultivated (March 22, 2021).
2. Every January, the state government announces the starting date for rice planting for that year. The Punjab Pollution Control Board (PPCB) and the state Department of Agriculture are advocating to push the planting start date to after June 25. Delaying by one week could save as much water as is used in 3.5 years. However, in 2019, the Punjab state government succumbed to pressure from farmers' unions and moved the date forward to June 13 (January 13, 2020).
3. The Chief Minister of Punjab announced that to address the labor shortage caused by lockdown travel restrictions, the nursery sowing and the transplanting dates in 2020 would be advanced by 10 days from the previous year to May 10 and June 10, respectively (May 10, 2020).
4. To ease power demand, rice transplanting was scheduled to start in six districts each on June 18, June 20, and June 22, with the remaining five districts beginning on June 24. Transplanting starts sequentially from districts with earlier harvest periods (May 6, 2022).
5. The Chief Minister of Punjab announced the 2023 rice planting schedule. The first phase starts on June 10 for fields outside the barbed wire along the border. The second phase starts on June 16 in seven districts. The third phase begins on June 19 in seven districts. The fourth phase starts on June 21 in nine districts (May 16, 2023).
6. In some villages in Malwa region, farmers have already started transplanting late-maturing varieties. Government influence is minimal in villages where farmers' unions are strong (June 13, 2022).
7. In Sangrur district, many farmers have already begun transplanting. Observing that some large-scale farmers started planting long-duration rice varieties without any enforcement action, other farmers felt reassured and began transplanting as well (June 19, 2023).

Table 8. Newspaper articles on Sowing date

Year	Month	Date	Headline
2020	01	13	Delay paddy sowing, meet water demand for 3.5 years: Panel
2020	05	10	Paddy sowing advanced by 10 days
2021	03	22	Well-timed paddy move can arrest the slide
2022	05	06	Staggered paddy sowing from June 18
2022	06	13	Farmers start sowing paddy in advance
2023	05	16	Punjab CM Bhagwant Mann announces 4-phase paddy sowing from June 10
2023	06	19	Sangrur farmers ignore official directions, go ahead with paddy transplantation

Straw use (ex-situ management)

Management of rice straw

1. In Sangrur district, the first self-funded straw bank was launched. Orders for straw are coming from cow sheds in New Delhi, Rajasthan, and Uttar Pradesh. The cow sheds purchase the straw at Rs 2.5 per kilogram (November 06, 2019).
2. Farmers in Ferozepur district devised a system to chop and compact rice straw into rectangular bales, which are then transported to biomass power plants. The machinery for this system cost Rs 15 million and can process 100 acres daily. Each bale measures 8 feet by 3 feet and contains approximately 400–500 kilograms of straw, which can be sold for Rs 130 per kilogram (October 29, 2020).
3. In Amritsar district, they expect Gujjar to process 5,000 tons of the total 943,000 tons of rice straw. Gujjar used to feed buffalo with basmati harvested by hand but now uses baler to buy rice bundles (September 23, 2024).

Use of rice straw in factories

1. To reduce stubble burning, a brick factory utilizing rice straw as a raw material with a production capacity of 100 tons per day was completed in Patiala at a cost of Rs 55 million (December 19, 2020).
2. The Punjab state government will allocate a budget of Rs 250 million to promote the use of straw. Subsidies will be provided on a first-come, first-served basis to 50 factories, including sugar mills and pulp and paper mills with boilers generating over 25 tons of steam per hour, to use rice straw as fuel (September 14, 2021).
3. The Union Minister of Environment announced subsidies for constructing pelletizing plants for rice straw. Priority will be given to factories with agreements with farmers in the National Capital Region, Punjab, Haryana, Rajasthan, and parts of Uttar Pradesh for the supply of rice straw (October 14, 2022).
4. India's largest bioenergy plant was established in Sangrur district by Germany's Verbio AG. The plant secures 100,000 tons of crop residues annually by collaborating with farmers. This initiative will eliminate stubble burning on 40,000–45,000 acres and reduce CO₂ emissions by 150,000 tons annually (October 19, 2022).
5. About 100–150 plywood factories in Punjab have started using rice straw as raw material. In a village near Shahkot in Jalandhar district, a plywood factory was built at a cost of Rs 2 million and uses 300 tons of rice straw collected from 100 acres of farmland as raw material (October 24, 2022).
6. Producing biogas from rice residues is challenging without government subsidies, and biochar pro-

duction lacks technical support (October 31, 2022).

7. The Punjab state government has mandated that brick factories use rice straw for 20% of their fuel starting May 1, 2023 (November 14, 2022).
8. A 10-MW biomass power plant has been set up in Fategarh Sahib district. Using Danish technology, it will use 100,000 tonnes of rice straw per year as fuel, solving the problem of burning 50,000 acres of cultivated land (June 25, 2024).
9. According to the crop residue management plan of the Punjab government, 24 biogas plants are soon to be set up. A total of 38 plants will be set up, but only three are operational (August 6, 2024).

The value of wheat straw

1. In Patiala district, farmers began selling wheat straw instead of burning it in 2022 due to the increased demand for livestock feed. Many farmers in Malwa and Doaba regions are transporting wheat straw to Rajasthan, where they sell it for Rs 2,500–3,000 per quintal (April 21, 2022).
2. The low wheat yield in the 2021 fiscal year caused the price of dried wheat straw feed (toodi) to soar, prompting small-scale farmers in Faridkot district to stop burning stubble and start using rice straw as livestock feed. The price of toodi increased from Rs 400–500 per quintal in 2021 to Rs 1,000 per quintal in 2022 (November 19, 2022).

The initiative of the Punjab government

1. So far, the Punjab state government has focused on in-situ straw management and provided 90,000 machines for this purpose. However, 10% of these machines have gone missing. Additionally, they have experimented with bio-decomposer technology, but the results have been unsatisfactory. Consequently, the state government is finally shifting its focus to ex-situ management, selling to biomass power plants, compressed biogas ethanol plants, paddy-straw-based ethanol plants, and industrial boilers (September 7, 2022).
2. The Punjab Minister of Renewable Energy has requested a subsidy of Rs 50 million per megawatt from the Union Minister of Power to construct a 100 MW biomass power plant in the state (February 15, 2023).
3. In Karnal district of Haryana, 13 sites have been allocated for straw collection centers to supply paddy straw to the IOCL (Indian Oil Corporation Ltd) 2G ethanol plant in Panipat. Each center can collect straw from 10–15 surrounding villages, providing 225,000 tons to IOCL (June 24, 2023).
4. The Punjab state government is preparing to scientifically manage 90% of the paddy straw to halve the number of stubble-burning incidents. By the end of October, an estimated 19.55 million tons of paddy straw will be generated, with plans to manage 11.5 million tons in situ and 4.13 million tons ex-situ; via bio-gas plants, bio-ethanol plants, biomass power generation, fuel for industrial boilers, brick kilns, etc. 820,000 tons of straw will be used as livestock feed (October 3, 2023).
5. The Punjab state government struggles with managing the 18.5 million tons of paddy straw produced annually. Currently, the state's 42 CNG units, 14 biomass power plants, and one ethanol unit can only handle 3 million tons of paddy straw (October 26, 2023).
6. Punjab is setting up pelletizing plants to convert rice straw into biofuel, with 16 already operational and 21 more expected to be operational by November 2024 (September 17, 2024).
7. The Punjab government plans to set up 39 compressed biogas plants for Rs 10 billion this year. Still, some were shut down after they were commissioned following protests outside the plants in Jalandhar, Hoshiarpur and Ludhiana districts over the release of carcinogenic substances during biogas production (September 21, 2024).

Straw collection by Baler

1. The central government provides a 65% subsidy for purchasing balers to collect paddy straw. The remaining cost is shared, with companies covering 25% and farmers covering 10% (July 21, 2023).
2. Farmers do not use balers because no sugar mills are nearby, and they must transport the paddy straw over long distances (October 17, 2022).
3. According to leaders of farmers' unions, factories only buy large bundles of straw and refuse to purchase straw collected by small balers (November 22, 2023).
4. In Moga and Fazilka districts, baler operators who have already secured sufficient paddy straw refuse to buy more, forcing farmers to burn the straw (November 24, 2023).

Table 9. Newspaper articles on Straw use

Year	Month	Date	Headline
2019	11	06	Some make hay amid noise over paddy residue
2020	10	29	Ferozepur farmers devise novel way to deal with stubble
2020	12	19	Straw-based brick plant comes up in Patiala
2021	09	14	Rs 25-cr sop for industry to curb farm fires
2022	04	21	Farm fire dip, farmers prefer selling off straw
2022	09	07	State banks on ex-situ crop residue management
2022	10	14	Govt offers aid to units managing paddy straw
2022	10	17	India's biggest bio-energy plant begins ops tomorrow
2022	10	19	India's largest bio-energy plant commissioned
2022	10	24	Young technocrat shows way in paddy straw management
2022	10	31	Biogas & biochar options hit hurdle
2022	11	14	Brick-kilns get 6-month deadline for using 20% paddy straw as fuel
2022	11	19	Now, farmers use paddy stubble as dry fodder for milch cattle
2023	02	15	Punjab seeks funds from Centre to set up 100 MW biomass projects
2023	06	24	Farmers can now sell paddy straw to IOCL in 13 villages
2023	07	21	Punjab: Ex situ management of paddy stubble set to get an impetus
2023	10	03	To check farm fires, Punjab to manage 90% crop residue
2023	10	26	Punjab Govt struggles to utilise, recycle 185 lakh tonnes of paddy straw
2023	11	22	Punjab farmers upset over Supreme Court remarks on paddy MSP
2023	11	24	Stubble burning sees uptick in Moga, Fazilka districts
2024	06	25	10 MW biomass power plant begins operations in Fatehgarh Sahib
2024	08	06	Stubble mgmt plans may go awry as farmers oppose biogas plants
2024	09	17	To counter stubble burning, Punjab govt pushes green fuel initiative
2024	09	21	Biogas plants planned to check ills of stubble burning hit roadblock
2024	09	23	Gujjars to play key role in stubble management in Amritsar district

Subsidy from the government (In-situ management)

Subsidy for purchasing machinery

1. To reduce stubble burning, the Indian government spent Rs 11.78 billion on subsidies for purchasing agricultural residue management machinery from fiscal year 2018 to fiscal year 2021 (July 13, 2022).
2. Under the scheme "Promotion of Agricultural Mechanisation for in situ management of crop residue", 76,626 machines were provided in Punjab over three years from 2018 to 2020 to combat stubble burning. Of these, 50,847 machines were supplied to custom hiring centers, and 25,779 machines were given to individuals (August 2, 2021).
3. The state government formed Custom Hiring Centres (CHCs) with groups of eight farmers each

- and provided an 80% subsidy for purchasing Happy Seeders (September 26, 2019).
4. A study by PAU found that the percentage of farmers using machines to manage rice straw increased from 16.03% in 2017 to 50.61% in 2018 and 62.58% in 2019. In addition to the 50,815 machines provided until the fiscal year 2018, an additional 23,500 machines were supplied in fiscal year 2019, significantly increasing the spread of machinery. With the approval of the Super Seeder machine by PAU in 2020, it will become even more accessible for farmers to manage rice straw (October 28, 2020).
 5. The Punjab government has approved ten types of machines (Zero till drill, paddy straw chopper, RMB plough, mulcher, super SMS, cutter-cum-spreader, super seeder, super master, etc.) for rice straw management. In 2019, 22,854 machines were purchased with subsidies, but only 14,625 were used. The Happy Seeder, priced at Rs 150,000 and requiring a 65-horsepower tractor, is still out of reach for small farmers, even with a 50% subsidy (November 10, 2020).
 6. The Smart Seeder developed by PAU has been included in the Union Ministry of Agriculture subsidy scheme. It can incorporate rice stubble into the soil and directly sow wheat, combining the Happy Seeder and Super Seeder functions in one machine (October 6, 2022).
 7. The high cost of agricultural machinery is a major obstacle for farmers. According to the agriculture minister's response, the estimated cost per acre is Rs 5,465 for the Super Seeder, Rs 4,100 for the super SMS attached to a combine harvester, Rs 3,600 for the baler and rake, Rs 3,595 for the reversible plough board plough, Rs 2,785 for the paddy straw chopper, Rs 2,525 for the Rotavator, Rs 1,465 for the zero till drill, and Rs 1,300 for the reaper binder (August 2, 2021).
 8. Farmers in Punjab ordered 19,042 machines, including Happy Seeders, mulchers, straw shredders, and super SMS. However, the state government provided only 10,111 machines (53%) (November 9, 2019).
 9. Farmers in Sangrur district were waiting for balers to arrive, but since they did not, they had to rent reapers at Rs 550 per acre to remove rice straw. To clear rice straw from the fields, at least two balers are needed per village (November 11, 2023).
 10. In Jalandhar district, there are only 125 balers for 46,600 farmers, leaving many villages with no choice but to burn rice straw. One baler can process 700–800 acres of farmland. If within 10–12 km of the owner's village, the machinery can be rented out for free (November 12, 2023).
 11. Punjab Farmers Welfare Minister explained that applications by August 13 will receive subsidies total of Rs 210 million for the purchase of machinery such as pneumatic planters, potato planters (automatic or semi-automatic), potato diggers, paddy transplanters, and DSR (direct seeding of rice) seed drills (July 25, 2024).
 12. In order to minimise the number of farm fires, Faridkot district authority made it mandatory for all those who purchased subsidised agricultural machinery to help small farmers with residue disposal and sowing. If the owner of subsidised machinery refused to provide it on hire, a notice would be issued and the subsidy would be recovered together with interest (October 29, 2024).

The abuse of the subsidy

1. Of the 107 machine banks run by farmer unions that received a subsidy of Rs 600,000–800,000 from the government, 34 did not exist at the documented locations. Of the 167 Happy Seeders provided, 24 were in a non-operational state (October 18, 2019).
2. To verify if there were any fraudulent claims on subsidies, the Punjab government planned to conduct a physical audit of all straw management machines purchased by farmers, panchayats, cooperatives, and custom hiring centers (CHCs) on November 1, 2021 (October 31, 2021).
3. In Sangrur district, none of the 2,475 farmers who applied for straw management machinery have

- received them. The agricultural department is conducting audits to prevent fraud, leaving farmers with no choice but to burn the straw (November 1, 2021).
4. The Tribune reported on October 18, 2019, that there were no records of machine distribution to custom hiring centers, and the allocation of billions of rupees for the crop residue management scheme remained unaccounted for (November 14, 2021).
 5. An agricultural machinery subsidy misuse scandal revealed that an average of 11% of agricultural machinery across 20 districts in the state is untraceable. Machines worth Rs 1 billion are missing (August 10, 2022).
 6. The Punjab Minister of Agriculture stated that out of the 90,422 straw management machines distributed to farmers, 11,275 are missing. Although the central government provided subsidies amounting to Rs 11.78 billion from fiscal year 2018 to 2021, Rs 1.5 billion has been embezzled (August 18, 2022).
 7. Due to delays by the Punjab Agriculture Department in disbursing subsidies for straw management machinery, only 16,645 out of the approved 46,460 machines had been purchased by November. Verification of machines to prevent fraudulent claims has taken time (November 20, 2022).
 8. Regarding the “missing straw management machines,” the Punjab Minister of Agriculture demanded a list of manufacturers from his secretary, alleging that the manufacturers were also involved in the fraud (January 26, 2024).

Table 10. Newspaper articles on Subsidy

Year	Month	Date	Headline
2019	09	26	High prices of machines leave farmers flustered
2019	10	18	34 farm machinery banks go ‘untraced’ in Bathinda
2019	11	09	Less machines to blame for stubble fires: Experts
2020	10	28	Land under stubble mgmt increases to 62.5%: PAU study
2020	11	10	Farmers unable to afford stubble mgmt machines: Study
2021	08	02	State given 76K machines in 3 yrs to stop farm fires: Centre
2021	08	02	Bajwa: Equipment only adding to input cost
2021	10	31	To prevent fraud, subsidy for stubble management machines after verification
2021	11	01	No stubble mgmt machine yet for Sangrur farmers
2021	11	14	Two years on, farm machinery bank scam returns to haunt agri officials
2022	07	13	Beneficiaries got Rs 35 crore subsidy multiple times in 2018–19: Inquiry
2022	08	10	Machinery worth Rs 100 cr found missing, says report on agri scam
2022	08	18	Punjab Vigilance to probe farm machinery scam
2022	10	06	Centre to provide subsidy on PAU smart seeder
2022	11	20	Punjab sits on subsidy to manage paddy straw, adds fuel to farm fires
2023	11	11	Baler shortage makes farmers burn crop residue in Punjab
2023	11	12	In Jalandhar, only 125 balers to manage stubble on 4.25 lakh acres
2024	01	26	Punjab: Notice to 2 top officers over missing straw machines, withdrawn
2024	7	25	Punjab Agriculture and Farmers Welfare Department invites applications for subsidised machinery
2024	10	29	Help small farmers, govt directs owners of straw mgmt machines

Farmers’ movement

Protest against the new farm law

1. The Punjab government is protesting the central government’s directive to abolish the MSP system. This decision affects farmers, market stakeholders, and intermediaries (June 25, 2020).

2. The Union Minister of Agriculture stated that the central government's goal is to double farmers' incomes and that the recently introduced three ordinances (Farmers' Produce Trade and Commerce (Promotion and Facilitation) Ordinance 2020, Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Ordinance 2020, Essential Commodities (Amendment) Ordinance Act 2020) do not abolish the MSP. The new laws will enable farmers to sell their produce at any price they choose (June 28, 2020).
3. The Bhartiya Kisan Union (Rajewal) announced a protest against the central government's agricultural reform laws on July 20. They claim that the reform laws will dismantle Punjab's agricultural market and hand it over to the private sector (July 10, 2020).
4. In Punjab, a massive farmers' rally was held in opposition to the agricultural reform bills proposed by the BJP government. The Farmers Produce Trade and Commerce (Promotion and Facilitation) Ordinance, 2020 allows farmers to sell their crops to private traders without going through the market (July 28, 2020).
5. The Prime Minister hailed the passage of the three agricultural bills in the lower house as "historic" and accused the opposition of misleading farmers. He argued that the bills are necessary to protect farmers from middlemen (September 19, 2020).
6. The President of India approved the three agricultural bills. The Prime Minister emphasized that these bills will free farmers from various constraints (September 28, 2020).
7. Farmers in Punjab planning to participate in protests against the agricultural laws threatened to burn rice stubble to sow wheat earlier (October 2, 2020).
8. Farmers from Majha, Malwa, and Doaba regions of Punjab gathered at the Haryana border to march to Delhi in protest against the agricultural bills (November 26, 2020).
9. A nationwide strike in support of Punjab farmers protesting the new agricultural laws was held in 25 states. Railways, roads, and shops were all closed (December 9, 2020).
10. The seventh round of talks between farmer representatives and government ministers ended without a conclusion. Farmers vowed to continue their protests until the three new agricultural laws were repealed, while the ministers repeatedly emphasized the benefits of the new laws for farmers (January 5, 2021).
11. On the birthday of the Sikh Guru, the Prime Minister announced that the three new agricultural laws would be repealed in the next session of Parliament and that a committee of experts would be established to effectively implement the MSP (November 20, 2021).
12. On November 29, the bill to repeal the agricultural laws was passed in parliament without opposition from the ruling party (November 30, 2021).

Protest demanding the guarantee of MSP

1. Over 100,000 farmers in Punjab protested, claiming that the central government had not fulfilled the promises made when the new agricultural laws were repealed in November 2021. Their demands include the establishment of a committee of experts to guarantee MSP for all crops, the withdrawal of charges against farmers arrested during the protests, providing government jobs to the families of the more than 700 farmers who died during the protests, and amending the Electricity Amendment Bill to benefit farmers and workers (February 1, 2022).
2. A report by the Department of Agricultural Research and Education under the Ministry of Agriculture and Farmers Welfare indicated that the number of stubble burning incidents increased during farmer protests against the new agricultural laws compared to the previous period (March 25, 2022).
3. The central government established a committee in July to reform the MSP system, but representa-

- tives from Punjab did not participate (December 18, 2022).
4. Farmer leaders announced that they would start a march to Delhi on February 13, 2024, to press their demands, including the legalization of MSP. Over 200 farmer organizations across India will participate in this “Delhi Chalo” march (February 5, 2024).
 5. While farmers demand MSP guarantees for all produce at C2+50% (at least 50% above comprehensive production costs) in line with the Swaminathan Commission’s recommendations, the government considers it a significant challenge requiring substantial fiscal allocation, infrastructure, and policies, while also needing to protect consumer interests. Guaranteeing MSP would necessitate an additional annual budget allocation of Rs 2 trillion (February 14, 2024).
 6. On the 78th Independence Day, farmers took out tractor marches across Punjab and Haryana to force the Union government to acknowledge their demands, including the MSP guarantee for their crops (August 15, 2024).
 7. Farmers activists protesting in Chandigarh have decided to call off the strike after the Punjab Chief Minister said he would accept their demands, including implementing a new agriculture policy, by September 30 (September 6, 2024).

Table 11. Newspaper articles on new farm law

Year	Month	Date	Headline
2020	06	25	Withdraw farm ordinances: Pb parties
2020	06	28	MSP regime to stay, says Union Minister
2020	07	10	BKU threatens protest over ordinances
2020	07	28	Despite curbs, farmers hold statewide protest
2020	09	19	PM blames middlemen for farm protests, says Oppn spreading lies
2020	09	28	Prez nod to farm Bills as protests rage in region
2020	10	02	Sangrur village vows not to burn stubble
2020	11	26	Pb farmers stopped at Hry borders
2020	12	09	Bharat Bandh brings state to a standstill
2021	01	05	No outcome, next meeting on January 8
2021	11	20	Centre relents, to roll back 3 farm laws
2021	11	30	No debate, Parl passes Bill to repeal farm laws; will answer all queries, says PM Modi
2022	02	01	Farmers burn PM’s effigies
2022	03	25	Parl panel: Stubble-burning spike during farm protest
2022	12	18	No representative from Punjab on MSP panel
2024	02	05	Farmers to march to Delhi on February 13, demand law to guarantee MSP for crops
2024	02	14	Guarantee on MSP a hurdle in farmer-Centre talks
2024	08	15	On Independence Day, farmers hold tractor marches in Punjab, Haryana
2024	09	06	After meeting Punjab CM, farmers protesting in Chandigarh call off stir

Weather condition

Influence of bad weather on crop sowing

1. The flooding of the Ghaggar River in the Moonak area in July 2019 delayed the rice sowing season, which subsequently delayed the wheat sowing season (December 24, 2019).
2. Monsoon rains caused the water level of the Sutlej River to rise, submerging hundreds of acres of crops in villages of Fazilka district (July 18, 2022).
3. The Ghaggar River overflowed, causing flood-like conditions in the Patiala district (July 9, 2023).
4. Farmers whose rice crops were damaged by floods received free PR126 early variety seeds from other farmers (July 17, 2023).

5. Farmers in flood-affected areas replanted the non-Basmati variety PR126 after the July 2023 floods. The yield of PR126 was equivalent to that of PUSA44 (November 24, 2023).
6. Across Punjab, 625,000 acres of farmland were affected by floods, but the agriculture department plans to replant rice seedlings on 200,000 acres (July 31, 2023).
7. The state government's promise to provide free seedlings was nothing but a boast on newspaper pages. Flood-affected farmers in Sangrur district are forced to buy seedlings at high prices of Rs 3,000–3,500 per acre from Punjab and Haryana (July 31, 2023).

Influence of bad weather on crop harvesting

1. Heavy rain and strong winds on October 4, 2021, caused the lodging of ripened rice and cotton in Bathinda and Mansa districts. The fallen rice cannot be harvested with combines, resulting in delayed harvesting (October 6, 2021).
2. In Sangrur district, the rice harvest, scheduled to begin at the end of September, was delayed by a week due to unseasonal rains that flooded fields and caused rice lodging (October 3, 2022).
3. Persistent rains in Punjab have increased soil moisture, preventing combine harvesters from entering the fields and delaying rice harvesting (October 18, 2023).
4. The shortened period between rice harvesting and wheat sowing due to unseasonal rains has raised concerns at the Punjab Pollution Control Board (PPCB) about a potential increase in stubble burning this season (October 19, 2023).
5. Due to the intermittent rains that started on November 9, the smoke has cleared, but agricultural activities will be delayed by several days. The high soil moisture content will take 4–5 days before wheat can be sown using super seeders. Additionally, there is no place to store harvested rice away from the rain, so harvesting must be delayed for a few days (November 11, 2023).

Compensation for the affected farmers

1. For weather-related crop damage, the government provides no compensation for losses up to 25%. For damages between 26% and 32% of the cultivated area, the compensation is Rs 2000 per acre; for damages between 32% and 75%, it is Rs 5500 per acre; and for damages between 76% and 100%, the compensation is Rs 12000 per acre (March 9, 2020).
2. The new government under Bhagwant Mann implemented crop compensation for farmers affected by natural disasters, which previous Punjab administrations had failed to do. In 2021, they handed over checks to farmers whose cotton crops had been damaged (March 27, 2022).
3. Over the past two years, due to adverse weather conditions and pest infestations, the Punjab ruling party AAP had to pay Rs 15 billion to rice and cotton farmers. Therefore, Punjab joined the central government's crop insurance scheme, Pradhan Mantri Fasal Bima Yojana (PMFBY), starting in 2023 (November 14, 2022).
4. Given the possibility that the central government's compensation scheme, Pradhan Mantri Fasal Bima Yojana, might not adequately cover Punjab, where AAP is the ruling party, the Punjab government decided to establish its own crop damage compensation scheme (May 31, 2023).
5. The Punjab government allocated Rs 1.86 billion from the disaster relief fund to compensate farmers affected by floods. Rs 18,000 per hectare will be provided for silt removal and Rs 17,000 per hectare for crop damage (August 23, 2023).

Table 12. Newspaper articles on Weather situation

Year	Month	Date	Headline
2019	12	24	July floods still taking toll on Sangrur farmers
2020	03	09	Farmers reject Sangrur admn report on damage to crops
2021	10	06	Rain damages paddy, cotton crops
2022	03	27	Farmers to get crop relief before girdawari: CM
2022	07	18	Sutlej in spate, crops damaged in Fazilka
2022	10	03	Untimely rain delays harvest in Sangrur
2022	11	14	Finally, state govt agrees to join Centre's crop insurance scheme from next fiscal
2023	05	31	Punjab to come up with own crop insurance scheme
2023	07	09	Incessant rain throws normal life out of gear in Punjab; flood-like situation in Patiala, Mohali leaves residents harried
2023	07	17	Farmers in flood-hit Punjab prop up each other with free seeds
2023	07	31	Punjab Agriculture Department aims to replant saplings on 2 lakh acres
2023	07	31	Sangrur: Flood-affected farmers compelled to buy paddy saplings at inflated prices
2023	08	23	Monsoon fury — Punjab: Govt releases Rs 186 cr for flood-hit; received nothing, claim farmers
2023	10	18	Rain slows down paddy arrival in Punjab grain markets
2023	10	19	As wheat sowing window narrows, PPCB issues alert to tackle farm fires
2023	11	11	Muktsar : Moisture content up, wheat sowing may be delayed
2023	11	24	Despite flooding in Punjab, paddy purchase exceeds target

Impact of Disease

1. Farmers who sowed wheat using the Happy Seeder without burning the stubble after paddy harvesting were troubled by the pink stem borer. One farmer had to purchase seeds again and re-sow as the wheat withered due to the egg of the pests remaining in the paddy residue (December 14, 2019).
2. In Muktsar district, wheat fields have been invaded by the pink stem borer after sowing. According to agricultural officials, the infestation spread from fields where paddy straw was mulched instead of being burnt (December 15, 2023).
3. In Muktsar and Sangrur districts, farmers who sowed wheat using the Super Seeder have expressed dissatisfaction with the invasion of the pink stem borer. They claim that the lack of stubble burning has had side effects, as the spray could not reach the crops beneath the leftover paddy straw (December 19, 2023).
4. Experts from PAU have identified the cause of the stunted growth phenomenon in paddy across the state as the southern rice black-streaked dwarf virus (SRBSDV) (August 27, 2022).
5. Due to the outbreak of the southern rice black-streaked dwarf virus (SRBSDV) in 2022, there is a movement across Punjab to switch from the PR-121 paddy variety to Supreme 110 or PR-126 (June 10, 2023).

Table 13. Newspaper articles on the impact of disease

Year	Month	Date	Headline
2019	12	14	Pest attack: No need to panic, officials tell wheat growers
2022	08	27	PAU decodes paddy stunting mystery
2023	06	10	PR-121 paddy variety shunned by farmers
2023	12	15	Pink stem borer hits Muktsar wheat crop
2023	12	19	Pink stem borer hits wheat crop; Punjab farmers blame residue ploughing

Impact of COVID-19

The governmental restriction

1. Prime Minister Modi announced a 21-day nationwide lockdown to prevent the spread of the coronavirus (March 25, 2020).
2. During the nationwide lockdown in India, air pollutants decreased, making the snow-covered Dhauladhar mountain range visible from Jalandhar, 160 km away (April 4, 2020).
3. To curb the spread of COVID-19, the central government decided to extend the nationwide lockdown until May 17 (May 2, 2020).
4. Since the easing of restrictions, air pollution levels have worsened. During the lockdown, the AQI in Punjab dropped to as low as 36, but by late May, it had risen to around 200 (May 27, 2020).
5. The number of new COVID-19 cases across India reached 414,000 at the peak of the second wave on May 7, 2021 (June 16, 2021).
6. In response to the onset of the third wave of COVID-19, the Punjab government decided to implement measures including a night curfew, closure of all educational institutions, limiting entry to cinemas, malls, and restaurants to 50% capacity, and prohibiting workplace attendance for those not fully vaccinated (January 5, 2022).

The problem of labour shortage

1. As a COVID-19 measure, the Punjab government decided to defer agricultural loan repayments from March 1 to August 3 (June 2, 2020).
2. Farmers were concerned about the labour shortage for wheat harvesting and the subsequent paddy sowing. Paddy sowing requires the skills of migrant workers, which the local population cannot provide (April 12, 2020).
3. The Punjab government sent 389,000 migrant workers back to their hometowns. With the paddy transplanting period shortened to one month, farmers struggled to secure labor. Wages also doubled from Rs 3200/acre in 2019 to Rs 7000/acre (May 29, 2020).
4. In response to the labor shortage during the second wave of COVID-19, the Punjab government decided to advance the paddy transplanting date to June 10 in 2021, with direct seeding starting on June 1 (May 15, 2021).
5. Landowners who typically relied on migrant workers for all farming tasks and worked other jobs themselves began transplanting rice due to the labor shortage and rising wages (June 12, 2020).
6. Young people from Punjab, whose plans to study abroad were cancelled, are now helping their parents on farms and in markets (April 17, 2020).
7. Migrant workers from Bihar and UP returned to Punjab as they could not find jobs and support their families in their hometowns (July 2, 2020).
8. Migrant workers who had returned to their native villages with the spread of COVID-19 came back to Malwa region during the paddy harvest season. During the wheat harvest, they had to rely on local laborers who were inexperienced with the tasks (October 3, 2020).
9. The Punjab government purchased crops at 3,691 centers from April 15 to May 31. The procurement period was extended until June 15, as needed. Farmers were issued electronic coupons to stagger the times they brought in their crops (April 13, 2020).
10. The Minister of Consumer Affairs, Food, and Public Distribution announced that procuring wheat (127.11 MT) and rice (202.78 MT) in 2020 reached record highs in Punjab. In response to the COVID-19 pandemic, an additional 4,400 procurement centers were established (January 5, 2021).

Shift to direct seeding of rice

1. Amid the COVID-19 turmoil, a groundbreaking development occurred for agriculture in Punjab with the increase in direct seeding of rice. Direct seeding was adopted on 20% (550,000 hectares) of the paddy cultivation area (including Basmati). This led to a significant reduction in costs and a substantial saving in water usage (July 27, 2020).
2. The Punjab government announced that from 2021 onwards, all farmers practising direct seeding of rice would receive a subsidy of Rs 1,500 per acre. The goal was to reduce the transplantation method, which consumes excessive groundwater (May 1, 2021).
3. Since migrant workers returned home due to the COVID-19 pandemic, direct seeding of rice has become a trend in Punjab. In 2020, 500,000 hectares were cultivated with direct seeding, increasing to 601,000 hectares in 2021. However, in 2022, the area was limited to 200,000–300,000 hectares. Before direct seeding, fields need to be irrigated twice. Farmers faced challenges such as a shortage of seeding drills, decreased yields, and weed growth (June 20, 2022).

Table 14. Newspaper articles on the impact of COVID-19

Year	Month	Date	Headline
2020	03	25	1.3 bn Indians under 21-day lockdown
2020	04	04	Mountain delight
2020	04	12	Farmers: Labour shortage set to compound problems
2020	04	13	To avoid rush in mandis, govt sets up 3,691 centres
2020	04	17	No labour, Punjabi youths sweat it out in fields
2020	05	02	Lockdown till May17, curbs eased in safe areas
2020	05	27	Air quality dips again, straw burning, industry to blame
2020	05	29	At 7K/acre, labour rates more than double in Punjab
2020	06	02	Paddy MSP hiked by Rs.53/quintal
2020	06	12	Employed in factories, marginal farmers take leave for paddy
2020	07	02	Migrants return, say hunger bigger threat
2020	07	27	MGNREGA softens the blow
2020	10	03	Farmers cheer as Covid-hit labourers return for harvest
2021	01	05	In Pb, record procurement amid lockdown
2021	05	15	Paddy transplantation advanced to June 10
2021	06	16	85% fall in cases since May peak; micro curbs the key, states told
2022	01	05	Night curfew back, edu institutes shut till Jan 15
2022	05	01	Govt offers Rs 1,500/acre aid for direct seeding of rice
2022	06	20	DSR makes patchy progress

Stubble burning in Haryana

1. In compliance with the Supreme Court's order, the Haryana government paid Rs 100 per quintal to small and marginal farmers who do not burn stubble after harvesting non-Basmati rice (November 8, 2019).
2. The Haryana government has plans to provide an additional compensation of Rs 1,000 per acre to farmers who stop burning stubble (November 12, 2019).
3. In Haryana, the number of stubble burning incidents decreased by 47% this season due to an increase in manual wheat harvesting, the establishment of more custom hiring centers (CHC) for lending agricultural machinery, and increased awareness among farmers due to the novel coronavirus (June 8, 2020).
4. The Haryana government is providing Rs 1,000 per acre in compensation to farmers who manage stubble through in-situ and ex-situ methods. Previously, only landowners could receive this com-

- pensation, but now cultivators are also eligible (February 11, 2023).
5. In Haryana, farmers who manage stubble through ex-situ methods without burning must first apply on a portal site and undergo an inspection by the agriculture department before receiving the payment (March 15, 2023).
 6. The Haryana Space Applications Centre (HARSAC) classified 147 villages in the state as red zones (6 or more stubble burning incidents) and 582 villages as yellow zones (2 to 5 stubble burning incidents) based on the number of stubble burning incidents. Panchayats in villages that moved from red to green zones were awarded Rs 100,000, while those from yellow to green zones were awarded Rs 50,000 (September 22, 2023).
 7. The Haryana government was giving Rs 1,000 per acre to farmers managing their paddy stubble through ex-situ or in-situ management without farm fires, Rs 7,000 for crop diversification, and Rs 4,000 per acre for direct seeding of rice (October 30, 2024).

Table 15. Newspaper articles on case of Haryana

Year	Month	Date	Headline
2019	11	08	From today, Hry to give R100/quital incentive to farmers
2019	11	12	Hry offers Rs. 1K/acre more to farmers
2020	06	08	Wheat harvested manually, farm fires drop by 47%
2023	02	11	12,900 Kurukshetra farmers to get Rs 11cr incentive for not burning stubble
2023	03	15	Over 11,500 farmers lead by example in managing stubble in Karnal
2023	09	22	Stubble burning: 147 villages in red zone, 582 in yellow
2024	10	30	Haryana rewards its farmers; farm fires down by 67% since 2021

Conclusions and Implications

The issue of stubble burning in Punjab and Haryana represents a complex mix of socio-economic, political, and environmental challenges. This paper highlights how stubble burning has become a significant contributor to air pollution in Delhi NCR, exacerbating health and environmental problems. Despite concerted efforts by both state and central governments, such as subsidies for crop residue management, incentives for crop diversification, and the enforcement of penalties, the issue persists due to systemic gaps in implementation, political pressures, and the socio-economic constraints faced by farmers.

The analysis of newspaper articles from 2019 to 2024 reveals that government interventions, including in-situ and ex-situ crop residue management strategies, promotion of short-duration rice varieties, and the establishment of biomass power plants, have achieved varying levels of success. However, challenges such as limited adoption of machinery, inefficiencies in subsidy disbursement, and a lack of viable alternative income sources for farmers continue to undermine these efforts. Political instability, including prolonged protests against agricultural reforms and delayed financial compensations, has further complicated the situation.

Progress in reducing stubble burning incidents in recent years demonstrates the potential of well-coordinated policies, but it also underscores the need for a long-term, multi-faceted approach to fully address the issue. Strengthened implementation of policies is essential, with a focus on effective enforcement of regulations, transparent subsidy disbursement, and timely delivery of machinery. Farmers must also be better informed about the economic and environmental benefits of alternative practices, supported by increased financial incentives to discourage stubble burning.

Promoting crop diversification is critical to reducing dependency on water-intensive paddy cultivation. Introducing market support and procurement guarantees for alternative crops would encourage

farmers to adopt different cropping patterns. Infrastructure and technological investments, such as expanding biomass power plants, biogas facilities, and straw banks, can offer scalable solutions for straw management. Moreover, making cost-effective machinery like balers, Happy Seeders, and Super Seeders accessible to small and marginal farmers can significantly decrease stubble burning incidents.

Greater engagement with farmers in policy formulation and implementation is vital for ensuring acceptance of measures. Community-based solutions and cooperatives should be supported to enable localized, sustainable practices. The socio-political context, including the trust deficit between the government and farmers, needs careful management through consistent dialogue and fulfilling commitments for financial and technical assistance.

Advanced data and technology, such as satellite monitoring and real-time air quality tracking, should be leveraged to improve accountability and enforcement. Climate variability, including delayed rains, necessitates adaptive strategies like flexible planting schedules and promotion of resilient crop varieties. The reduction of stubble burning must also align with broader environmental objectives, such as groundwater conservation and carbon emission reduction, ensuring that solutions are both holistic and sustainable. Collaborative frameworks between states and national level can enhance resource sharing and technology transfer to address the regional nature of air pollution.

By addressing the structural, economic, and political dimensions of the problem, a sustainable resolution to stubble burning and its environmental impacts can be achieved. This requires not only government commitment but also active participation from all stakeholders to build an equitable and environmentally sustainable agricultural system. Lessons from past experiences emphasize the importance of integrating long-term environmental goals, fostering farmer participation, and strengthening the mechanisms for implementation to create lasting change.

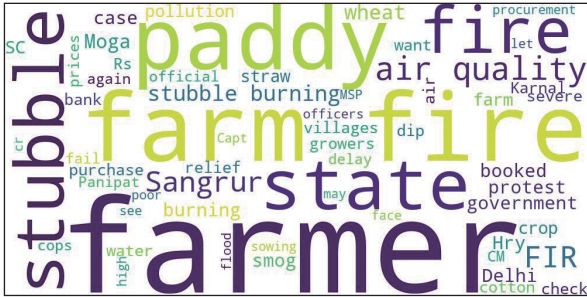
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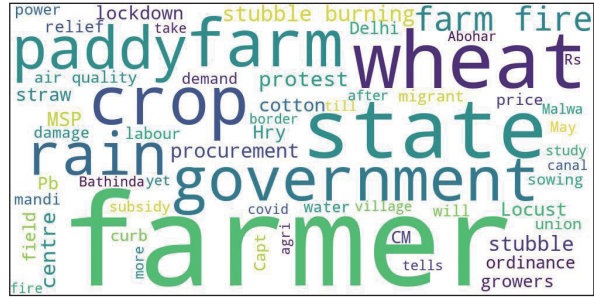
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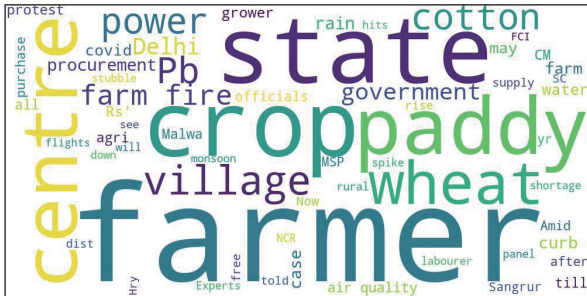
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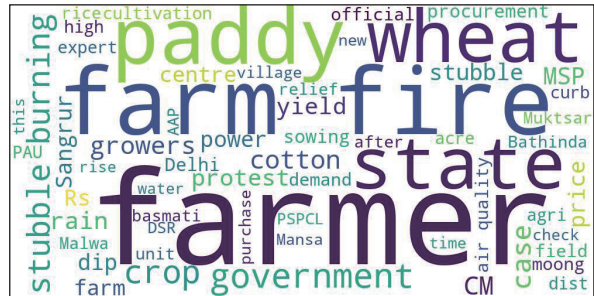
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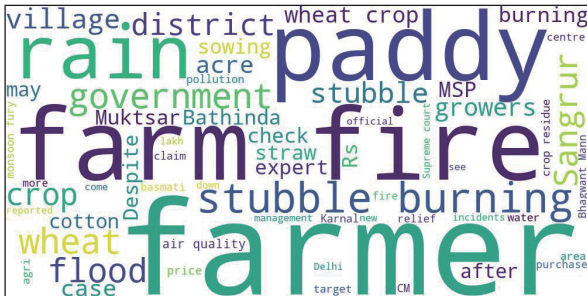
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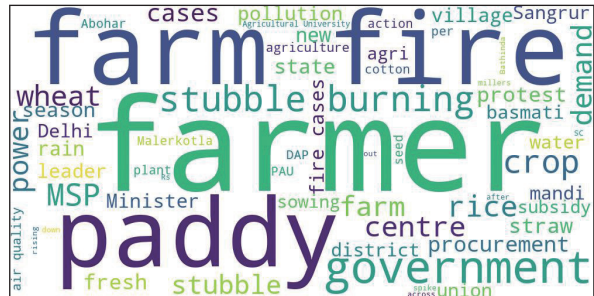
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2023



2024



Word cloud on the front page is created using the news titles of all years and those on the back page corresponds to individual years (the joining words, prepositions, Punjab, Haryana and Delhi are excluded)

The word clouds are prepared by Natsuko Yasutomi, RIHN

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